ESPON

EUROPEAN UNION

Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

Scientific Report

Building the next generation of research on territorial development

Papers presented at the ESPON Scientific Conference on 14 November 2018 in London, United Kingdom

September 2019

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Table of contents

List of figures

List of maps

List of tables

Foreword

The speed of change in Europe in economic and social terms is accelerating, accompanied by an increasing fragmentation of society and territories that implies a real threat to integration.

At the same time, places and economies are more interconnected than ever. Administrative borders become less important, as social and economic developments in one place have major impacts on development perspectives in other places.

Policymakers increasingly realise that they need to work together. But in this new environment they are still quite blind. They are lacking not only data, but also the tools and methodologies to understand the flows and interconnections of places and transform this information into concrete policy measures.

In ESPON we develop research to support policymakers to narrow this gap. It is important though to ensure that we are asking the right questions, those that policy-makers raise seeking to receive answers from the researchers.

We know now that we need a forward-looking, integrated approach in the field of territorial research, that gathers expertise from different sectors. We also need a place-sensitive approach that allows to capture the realities of different places and their interrelations at a very nuclear level.

ESPON supports the transition towards a new quality territorial research. Our Scientific Conference in London, on 14 November 2018 was about “Building the next generation of research on territorial development”.

The three topics of the conference – territorial interrelations, monitoring integrated territorial development and new data sources – reflected on some of these key challenges that the research in territorial development field is facing today.

This publication contains the papers presented and discussed at the ESPON Scientific Conference together with a summary of the keynote speeches and a synthesis of the discussions among representatives of the European Commission, European scientific organisations and the ESPON European Grouping on Territorial Cooperation (EGTC).

I hope that this publication will inspire the research community in the field of European territorial development and cohesion to continue developing and applying innovative approaches and methods to support and inspire policy-makers to address the territorial dimension in their policy development.

Ilona Raugze
Director, ESPON EGTC

1

Executive summary

1. Executive summary

This is both an exciting and unsettling time for social and territorial science. Participants at the ESPON Scientific Conference held on 14 November 2018 in London shared ideas and inspiration for the next generation of scientific approaches to European territorial research.

The promises and perils of the next generation of research

Territorial researchers face the luxury and the upheaval of a whole suite of potent new methods and tools to capture current urban and regional phenomena. Many leverage data alongside existing knowledge to create agile analytical frameworks fit for the complexity and profound interdependencies that increasingly characterise territorial development. For example, geospatial data gathered from online and mobile sources allied to new econometric and mapping tools are helping not only to track flows, but also to spot unintended effects and pick up on unnoticed complementarities. The "volume, velocity and variety" of these new data signals the prospect for researchers of better temporal and spatial accuracy, more opportunities to replicate and fine-tune approaches, and ultimately developing a clearer grasp of evolution and causation in contemporary territorial development.

The promise for Europe-wide policy is very real: smarter place-based analysis, tangible evidence of impacts, and stimuli for collective vision and foresight. Speakers and panellists highlighted the ways that this new wave of research can shed very welcome light on unresolved questions: the links between economic growth and policy outcomes, the impacts of governance on urban development, the route to a circular economy, and the carrying capacity of city and regional systems. Such insights are already equipping and inspiring the renewed EU territorial agenda, and its appetite for deeper data collaboration and scientific plurality. ESPON's dedicated research community is well placed to serve these ambitions, building on its success in developing tools to inform metropolitan governance and cross-border cooperation, and to map interregional relations and flows. As the network of institutions and scientists involved grows, so does the community's potential to inspire targeted and informed territorial policy-making.

However, the next generation of research also brings with it very real challenges. Conference participants agreed that substantial efforts will be required to uphold scientific credibility, ensure substantive levels of co-creation and develop more consensus about the underlying terminologies (e.g. inclusion, integration, attractiveness, density, agglomeration and systems of cities) and their territorial impacts. There should be ongoing vigilance to strike a balance between the desire to accommodate fresh ideas and the obligation to assemble reliable, trustworthy, comprehensive and representative data. Above all, participants stressed that it will be important to ensure that researchers continue to ask the right questions to address ongoing territorial disruption and interdependencies.

The need for speed

The impulse to accelerate and iterate with new modes of analysis is keenly felt, particularly given the recent disruptions to globalisation, growing disparities between regions, the political opposition to the effects of city agglomeration, the urgent skills requirements of the new economy, and the fundamental and ongoing imperative of sustainability and energy transition. This reflects a wider aspiration for data literacy at all levels of decision-making, which also has implications for the ability of European territories to compete in the digital economy, and to optimise their potential to become leaders in the integration of "smart" data-led approaches.

The threshold requirements for new innovative territorial inquiries in this next generation are becoming clear. Participants at the conference stressed that future best practice research will be responsive to the specific and multi-layered needs of policy-makers and stakeholders. In so doing, it will speak to the shared governance models that operate across different geographical scales. It will draw out interdepend-

encies and interconnections across a wider frame of reference and will move beyond dichotomies that encourage zero-sum thinking.

However, in this era of technology-powered innovation, participants agreed that the risks relating to the proliferation and fragmentation of evidence are plain to see and will need to be mitigated by pooling resources and developing closer institutional relationships. In this context, a well-defined value chain will be particularly useful in helping projects to complement one another, add to the existing knowledge base, and build strong narratives that can engage and empower policy-makers to make appropriate and tailored territorial interventions. Above all, speakers pointed out that the next horizon of research could achieve a new level of relevance and usefulness – through the enhanced speed, accuracy, timing and communicational clarity that advanced research techniques themselves provide.

Realising potential: the future of territorial research

The presentations and discussions at the conference in London confirmed a number of shared priorities going forward if the promise of the next generation of territorial research is to be fully realised:

- There should be channels for a deeper and longer-term process of dialogue and co-working between researchers and policy-makers, including joint contributions to define scope, deliverables and implications.
- There should be an agenda of capacity building, both for researchers, through knowledge exchange and peer-learning workshops, and for the process of the "translation" of research for city leaders as they marshal and interpret data. For the benefit of all parties, mapping the universe of research and data initiatives will be essential for building a shared purpose.
- There should be a focus on harnessing research to achieve compelling visualisations and narratives, to stimulate decision-maker and civic participation, and support more proactive and strategic policy-making.

ESPON is committed to these priorities and to taking responsibility for fostering quality and capacity during this age of disruption.

2

Towards next generation research to inspire territorial policy-making

2.
Towards next generation research to inspire territorial policy-making

This report is based upon the ESPON Scientific Conference held in London, United Kingdom, on 14 November 2018. The event brought together representatives of the European Commission, European Grouping on Territorial Cooperation (EGTC) programmes and European scientific organisations, and academics, researchers and entrepreneurs to discuss experiences and upcoming challenges in territorial development and cohesion, and how to apply new scientific approaches and tools in territorial research.

After opening remarks and keynote speeches that explored new trends in the field of territorial development, most of the day centred around two sets of parallel sessions in which 17 researchers presented, explained and discussed new concepts, methods, indicators, typologies, tools, maps and models that they have developed or used in relation to three specific topics:

- territorial interrelations
- monitoring integrated territorial development
- new data sources.

This short synthesis provides and identifies the key points and policy imperatives raised during the opening sessions, as well as short summaries of the 17 research papers presented at the event, and their key innovations and contributions to the field of territorial development. The synthesis ends with a summary of the final panel debate, which reflects on the traditional ways of doing research in relation to the three specific topics and future research imperatives.

2.1.
State of research in the field of territorial development

The opening keynote speeches focused on the many digital and geographical disruptors facing Europe and addressed far-reaching questions about the "why", the "what" and the "how" of territorial research. This generated a rich audience discussion that prompted questions about the role of localism as a guiding framework, the ways that geographers can navigate complexity, and the ultimate responsibilities for data monitoring in an era of porous and overlapping European geographies.

i) New disruptors and the promises of new research

Andy Pike's keynote speech pointed to a series of digital and spatial drivers and disruptors that are currently unsettling urban and territorial development patterns. These include:

- **Opposition to the existing consensus around globalisation, agglomeration and "city-centric" policy-making**: there is strong demand to consider the wider interdependencies in the city-regional basin, and for greater precision about the roles of scale and density as determinants of urban economic growth. This is particularly important, as baseline scenarios show that disparities both between and among European regions will continue to increase up to 2035.
- **Major changes in skills requirements in the digital economy**: there is also a tendency for these skills to be highly concentrated in a small number of locations.
- **Entrenched social and spatial inequalities**: such inequalities prompt efforts from "left-behind" places to reorganise around foundational infrastructures, networks and collective assets.

These disruptors are driving a new generation of research on place-based development, inclusive growth, quality of life, the evolutionary character of urban economies and economic resilience. A key thread running through many of these new research questions is that more people and places must be connected

to growth models, and that new links between growth and policy outcomes must be explored through aggregate European-wide studies.

ii) Imperatives for action and lessons from successful implementation

Daniela Florea's keynote speech took a distinct yet complementary approach, focusing primarily on the priorities required for policy-makers and researchers to interact more successfully. To emphasise the necessity for high-quality, usable data, she highlighted the importance of:

- **Research projects and analyses that present data in a practical context and are up-front about their potential policy applications, rather than from a purely technical perspective**: these will help to build bridges between the policy and data science communities and may also help city leaders to educate key stakeholders and policy-making teams about what "going digital" can do for their city visions and ambitions.
- **Data-literate decision-makers and promoting the sharing of best practices**: data-driven decision-making depends on decision-makers who are adequately trained in data handling and analysis. Conversely, data specialists need softer skills such as negotiation and iteration to maximise their impact. This can be achieved by using millennials as reverse role models, supporting data literacy programmes and monitoring progress through the use of key performance indicators (KPIs).
- **Decision-makers who are incentivised to promote experimentation**: this can be achieved if policy-makers work with researchers to instil a sense of urgency from the beginning and prioritise open data sources, which can grow exponentially over time.

To illustrate these imperatives, Florea highlighted examples of successful data-driven approaches in European cities. These examples reaffirmed the importance of cities having a recognised digital leader, a deep government–civic collaboration in relevant research and the creation of open, co-created databases that are accessible and usable by interested parties.

iii) Challenges and dilemmas of the next generation of data-driven research

Both keynote speakers raised the challenges and dilemmas posed by territorial data. Speakers noted that alongside limitations to the data themselves (e.g. being out of date, and data inconsistencies, incompleteness and comparability), there are also barriers to engaging political decision-makers in using data effectively.

Speakers and audience members noted that data-driven decision-making is novel. To support future decision-making, the integration of new data sources may require effective alignment and timing with political and legislative agendas. It will also be important to support political leaders in becoming champions of urban analytics.

Several questions and debates were raised in the ensuing discussion. These included:

- **The responsibility for cross-border data observatories**: speakers emphasised that the role played by ESPON, the nation state or civil society actors depends on location, given the differences in prevailing political cultures between countries.
- **The EU urban agenda and the future focus on cities**: the view of Andy Pike was that, instead of focusing less on cities, there should be more emphasis on how opportunities in larger cities are connected to and supported by opportunities in wider regional hinterlands.
- **The promise and limitations of localist research**: Daniela Florea highlighted that the skills and insight of multidisciplinary thinkers are needed to deepen the understanding of the multiple interactions between space and data on different scales of analysis.

2.2.
What is needed from the research community?

Ilona Raugze, Director of ESPON EGTC, and *Wallis Goelen Vanderbrock*, Head of Inclusive Growth, Urban & Territorial Development at the European Commission's Directorate-General for Regional and Urban Policy (DG REGIO), highlighted in their presentations four key imperatives specifically targeted at the research community.

i) Overcoming siloes and promoting collaboration

There is increasing recognition among policy-makers and researchers that the key to delivering impactful territorial research is effective collaboration. Speakers highlighted that more time must be devoted to encouraging productive dialogue between researchers and policy-makers. This also relies on governance itself becoming more collaborative and horizontal in nature. In future, decision-makers will depend on careful support and research to recognise the benefits of sharing governance across borders and throughout regions. Examples of successful collaboration must be actively circulated by research communities to accelerate this process.

ii) New methodologies and knowledge sources

A key imperative noted by speakers was the need for new tools and methodologies to better understand and gather more up-to-date data on territorial flows and interrelations. In many instances, contemporary maps do not accurately portray the growing interdependencies between places, which means that a new, more multidisciplinary approach is required. The discussion highlighted the need for creative research processes that reward rigour but also pragmatism and flexibility.

iii) Agile projects and narratives that support smart policy-making

The current speed of territorial and digital disruption means that policy decisions will need to be made quickly and with a high degree of spatial and temporal accuracy. This in turn requires the creation of new narratives that allow for quicker and better targeted interventions, and effectively connect projects with added value for society. In this regard, speakers highlighted the potential to synchronise research with policy timing cycles that impact upon territorial development and the creation of live feeds of evidence as two promising ways forward.

iv) Careful attention to policy relevance and usability from the beginning

The speakers highlighted that, although mapping and data analysis are important, the data used must be tailored very carefully to be relevant to the new generation of policy questions. On the one hand, it is essential that future research is positioned carefully with respect to existing scholarship so as to ensure better contextualisation and understanding. However, avenues for stakeholder involvement at all stages of the process are very important, to make sure that results are useful and can be applied effectively.

2.3.
Fresh scientific approaches and tools in territorial research

i) Territorial interrelations

The parallel sessions related to this topic dealt with the question of how to improve and strengthen the analytical and methodological capacities to capture territorial interrelations, functional areas and territorial development beyond fixed administrative units.

Most of the presentations stressed the **increased need for integrated analytical approaches** that combine quantitative evidence with qualitative impact analyses of institution- and stakeholder-related interactions. Panellists and discussants shared the view that this requirement will be a challenge:

- Some of the methods to be used are very time consuming, not easily scalable and therefore expensive.

- The qualitative findings about institutional territorial interrelations will vary considerably because of the high degree of diversity of the legal and organisational conditions in different cross-border and functional areas.
- Researchers have not yet refined tools with which to compare qualitative and policy-relevant findings of specific territorial conditions and institutional designs at a European level.

Despite a certain scepticism, panellists and discussants expected these methods to provide substantial benefits. They can help researchers and policy-makers see specific territorial assemblages in the context of relational governance networks, and to find and develop new and appropriate formats for policy interventions. Whether it is "institutional mapping", "social network analysis" or "ethnographic methods", all approaches presented aim to **deepen a holistic understanding of territorial interrelations** that goes beyond "data mapping". In a nutshell, the speakers and authors outlined the following intentions and new analytical approaches:

- **Institutional mapping (IM)**: IM empowers stakeholders to evaluate their performance and operational flows in complex institutional arrangements, which in turn create spatially diverse systems. IM generates an inventory of the key players in a process, highlights their roles and charts the connections between various stakeholders. Moreover, it acknowledges the distribution of power and the resulting differences in outcome. In particular, this method allows for a knowledge co-creation process that facilitates communication between researchers and territorial actors (*Carlos Ferreira*, Jennifer Ferreira, Kevin Broughton and Stewart MacNeill).
- **Social network analyses to enhance the understanding of territorial interactions**: understanding the impact of cross-border cooperation programmes, especially on socio-economic development and social cohesion, requires a focused look at the correlation of maturity of institutional capacities with the intensity of civil society engagement. For the Western Balkans, the research showed that civil society organisations are most successful at providing brokering opportunities when there are structural institutional gaps between different actors and stakeholders in the cross-border region (*Dragisa Mijacic* and Jasna Zarkovic).
- **A new modelling framework for shared borderless challenges such as land use or health**: causal maps of systems of borderless challenges, which identify drivers and impacts of changes and transformations, will help to forecast ecosystem service demands, investment needs and policy interventions. This approach will allow policy-makers to maximise value for money by assessing policy or investment outcomes across sectors, economic actors, space and time (*Andrea Bassi* and Montira Pongsiri).
- **Ethnography and Institutional Collective Action (ICA) Frameworks as special research tools.**: ethnography can enrich in-depth explorations of territorial interrelations by providing a tool that makes "hidden data" accessible and makes the influences of informal factors, actors and collaborations visible. The ICA Framework offers an approach to explain collaborative mechanisms such as "integrated territorial investment" – how institutions collaborate, what the risks and costs are, how to select partners for collaboration, etc. (*Sylwia Borkowska-Waszak*).
- **Rethinking marginality**: this research is based on the criticism of traditional spatial imaginaries (simplified indicators that are used to identify target territories to design area-based policies) and proposes a policy approach that addresses the construction of nature-related solutions that can link places and people beyond traditional forms of interrelation. This approach is more relevant now than ever. It examines the phenomena of inclusion, marginality and (inner) peripheries in the context of territorial development, and the findings suggest that policy-makers should shift economic restructuring processes away from central urban areas (*Valeria Fedeli* and Alessandro Balducci).
- **The influence of territorial arrangements on innovation systems**: this research focuses on innovative forms of entrepreneurship and their relationship with territorial configuration and the economic fabric, while distinguishing between innovative start-ups and innovative small and medium-sized enterprises (SMEs). Following an administrative-morphological approach, this analysis centres on the different impacts of high-density urban cluster municipalities, small and medium-sized town municipalities and very small-town municipalities on the innovation dynamics in Italy (*Giacomo Durante* and Margherita Turvani).

KEY MESSAGES HIGHLIGHTED IN THE DEBATE

1. Concepts and methodologies, which focus on qualitative in-depth analysis, are very valuable because they can help us understand decision-making in implementation processes at different levels, and foster collaboration between policy and research.
2. The visualisation of various types of territorial institutional interrelations, power distribution, stakeholder interactions, etc., will make research findings more comprehensible. Developing research and communicating designs together from the beginning will improve the quality of the visualisation of scientific results.
3. The results of research using qualitative and integrated methodologies at a pan-European level are not comparable enough yet and researchers need new ideas on “in-depth quality mapping”.

ii) Monitoring integrated territorial development

Taking increasing territorial interrelations as a given, the session on monitoring integrated territorial development revealed a series of new tools that can be used to implement territorial strategies in a more connected way. This session revealed a number of ambitious and promising studies, all at different stages of development and involving a range of different approaches, from longitudinal approaches, through integrative “systems-of-systems” perspectives, to foresight, scenario-based and typological models. The methods of the papers range from leveraging new databases and building new, more sophisticated frameworks for data evaluation, to the use of expert insight and collaboration to develop a specific framework.

Although different in their methodological underpinnings, these approaches have some research aims in common. Many of the papers focus on:

- a shift from static to more dynamic monitoring of the processes underlying territorial cohesion;
- fine-grained analyses of the importance of local and national governance systems in the translation of Europe-wide policies.

Many of the presentations focused on the promise that these new monitoring methods may offer. Several panellists highlighted that new monitoring frameworks can help to implement more integrated policies and can be used to identify and benchmark best practices and effective policies with greater accuracy. Other panellists focused on the advantages that these new techniques offer for developing overall strategies and narratives – particularly for larger regions – and for helping to engage local areas in knowledge sharing and consensus building.

However, the panellists also raised **several ongoing challenges related to the new monitoring approaches**. These include:

- the reliance of many datasets on existing definitions and local interpretations, which makes cross-Europe comparisons difficult;
- the difficulty of accurately monitoring impacts of spatial planning alongside other territorial policies;
- missing regional and other data from some databases.

A common perspective across each of the sessions was that effective policy implementation is more likely when there are more opportunities for bottom-up engagement and real dialogue between stakeholders in the early stages of the monitoring process.

The individual presentations highlighted several key innovations and conclusions:

- *Giancarlo Cotella* and Umberto Janin Rivolin's paper on the links between European policy and domestic governance processes creates a **new typology of how countries are responding to the Europeanisation of territorial governance and spatial planning** (TGSP). A highly comprehensive attempt to analyse Europeanisation dynamics in the field of TGSP, the paper sheds light on the impact of domestic traditions and institutions on shaping Europeanisation dynamics, and also on how and why certain policy processes become dominant.
- The creation of a new typology is also central to *Eduardo Medeiros's* work on integrated territorial development strategies. Drawing on initial work assessing integrated territorial investments (ITIs) in Portugal, the paper proposes **an evaluation typology to assess and compare integrated sustainable urban development strategies across Europe**. The five key metrics used in the evaluation (economic, social, environmental, governmental and planning) suggest that local authorities are gradually adopting more holistic and efficient integrated urban development policy approaches.
- *Maria Prezioso*, Maria Coronato and Angela D'Orazio's research on regional capacities for spending European funds also shows the importance of incorporating qualitative and evaluative elements into research design. The paper, which is based on an original territorial impact assessment approach, uses a **mixture of qualitative and quantitative indicators to propose tailored solutions for regions seeking to achieve technical pre-spend conditions.** It reveals the many barriers to translating EU territorial cohesion spending into real impact – namely low engagement, difficulty selecting beneficiaries and poor oversight mechanisms.
- The importance of combining quantitative and qualitative analyses was further highlighted by research undertaken by Margherita Russo, *Francesco Pagliacci*, Pasquale Pavone and Anna Giorgi. Their paper combines **multidimensional analysis of the characteristics of EU macro-regions with a comparative, qualitative perspective on priorities outlined in regional innovation strategies**. It shows that bottom-up strategies for regions can support integrated approaches, and that the RIS3 database in particular can help with the successful design and implementation of policies.
- The work of *Dimitra Chondrogianni*, Stylianos Karatzas and Professor Yorgos J. Stephanedes on exploring city capabilities for investment and development, meanwhile, shows the importance of causal models in monitoring integrated territorial development. It proposes an ambitious new model based on the concept of "Urban Comprehensive Carrying Capacity" that adopts a **"systems-of-systems" approach for defining urban attractiveness**. A weighting system is used to define an "urban smartness" score that is adapted to different scales, overcomes sector siloes and helps to identify cross-sector interrelations.
- Finally, the research presented by Kai Böhme, Christian Lüer and *Frank Holstein* on territorial foresight illustrates how the interactive participation of practitioners from diverse backgrounds in envisaging workshops can be an innovative tool for exploring long-term futures and implications for cities and regions. It shows that while data are important, it is also important for **effective territorial monitoring to involve experts in discussions of "what-if" questions that encourage lateral thinking** and to invite the production of maps that help to shed light on the unintended consequences of sector-based policies.

iii) New data sources

The parallel sessions on new data sources revealed exciting new methodologies and practical ways of using unconventional data sources to more effectively characterise territorial interrelations, more accurately monitor integrated territorial development and ultimately inspire a **more nuanced and more targeted generation of territorial research.**

Collectively, the presentations highlighted the shortcomings of many existing datasets and techniques – particularly with regard to their purchase on territorial cohesion. Many panellists shared the view that conventional techniques:

- are based on aggregated data, making targeted territorial interventions difficult;
- tend to use obsolete analytical frameworks;
- are too costly, sporadic and difficult to update.

These shortcomings have redirected attention towards the potential of new sources, many of which rely on “big data”. There was a consensus among panellists that these data may become essential in an era of accelerating cross-border flows and interlinkages. The key message was that **new datasets are allowing researchers to better describe and measure future territorial phenomena** and that finer-grained regional data in particular are crucial to the development of effective place-based policies.

Panellists highlighted the **“volume, velocity and variety”** of new data and their advantage of higher temporal and spatial resolutions than traditional datasets. Speakers also noted that much of the innovation stems from fusing new data with what already exists. The new analytical approaches showcased included:

- **New econometric approaches** to regionalising national indicators (e.g. on waste generation and material consumption): these can facilitate more focused circular economy interventions (*Marco Bianchi* and Carlos Tapia).
- **New sources of web-based geospatial data** (e.g. POI (points of interest), web-based datasets of cross-border investments or web scraping from real estate housing portals): these can be used to identify land use more appropriately and encourage more targeted territorial interventions (*Filipe Batista e Silvia*, Ricardo Barranco, Konstantin Rosina and Carlo Lavalle).
- **Combinations of conventional (e.g. census) and unconventional (e.g. scraped web data) datasets**: these can be used to map the dynamics of unequal local housing affordability and its role in perpetuating social inequalities and socio-spatial segregation (*Renaud Le Goix*, Timothée Giraud and Ronan Ysebaert).
- **Mobile phone data:** these can be used to track the movement patterns of tourists, residents and students and generate new territorial insights on a more granular scale. For example, research undertaken by *Helka Kalliomäki,* Nicolas Balcom-Raleigh, Pekko Lindblom and Anto Aasa shows how in Estonia mobile positioning data have been used to produce an official nationwide mobility database and investigate mobility patterns, while *Fabio Manfredini* and Paola Pucci’s research on profiling urban populations in Milan illustrates how mobile data have been successfully used to map and monitor density and mobility patterns, and surges in demand associated with events or the night-time economy.
- **A new comprehensive approach and conceptual framework for identifying big data sources** that is relevant for the analysis of territorial development in European growth corridors (*Helka Kalliomäki,* Nicolas Balcom-Raleigh, Pekko Lindblom and Anto Aasa).
- **New data methods to simplify mapping and develop a stronger territorial evidence base:** research undertaken by *Jacques Michelet,* Erik Gloersen, Ronan Isebaert and Frédéric Giraut shows how Voronoi’s polygons can create an alternative to NUTS-level mapping, in turn making it easier to distil, package and update key cartographic messages.

Equally, the panellists were **wary of some of the risks of big data** – particularly:

- reliability, as the profit motives of the gatekeepers of new data could impede the mission to produce complete and consistent datasets, and, moreover, conditions allowing the generation of data (e.g. tech, market conditions and legal frameworks) are not necessarily stable in the long term;
- representativeness and selection bias;
- the difficulty of assessing quality because there are few established benchmarks for comparison;
- the fact that there are no agreed standards on secrecy, privacy and ethics.

KEY MESSAGES HIGHLIGHTED IN THE DEBATE

1. Methodologies should be constantly updated to keep up with trends in big data to produce even deeper territorial insights – for example predicting future patterns.
2. The quality and sustainability of the datasets should be ensured by assessing data sources, minimising background noise and deploying spatial and temporal analyses.
3. New datasets are especially valuable in cases where there are little or no existing data – for example on tracking and forecasting movements of night-time workers in the city.
4. Data alone are not the panacea for understanding new social and cultural dynamics, and therefore softer indicators need to be included in methodologies early on in the design phase.

2.4. Are we asking the right questions?

In the final session, panellists from European scientific organisations presented and discussed their opinions on **past and future challenges in research on territorial development.** A key guiding framework for the discussion was "are we asking the right questions?" Several interesting points came out of the discussion, including the risks and opportunities associated with big data, the importance of producing high-quality research and the need to build capacity through sustained dialogue.

i) Big data: opportunities and risks

Unlocking new data for research on territorial development is one of the key issues. But, in regard to quality standards, researchers have to be careful about big data. Scientific thinking should not be based on it – it can be unreliable, unsustainable and related to "fake news", and its analysis is not yet a mature science. An initial question when selecting data from the huge volume that is available should always be: "do new data add to the quality of policy-making and will they contribute to a real need?" Big and new data help to fine-tune models but cannot substitute for them – using such data is only a way of helping to make sense of reality, they are not a reality themselves. Thus, good and innovative explanatory models and alternative methods of investigation are of high importance for the development of policy-relevant research.

ii) Quality of research

Scientific quality needs to be maintained, which means normative perspectives and standardisation are also key issues. But this also means that it is important to fund young researchers, apply new technology tools and ways of analysing and mapping, and create curiosity and sensitivity in relation to difficult questions that will lead to disruptive research. This will empower the social sciences in particular to incorporate the diversity of methods available, to create and use more open access data, and to remain focused at the same time. In contrast to the public and private planning sectors, territorial research does not contribute to rankings as they exist (e.g. for cities regarding a wide variety of topics), which stimulates policy-makers to engage more intensively.

iii) Capacity building through dialogue

Although "mapping" itself is not a sufficient tool to explain complex developments, impressive maps can generate a huge level of public engagement and participation. Synthesising qualitative information into knowledge to help policy-makers take prospective decisions is a challenging skill for researchers and can be strengthened by participatory capacity-building activities. Engaging stakeholders, policy-makers and researchers (e.g. through peer-learning workshops) will lead to capacity building for all involved. From the perspective of researchers, ESPON has inspired huge changes in territorial policy-making through its research activities and value chains and this should be strengthened. But leaders and decision-makers

should be aware that dialogues are time consuming for both sides, and it is often still difficult to convince policy-makers of the benefits of cooperative research.

iv) Challenging research questions for the future

The panel debate and audience discussion highlighted some core questions for the next generation of research on territorial development:

- Understanding interlinkages between different places and places of different scales needs to be better captured and reflected in policy-making. Current knowledge of these interlinkages is mainly based on case studies and therefore needs to be mainstreamed on functional geographical scales through joint cooperative projects (*Ilona Raugze*).
- Despite ongoing discussions about (inner) peripheries, places left behind, inclusion and related topics, core research questions on social inequality, exclusion, diversity, poverty and risk management have recently been of less importance and need to be re-emphasised in the current cycle of research (*Antoine Le Blanc*).
- Research on the connections between the local population and governance frameworks will become more important because consultation and cooperation will require new formats to integrate the diversity of positions and opinions. Various types of environmental transitions (energy, biodiversity, climate change) will also need to be better integrated into a holistic definition of territorial development. This calls for new types of research questions that promote cooperative behaviour (*André Torre*).
- Planning is about public services and how they feed into regional development. At the European level, it is important to ask: What are the overarching theories that attempt to explain what is happening at the European level? Are the theories we have sufficient? (*Gordon Dabinett*).
- Some areas of territorial development will require additional research in the future: the circular economy, urban metabolism, carrying capacity and the environmental (in)efficiency of large cities (*Henk van der Kamp*).

3

Territorial interrelations

3.
Territorial interrelations

3.1.
Knowledge integration with systems thinking for improved policy effectiveness

Andrea M. Bassi[1] *and Montira Pongsiri*[2]

Key words: systems analysis, systems thinking, territorial planning, integrated assessment

i) Introduction

There is now greater recognition that we live in an interconnected system (UNEP 2011; Steffen et al. 2015) as evidenced by the attention given to climate change mitigation and adaptation, and the green and circular economies in the formulation of public policies and the creation of national and sub-national development plans.

Much progress has been made on the practice of sustainable development. Building on recent momentum on the increased understanding of, and political will to address, the impacts of global and local environmental changes on human health and well-being (Whitmee et al. 2015; UN Environment 2017), there are new opportunities for policy-makers to more explicitly account for the dynamic interplay between social, economic and environmental performance, at both local and global levels (Haines 2017). A fuller understanding of the interconnections between social, economic and environmental performance could elucidate possible unintended consequences, win-win opportunities and trade-offs that should be considered in policy formulation (Probst and Bassi 2014).

We first introduce the progress made towards policy formulation and assessment in recent decades. We then propose the use of a systematic and integrated modelling approach to link complementary tools. The integration and tools are based on systems thinking. Systems thinking is an approach that allows us to better understand and forecast the outcomes of our decisions, across sectors and economic actors, and over time and space (Probst and Bassi 2014). Systems thinking places emphasis on the system, made of several interconnected parts, rather than focusing on its individual parts. Originating from systems theory, systems thinking focuses on understanding how the components of a system are interconnected with one another. As a result, it is transdisciplinary, cutting across social, economic and environmental dimensions.

The systematic approach to linking tools is intended to integrate knowledge on the economy, the environment and society in a new way so as to directly inform sustainable development policy planning. This approach presents the opportunity to use existing spatially explicit tools in a way that informs each tool's use, resulting in the more efficient generation of knowledge that can then be applied to addressing shared, borderless challenges. Knowledge generation facilitates an understanding of dynamic interrelationships between social, economic and environmental factors, which helps to identify or address trade-offs and unintended consequences of policies – e.g. in the context of the circular and green economies, or in the broader context of sustainable development (Pongsiri et al. 2017) – and synergies (e.g. co-benefits) that can be exploited to achieve multiple goals.

ii) Progress on policy formulation and assessment

The understanding of what it will take to achieve sustainable development has evolved, as have the tools that are used to support sustainable development planning. Over the years, we have observed three notable trends. First, the interest in the use of modelling tools has shifted from understanding the sectoral impacts of economic development decisions to cross-sectoral impacts. Second, the application of modelling tools has moved from global- to local-level applications. Third, the earlier use of models generated

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quantitative assessments for global-level public policy formulation, but this has now shifted to the use of models to perform project-level sustainability assessments for communities and investors.

More actors from society are now involved in the use of knowledge-based tools to inform decisions. This is partly because of the progress that has been made in understanding sustainable development, culminating with the endorsement of the United Nation's (UN's) 17 Sustainable Development Goals (SDGs), a set of global goals that follow on from the Millennium Development Goals, which almost all UN member countries have agreed to make progress and report on. Integration underlies the SDGs, and a clear strategy to achieve the SDGs is to identify and exploit synergies between them and, in doing so, recognise any trade-offs.

A first strong contribution to policy formulation and assessment addressing the economy, the environment and society was the United Nations Environment Programme's (UNEP's) Green Economy Report (2011), which set out new integrated modelling work with a global scope. Ahead of the United Nations Conference on Sustainable Development (Rio+20), interest shifted from the conceptualisation of the green economy to its implementation. Many countries started creating and customising their own green economy assessments. There was an increased need to understand how economic development affects the natural resource base and society. As a result, the Partnership for Action on the Green Economy (PAGE) published a country starter kit to lay common ground for those interested in preparing a green economy assessment [3]. As of 2019, several organisations are actively using integrated approaches to policy analysis. While progress is being made on several fronts, both governments and international organisations are still struggling with the same questions that were at the core of the Green Economy Report discussions in 2008 and that are still being raised, including at the World Economic Forum: how can investments in sustainability be leveraged? How can development plans be effectively implemented in a local context?

These questions call for the adoption of more detailed, customised and context-specific modelling tools, given that policy- and decision-maker interest has shifted from global assessments demonstrating how the sustainability concept can be modelled and policies can be analysed, to:

- country-level assessments to better capture specific context conditions;
- assessments done on spatial scales relevant to various communities' interests on the impacts of human activity on the environment and ecosystem performance; these impacts can be estimated with more precision, and the economic valuation of associated ecosystem services can be measured.

Practically, there is a call to use systems thinking in policy formulation and evaluation.

iii) An integrated approach to policy formulation and assessment

Achieving sustainable development requires the strategic use of modelling tools to generate integrated knowledge. We propose to use a framework that is based on systems thinking and links distinct modelling tools, making use of the strengths of those models that are already used locally, and leveraging their use (i.e. outputs to enhance the function of other tools used for a different yet complementary purpose).

This integrated modelling framework is proposed to allow (1) the identification of the main drivers of change at the local level (qualitative and stakeholder-driven), (2) an evaluation of the strengths of existing relationships across variables, and (3) a science-based sectoral and spatial scale analysis to inform policy/investment outcomes. The framework can therefore support policy formulation and assessment by anticipating the possible emergence of unintended effects, thereby allowing value for money to be maximised when assessing policy choices across (1) sectors, (2) economic actors, (3) dimensions of development, (4) space and (5) time.

3 The toolkit is formed by the following 3 reports:
1. "A Guidance Manual for Green Economy Policy Assessments". UNEP, 2014.
https://www.un-page.org/files/public/content-page/unep_assessment_ge_policymaking_for_web.pdf
2. "Using Models for Green Economy Policymaking". UNEP, 2014.
https://www.un-page.org/files/public/content-page/unep_models_ge_for_web.pdf
3. "A Guidance Manual for Green Economy Indicators". UNEP, 2014.
https://www.un-page.org/files/public/content-page/unep_indicators_ge_for_web.pdf

The tools included in the framework are spatial information and models for the estimation of changes in land cover and associated changes in the provision of ecosystem services. These data are coupled with socio-economic analysis (Figure 3.1.2) and used to create, through a participatory modelling approach, a causal map of the system (causal loop diagram (CLD); Figure 3.1.1)[4] that identifies the drivers and impacts of land use change in the region, such as those resulting from potential development investments and policies. Subsequently, a system dynamics model (SDM) is developed to quantify the CLD. The quantified projections of the SDM are then used to generate future land cover maps that can then be used to forecast the capacity of ecosystem service provisioning on desired spatial and temporal scales. Finally, the results of these spatially explicit models are fed back into the SDM to improve calibration and add territorial realism.

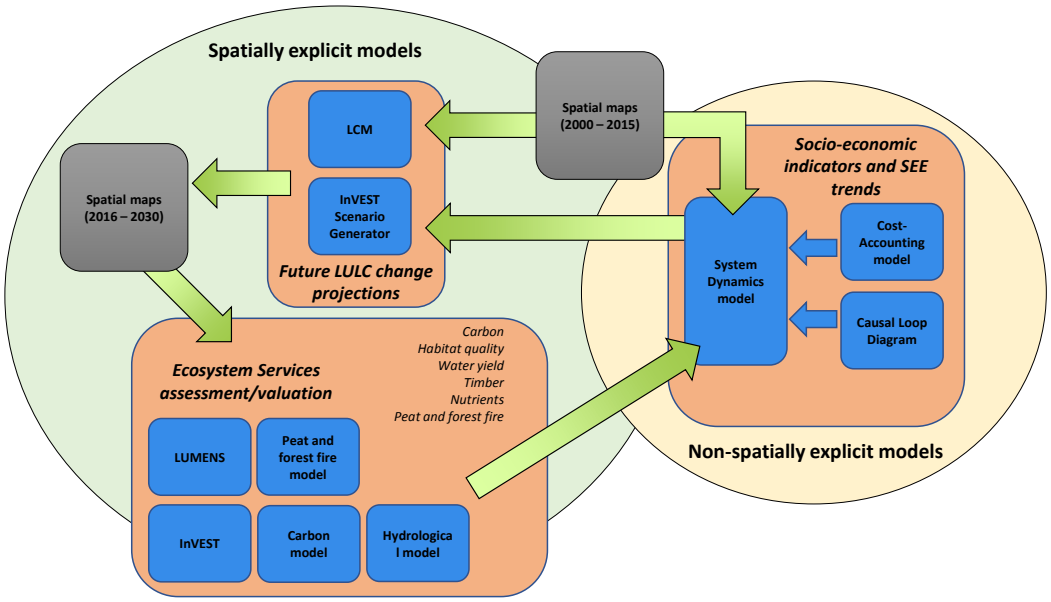
This framework is intended to be used for the simulation of "what if" scenarios over long time horizons down to local scales and for the evaluation of economic, environmental and social (i.e. health) impacts, and it considers the abovementioned elements in the context of the specific interests of different actors (i.e. households, the private sector and government). As a result, this framework is designed to inform the policy process (i.e. by testing the probable outcomes of policy interventions proposed by local policy-makers) rather than "tell" policymakers what to do, based on optimisation.

The policy analysis performed could be of a dual nature: *ex ante* and *ex post*. *Ex ante* refers to the use of models to better assess the possible outcomes of interventions yet to be implemented. This type of modelling can generate "what if" projections of the expected (and unexpected) impacts of available policy options using key indicators across sectors. Well-designed models that merge economic and biophysical variables and sectors can support cost-benefit analyses and the prioritisation of policy options. The use of structural models that explicitly link policy interventions with their impacts can generate projections of how a certain policy target could be reached and when. An *ex post* analysis is useful to evaluate the performance of interventions that have already been implemented by monitoring trends and analysing any differences between model projections. *Ex post* modelling can support impact evaluation by improving the understanding of the relationships between the key variables in the system and by comparing the projected performance with the baseline conditions and historical data. Improvements to the model and updated projections allow decision-makers to refine policy targets and objectives, as well as to build on co-benefits across sectors.

For example, the use of such products in Indonesia resulted in the assessment of how aligned the national and sub-national (provincial and district) development plans were (TNC 2017). In Tanzania, this approach allowed the estimation of the local impacts of a national plan for agricultural expansion, and highlighted potential challenges related to water availability and new long-term seasonal migration (TEEB 2018). In Europe, this approach can quantitatively evaluate the effectiveness of green economy activities and circular economy interventions in different localities (e.g. urban and rural) while accounting for the specificities of the local context (as enabling or limiting conditions), as well as for the creation of local or regional benefits (e.g. by reducing air and water pollution, or health impacts from waste landfilling and burning). The International Institute for Sustainable Development (IISD) has created several applications for infrastructure (for energy, buildings, water, roads and natural infrastructure) using the Sustainable Asset Valuation (SAVi) tool.

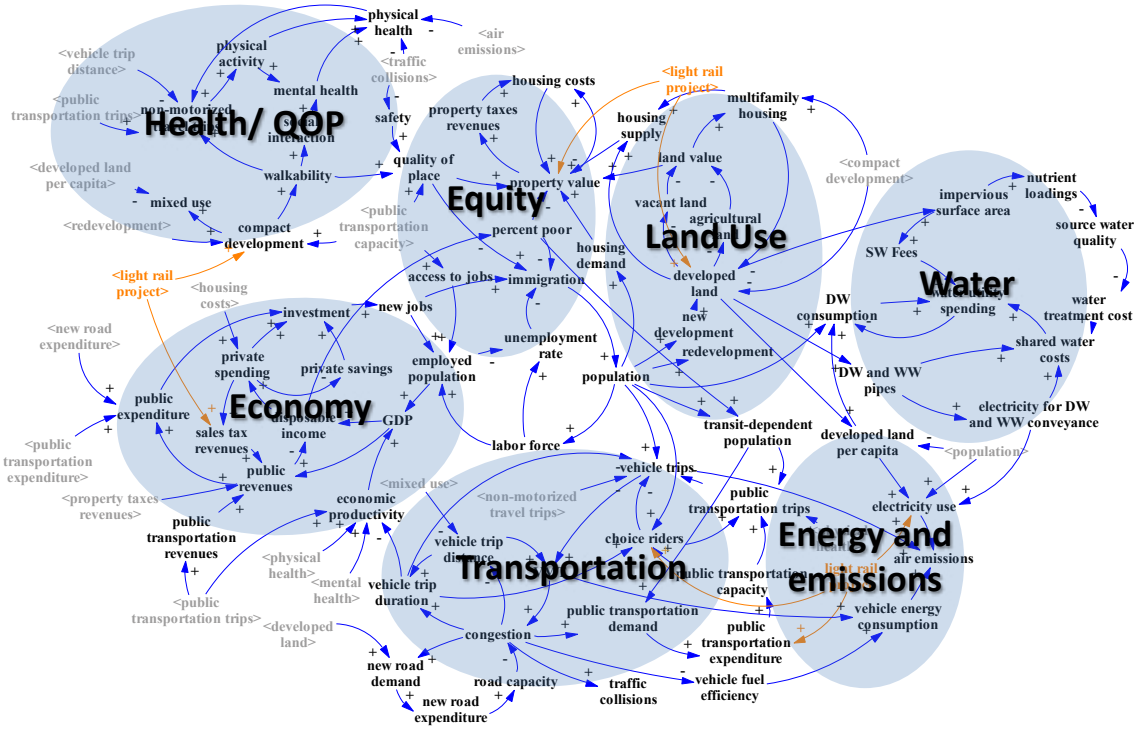
4 Figure 3.1.1 highlights how a CLD can be used to map the main drivers of change in a system and identify cross-sectoral interrelations. This is at the core of the use of an integrated, systemic approach. Figure 3.1.2 presents, with different levels of detail, an overview of the modelling framework and the flow of information across tools. It shows the roles of maps, CLDs and mathematical models. Specifically, data and a multi-stakeholder approach are used to create the CLD. This is the blueprint for the creation of the system dynamics mathematical model. The results of the simulation of this model are then used as input for spatial models, forecasting change in space (i.e. generating future land use and land cover maps). Future spatial maps are then used to estimate ecosystem services and related health impacts, for which having spatial explicit inputs is crucial. The projections on ecosystem services are then used to improve the calibration and analysis of the system dynamics model.

Figure 3.1.1.
Examples of model integration, first step: conceptual approach



Source: US EPA 2016

Figure 3.1.2.
Examples of model integration, third step: linking models



Source: TNC 2017

iv) Conclusion

Regional challenges such as land use change and transboundary air pollution are inherently shared across regions and therefore require shared solutions. Health and well-being are central to achieving long-term SDGs, so their inclusion is key when assessing policy strategies.

A systems-based methodology to develop shared understanding and applying that understanding to guiding sustainable development policy coherence is critical. Moreover, systems-based methodologies can catalyse multidisciplinary (research) and transdisciplinary (research and policy) collaborations, which are key to advancing scientific understanding and its use for policy formulation, especially when decisions have to be made on certain spatial scales (local, landscape, national, regional).

The approach proposed, to systematically link complementary tools, is intended to improve the understanding of the dynamic relationships between economic development, the environment and society. Field study examples of this approach demonstrate that it could be adapted and used to inform sustainability development policy processes at the EU region and local levels.

Available tools need to be used in complementary ways to inform knowledge generation for integrated assessment and cross-sectoral planning. Using systems-based tools to understand interrelationships is the critical first step towards identifying potential joint policy interventions and strategies for leveraging investments for long-term sustainable development.

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3.2.
The uses of institutional mapping for understanding territorial interrelations

Carlos Ferreira, Jennifer Ferreira, Kevin Broughton and Stewart MacNeill[5]

Key words: territorial interrelations, institutional mapping

i) The changing nature of spatial development

Cities and regions are increasingly developing across functional areas, bringing organisations and individuals together across administrative borders (Chilla et al. 2012). The ways in which these organisations and individuals come together – institutional arrangements – creates spatially diverse systems at national, regional and local levels (J. Ferreira 2017b). However, institutional arrangements are not always stable, and can fail to deliver the expected outcomes (C. Ferreira 2017). One analytical tool that can systematically analyse institutional arrangements and produce results that can be compared across contexts is institutional mapping. This paper explores how institutional mapping can be used to understand territorial interrelations, using examples from the ESPON ReSSI project – Regional Strategies for Sustainable and Inclusive Territorial Development.

The paper is organised as follows. The next section describes the basics of the institutional mapping methodology. This is followed by three examples of institutional maps from the ESPON ReSSI project. The final section reflects on the uses, generalisability and limitations of institutional mapping in the understanding of European territorial development and cohesion.

ii) Institutional mapping

An institutional map is a visual representation of groups and organisations in a community, used to visualise institutional arrangements and reduce complexity. In doing so, institutional maps display existing governance structures and highlight relationships between actors (J. Ferreira 2017a). For example, institutional maps have been used to represent the stakeholders involved in cross-border cooperation arrangements around Luxembourg, which includes actors from four countries (Chilla et al. 2012). From the point of view of strategic planning, institutional maps have the advantage of incorporating both territorial and political dimensions, complementing both perspectives and considering the governance context in a broader sense.

The data requirements for producing institutional maps are not set at the start; choices about what data must be collected depend on the objectives of the researchers and other stakeholders. The method allows for the important actors involved (formally and informally) in a topic to be visualised, and their relationships to be highlighted. This is a crucial aspect for understanding how European territorial development and cohesion happens in practice.

Despite the context dependency of the method, protocols for creating institutional maps have been created by practitioners, from which it is possible to infer the data required. Aligica (2006) describes three key principles to institutional mapping:

1. Data sources: information for the institutional maps can be drawn from various sources, including previous research or official documents.
2. An awareness of differences among the systems being mapped: each institutional context is likely to be specific.
3. An awareness of historical context: past issues are likely to affect current institutional arrangements.

The reasons for employing institutional maps are threefold. First, there is a methodological aspect. Institutional maps produce inventories of key players in a process, highlight their roles and plot the linkages between them. This is especially useful at the early stage of a research project, as it helps identify people, organisations and policy choke points that may be of interest in the analysis.

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Second, from a comparative point of view, institutional maps allow for comparisons of the basic outlines of the institutional arrangements of multiple cases. This can illustrate hierarchies among stakeholders and helps create a picture of the flows among them.

Third, institutional maps have a knowledge co-creation aspect, as they facilitate communication between researchers and territorial actors. Stakeholders can (and should) be invited to co-create institutional maps, identifying how they see the relationships and flows in place. This creates dialogue, promotes interest in the results and opens the door for engagement between territorial actors and researchers.

iii) Institutional mapping in practice: the ESPON ReSSI project

The ESPON ReSSI project explores good practice in local and regional development (ESPON and Coventry University 2018) by addressing two key questions:

1. How can sustainable and inclusive regional strategies be promoted, given the changing role of local authorities and the growing number of stakeholders involved in planning?
2. What is good practice in delivering economic development policy, in the context of new governance frameworks?

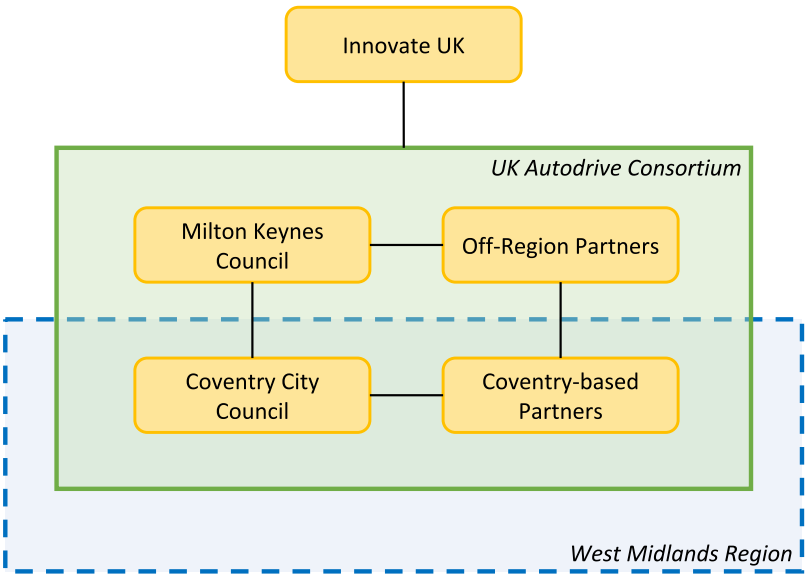
These questions were explored in four territorial contexts: Coventry (United Kingdom); Region of Southern Denmark (Denmark); Piedmont Region (Italy); and Oeiras (Portugal). In each territorial context, one or two cases were chosen, with a view that they would constitute relevant examples of practice. The cases were:

- Coventry: Electric Taxis and UK Autodrive – focus on the automotive sector.
- Region of Southern Denmark: Regional Growth and Development Strategy and Regional Development Agreement 2016–17 for South Jutland – regional plans to promote municipal cooperation.
- Piedmont Region: Green Crown and National Strategy for Inner Areas – collaborations aimed at creating networks of municipalities.
- Municipality of Oeiras: Green and Blue Corridor – a project to create a large park shared by three contiguous municipalities.

This paper will now illustrate how institutional maps contribute to the understanding of territorial relations by focusing on three specific cases: UK Autodrive; the Regional Growth and Development Strategy; and the Green and Blue Corridor project.

The UK Autodrive project aims to increase public awareness of autonomous vehicle and connected car technologies, as well as to enable cities to understand how to benefit from automated transportation. Coventry City Council is one of the 12 members of the UK Autodrive consortium. The project is financed by Innovate UK, a non-departmental public body reporting to the Department of Business, Energy and Industrial Strategy (DBEIS), with automotive industry match-funding. Figure 3.2.1 shows a simplified institutional map for the UK Autodrive project.

Figure 3.2.1.
Simplified institutional map for the UK Autodrive project



The map was first drafted in collaboration with Coventry City Council, one of ReSSI's stakeholders and a key stakeholder in the UK Autodrive project. The initial draft included all 12 project partners, plus the funder (Innovate UK) and other organisations that could have an interest in the project's development. The initial map, while detailed, proved relatively uninteresting, as it merely enumerates the organisations involved in UK Autodrive.

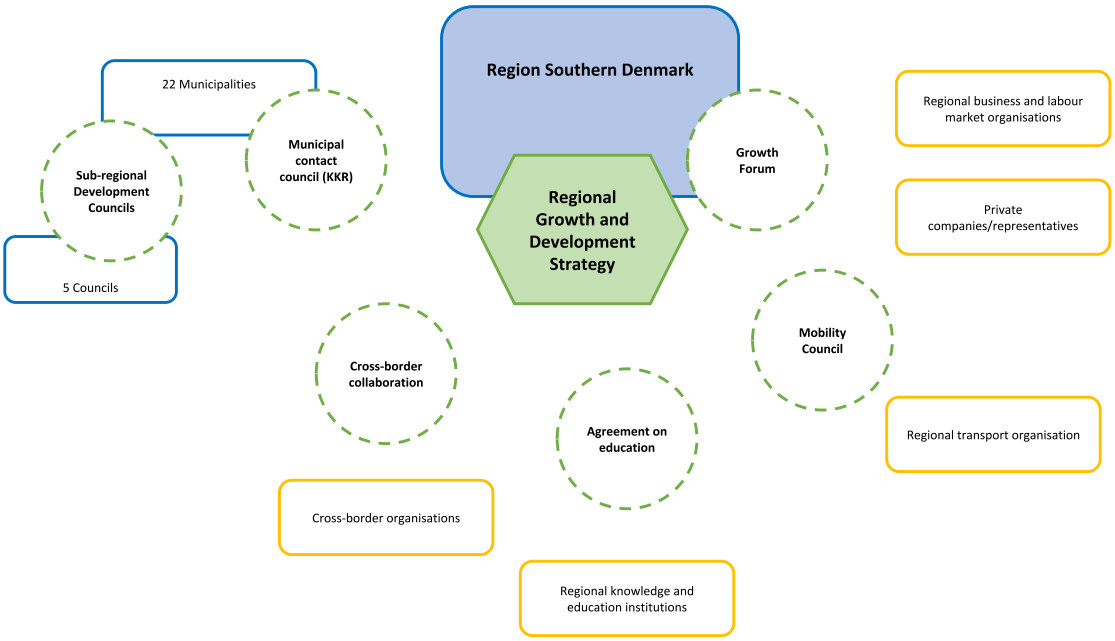
Over the course of the research, it became clear that the key policy interest of the stakeholder was to understand how the City of Coventry – and the West Midlands region – could benefit from the project. It was also noted that most of the stakeholder's interactions in the context of UK Autodrive were either with the Coventry-based private companies involved or with Milton Keynes Council (in the East Midlands region), which led the project. As a result, the institutional map was redrawn to reflect this set of objectives and conditions.

The new map highlights the regional and territorial dynamics at play in the UK Autodrive project. It provides a visual representation of which partners Coventry City Council should focus their resources on, to maximise the retention of knowledge and value for the city. At the same time, by highlighting the regional dimension of the project, the map opens up the possibility of involving the recently created West Midlands Combined Authority, of which Coventry City Council is a part.

In this case, the institutional map helped define what the objectives of the stakeholder were, and how to pursue them effectively. This is especially important in situations such as the UK Autodrive project – financed by central government and featuring a cross-regional consortium – in which the level of territorial interrelation can lead to questions in terms of what the local benefits of participation are.

The Regional Growth and Development Strategy (RG&DS) is the regional growth strategy of the Region of Southern Denmark. Built around the concept of "The Good Life as a Driver of Growth", the RG&DS seeks to create alliances and promote cooperation among a wide variety of stakeholders in the region. Figure 3.2.2 shows the institutional map for the RG&DS.

Figure 3.2.2.
Institutional map for the Regional Growth and Development Strategy



This map depicts not only the actors involved in devising and implementing the strategy, but also their proximity to it. Legally, the Region of Southern Denmark and the Growth Forum are responsible for the RG&DS; hence, their roles overlap in developing the actual strategy. The remaining councils and fora, on the other hand, are the vehicles for the implementation of the strategy.

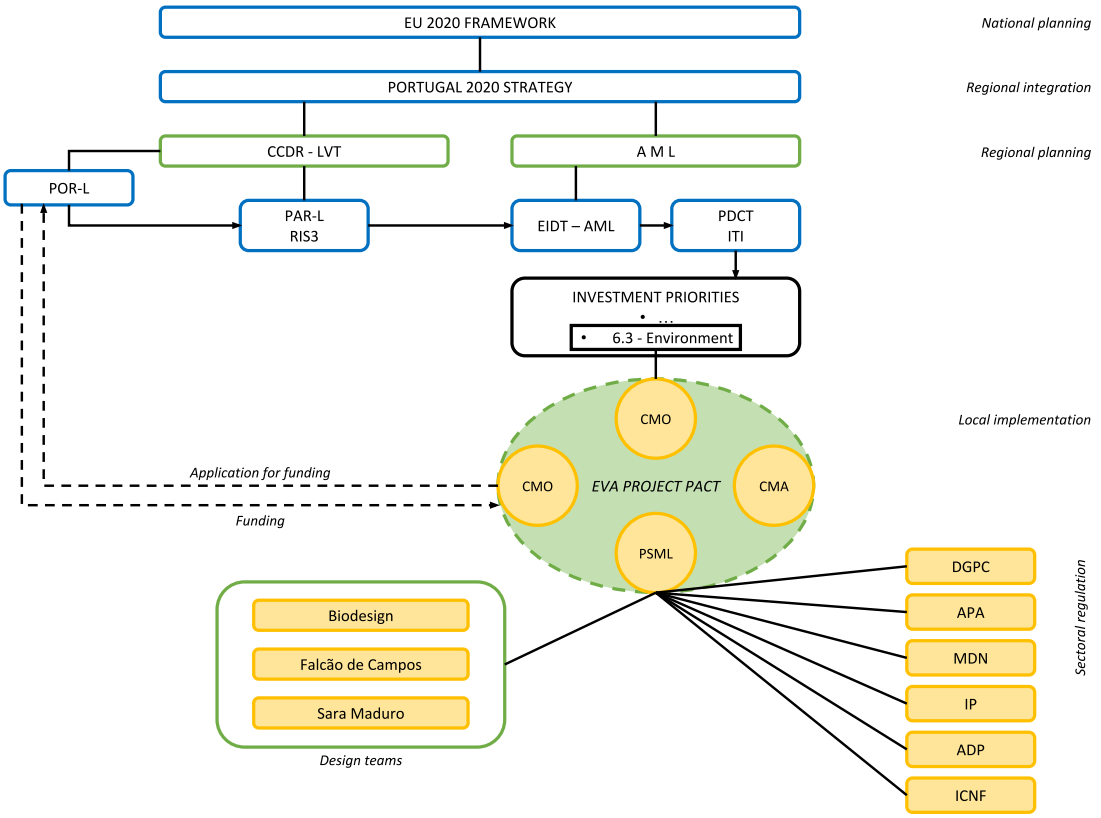
The institutional map seeks to demonstrate how stakeholder groups, which are progressively distanced from the thinking and ideas behind the strategy, are actually key to its success. This presents a problem for the regional authority: without the legal or funding means to implement its strategy, it must find mechanisms to communicate the vision and objectives of the RG&DS to the remaining regional stakeholders in a persuasive manner.

Because of this distance between the stakeholders responsible for delivering the strategy and the strategy proper, the Region of Southern Denmark opted for a communicative approach to its policy. It made the strategic decision to operate as an information provider to stakeholders. This information provision was used as an opportunity to promote cooperation: it was used to build legitimacy and trust, and to set the agenda and thus guide the direction of policy in the region. The Region of Southern Denmark became a broker of relationships, all built around the idea of The Good Life as a Driver of Growth. The institutional map helped develop this strategy to bridge the distance between the various territorial stakeholders.

The Green and Blue Corridor was a project to build a 10 km^2 nature corridor, shared by three municipalities in the Greater Lisbon region (Portugal): Oeiras, Sintra and Amadora. The Portuguese planning framework is characterised by the absence of regional planning authorities, focusing instead on municipalities as the locus of territorial governance. As a result, each municipality has a municipal master plan for its territory, but mechanisms for coordination are lacking. This was seen as a limitation to the development of the Green and Blue Corridor project.

Figure 3.2.3 illustrates the institutional arrangement of the Green and Blue Corridor project. At the centre of it is a pact between the three municipalities and a public body with no planning powers, Sintra Parks (PSML). This pact must be coordinated with the Development Strategy for the Metropolitan Area of Lisbon (overseen by 18 independent mayors in the Greater Lisbon region), three independent design teams, and six national and regional statutory planning authorities, each with sectoral accountability and veto over interventions in their jurisdiction.

Figure 3.2.3.
Institutional map for the Green and Blue Corridor project



Successful delivery of the Green and Blue Corridor project required considering the needs of the large number of stakeholders involved, as well as their individual policy priorities. This highlighted the sheer number of potential pinch-points in the process, whereby the entire project could have been blocked by any one of many stakeholders. As a result, the focus for all involved was to build consensus. This was achieved through multi-stakeholder deliberative meetings and a consistent focus on progressing through small activities, rather than devising large-scale territorial planning strategies. The institutional map helped to identify the multiple pinch-points in the project, and to devise a systematic strategy to address them.

iv) Reflections

The effective management of territorial interrelations is increasingly important in promoting successful spatial development. The growing number of actors and organisations involved in planning, and the need to manage their specific interests and priorities, suggests a need to monitor progress as well as act on the findings of that monitoring.

By allowing researchers and stakeholders to choose the dimensions across which institutions are mapped, institutional maps can help both in exercises of developing cooperation and when there is a need to secure territorial objectives once cooperation has been appropriately developed. For all the reasons listed above, institutional maps should be considered a fundamental tool in territorial development as well as in policy evaluation.

As noted, the findings of institutional maps are strongly context specific. They identify the milieu of a specific case, based on the contextual information available, which makes them difficult to generalise. However, institutional maps can and should be used in comparative case research, comparing and contrasting institutional set-ups across cases to identify the causes of outcomes in different contexts. In these cases, researchers must make sure that comparable procedures are undertaken across cases, for example through the design and use of case study templates and institutional map templates.

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3.3. Civil society organisations and cross-border networks in the Western Balkans

Dragisa Mijacic[6] and Jasna Zarkovic[7]

Key words: cross-border cooperation, civil society organisations, social networks, Western Balkans

i) Introduction

The cross-border cooperation of EU Member States with non-member neighbouring countries came to the agenda during the enlargement process in the early 2000s, when the countries of the Western Balkans, namely Albania, Bosnia and Herzegovina, Croatia[8], the Republic of North Macedonia, Montenegro, Serbia and Kosovo under UN Security Council Resolution 1244 (1999), became involved in cross-border cooperation programmes, initially only with EU Member States and later – as of 2007 – among themselves as well.

These cross-border cooperation programmes have created a sort of social environment, a social network that brings together different actors from public and private sectors, including civil society organisations (CSOs). This is an opportunity to apply the key principles of social network theory, which considers actors and the relationships between them.

A social network is a structure composed of a set of actors, some of the members of which are connected by a set of ties depicting their interconnections (Knoke and Yang 2008:6). Nevertheless, stipulating that connections exist among network actors does not require that all members of the network have a direct link to all actors. A configuration of empirical relations among concrete entities identifies a specific network structure, the pattern or form of that network. Structures can vary dramatically in form, from isolated

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8 Although Croatia became a Member State on 1 July 2013, it was a beneficiary of the 2007–13 IPA programme and is therefore included in this analysis together with other countries of the Western Balkans.

structures in which no actors are connected to saturated structures in which everyone is directly interconnected. More typically, real networks exhibit intermediate structures in which some actors have more extensive connections than others.

A core theoretical problem in network analysis is how to explain the occurrence of different structures and, at the actor level, account for variations in linkages to other actors (Knoke and Yang 2008:8). Therefore, a fundamental principle in social network research is that social actors can benefit from serving as intermediaries between others who are not directly connected. Through such intermediation, social actors can potentially broker the flow of information and synthesise ideas arising in different parts of the network. This is a core principle of the theory of structural holes, which studies the ways in which actors fill the "holes" between structures that do not otherwise interact (Burt 1995; Kleinberg et al. 2008). Such holes provide opportunities for socially entrepreneurial actors to bridging roles to disparate groups that otherwise do not interact with each other (Kleinberg et al. 2008).

Taking into consideration the key principles of social network theory and the theory of structural holes, the question is whether or not there is an actor or a group of actors that plays a brokering role between actors that are eligible for cross-border cooperation programmes but are not directly connected, considering in particular the social environment of the Western Balkans, which includes borders and a complex historical legacy, as well as language barriers (in some cases). In that regard, the paper tests the following hypothesis: CSOs are the most successful group of actors in providing brokering opportunities to bridge the structural holes between different actors in cross-border cooperation programmes regardless of the programme measure.

The study discussed in this article is one of the pioneering works on this topic, trying to introduce a new methodological approach in examining cross-border networks for understanding the impact of cross-border cooperation programmes, especially on socio-economic development and social cohesion in the context of the Western Balkans.

ii) Cross-border cooperation programmes in the Western Balkans

In the 2007–13 Financial Framework, the European Commission introduced the Instrument for Pre-accession Assistance (IPA), which aimed to support reforms in the "enlargement countries" with financial and technical help. The IPA had a budget of EUR 11.5 billion and covered five components, including cross-border cooperation.

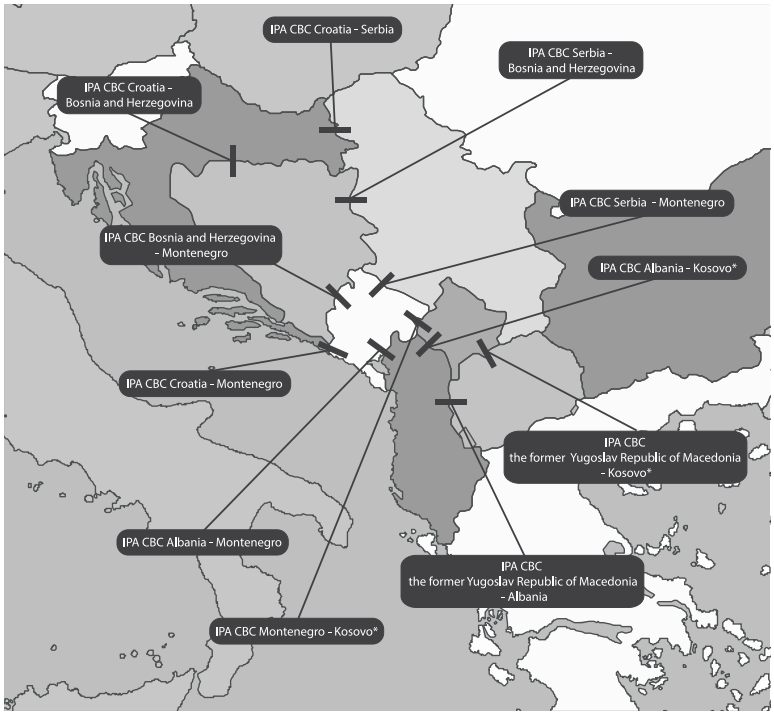
The IPA programme created conditions for establishing 11 cross-border cooperation programmes between the beneficiary countries of the Western Balkans. All programmes had similar overall objectives, yet differed slightly in their formulation of specific objectives, priorities and measures.

The priority measures of these programmes focused on various issues related to the common needs of respective bordering areas, such as sustainable economic development or more concretely competitiveness, productivity and tourism (which is the most common of all economic sectors), rural development and environmental protection (often being a separate measure). All programmes had a separate measure focusing on "people-to-people" interventions, which included joint small-scale actions involving local actors from the border regions.

The size of grants differed between "people-to-people" interventions and other measures. For "people-to-people" measures, EU grants usually fell between EUR 20 000 and EUR 50 000, while the grant amounts for other measures were much higher, usually between EUR 50 000 and EUR 300 000, so the latter projects were much larger in terms of size or duration.

Cross-border cooperation programmes supported joint operations that were jointly selected by the participating countries through a single call for proposals covering the whole eligible area. The operations selected for cross-border programmes had to include at least two final beneficiaries, one per each side of the programme area. The characteristic common to all eligible beneficiaries is that they must be non-profit legal persons.

Figure 3.3.1.
Map of cross-border cooperation programmes between IPA beneficiary countries in the Western Balkans



Source: Authors' own design

iii) Methodology and data collection

To test the abovementioned hypothesis, it was necessary to collect and analyse all necessary information from all 11 cross-border cooperation programmes between the beneficiary countries in the Western Balkans. This led to the creation of a database with 303 projects that were funded by 11 cross-border cooperation programmes between IPA beneficiary countries of the Western Balkans within the EU's 2007–13 Financial Framework.

In total, 296 projects are included in this analysis[9]. Given that each of these projects had two beneficiaries ("lead applicant" and "applicant"), 592 project beneficiaries from all 11 cross-border cooperation programmes are included[10].

The project beneficiaries, both lead applicants and applicants, were further classified into six categories:

- **Central-level institutions (and their entities):** this category includes different institutions from central government, such as national ministries, as well as government institutions that are assigned to the central level (such as the cadastre office, national employment services, centres for social welfare, public hospitals and national parks).
- **Municipalities (and their entities):** this category is similar to that above, but also includes local governments (municipalities) and other institutions established by municipalities (such as public utilities companies and local tourist organisations).

9 Not all grant projects were included in the further analysis for this article, namely seven projects from the cross-border cooperation programme North Macedonia – Albania did not have a partner from the other side of the border, therefore they were not relevant to our analysis. The analysis also did not include strategic projects from any programme.

10 Since each beneficiary signed a separate grant contract with respective contracting authorities, it is also possible to say that this article analyses 592 grant contracts.

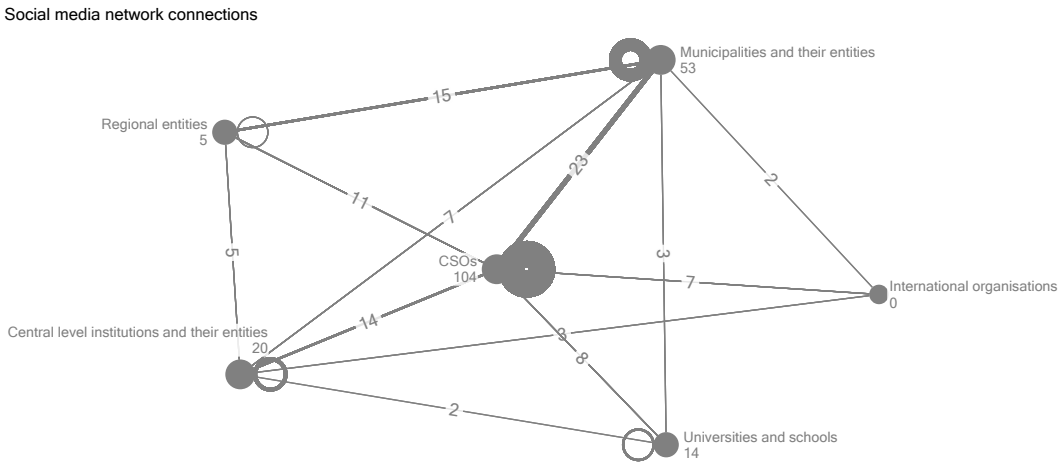
- **Regional entities:** this category includes various types of regional institutions, from regional (middle-tier) governments (such as districts in Bosnia and Herzegovina, counties (*županija*) in Croatia and provincial government (*Vojvodina*) in Serbia) to regional development agencies, regional/cantonal chambers of commerce, etc.
- **Universities and schools:** this category includes educational institutions at both central and local levels, such as universities, faculties, colleges, secondary schools and primary schools.
- **CSOs:** this category includes CSOs in a broad sense, from non-governmental organisations and think tanks, to religious entities and sports associations.
- **International organisations:** this category includes international organisations that have benefited from cross-border cooperation programmes, being either multilateral development agencies (such as the United Nations Development Programme (UNDP)) or international non-governmental organisations (Caritas, Oxfam, etc.).

iv) Results of the social network analysis

Social network analysis was used to test the hypothesis that CSOs are the most successful category of actors in providing brokering opportunities to bridge the structural holes between different actors in cross-border cooperation programmes regardless of the programme measure. To test the hypothesis, interactions were analysed for all categories of beneficiaries from all 11 cross-border cooperation programmes.

In Figure 3.3.2, the interactions between actors are presented for all projects of all 11 programmes for all calls. Figure 3.3.2 demonstrates that CSOs were the most successful in bridging structural holes between different actors, since they are linked with all types of beneficiaries. Municipalities and central-level entities are also interconnected with all other actors, yet the numbers of structural links are much lower than those for CSOs. Figure 3.3.2 also shows that most interactions were established between CSOs themselves, 104 in total, followed by intermunicipal interactions, 53 in total.

Figure 3.3.2.
Social network analysis of beneficiaries for all projects



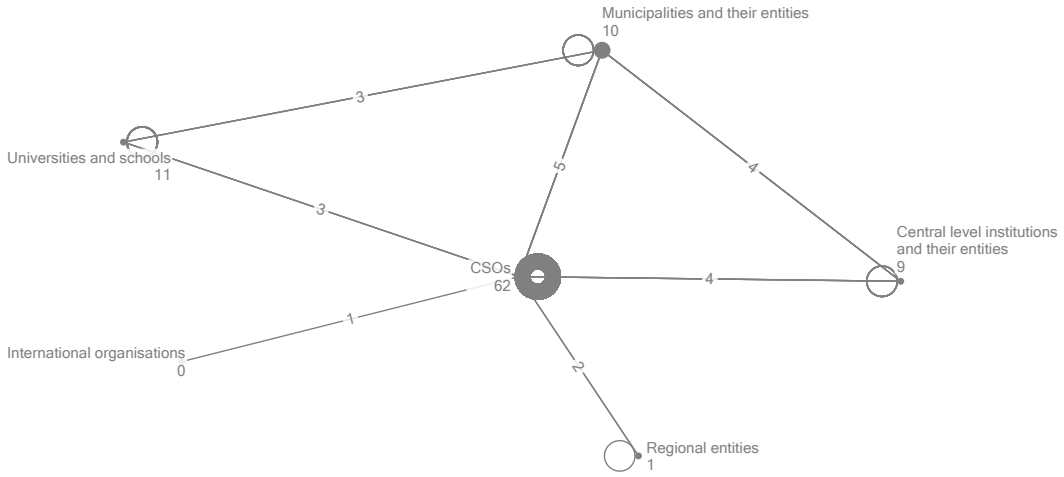
Source: Authors' own calculations

It was also important to test the hypothesis in the context of programme measures: "sustainable development" measures, which include all measures related to economic development, competitiveness and productivity, tourism, rural development, environmental protection, etc., and "people-to-people" measures, which cover small actions that were part of each programme.

The analysis of social networks in the context of the "sustainable development" category shows that CSOs were the most important actor, with 90 interactions, followed by municipalities, with 81 interactions. Nevertheless, the brokering capacity of CSOs is much stronger than that of municipalities, since CSOs

were linked with all other categories, while municipalities did not cooperate with universities and schools. Central-level institutions also interacted with all other categories, yet they had a considerably smaller number of connections (34) than those of CSOs (90).

Figure 3.3.3.
Social network analysis of beneficiaries for "people-to-people" measures



Source: Authors' own calculations

The final analysis covers "people-to-people" interventions, including joint small-scale actions involving local actors from the border regions. The social network analysis presented in Figure 3.3.3 shows the important role played by CSOs (77 out of 115 interactions). This was expected because of the nature and scale of actions within "people-to-people" measures. The analysis also shows the importance of the brokering role played by CSOs in linking structural holes, since the degrees of connectivity for all other actors are comparatively low.

v) Conclusion and discussion

Cross-border cooperation programmes in the Western Balkans brought a new dimension to interactions between different social actors. Given the recent history of conflicts and disputes over territorial issues that involved all Western Balkan countries, it is important to analyse and understand how different structures within beneficiary countries communicated with each other to establish joint project actions. Such issues are also relevant in terms of measuring the effects and the long-term impacts of cross-border cooperation interventions between the Western Balkan countries within the EU's 2007–13 Financial Framework.

By using social network analysis to study grant beneficiaries from 11 cross-border cooperation programmes involving the IPA beneficiary countries in the Western Balkans under the 2007–13 Financial Framework, it was demonstrated that CSOs were the most dominant interlocutors among all categories of actors, since they played the most important brokering role in bridging the structural holes between different actors. CSOs proved to have the strongest interconnecting role for both types of measure: "sustainable development" and "people-to-people" measures.

Results of the social network analysis of cross-border cooperation programmes should be better utilised by policy-makers and supported by policy solutions that will create better effects on development. This type of analysis should be extended with case study analysis of the most successful interlocutors, to determine factors in their success and draw conclusions that could be turned into policy recommendations. The policy solution might also include strengthening the brokering potentials of other actors.

Social network analysis could also be applied in financial matters, checking for fraud and organised structures that jeopardise financial regulations. Combining social network analysis with other quantitative and qualitative instruments will give more insight into the impact of development programmes.

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3.4.
Rethinking marginality, beyond traditional spatial imaginaries

Valeria Fedeli and Alessandro Balducci[11]

Key words: marginality, economic restructuring, exclusionary inclusion, urban/territorial policies

i) Introduction

There is a growing body of policy-oriented research on the uneven socio-economic consequences brought about by the restructuring of capitalism due to the processes of digitalisation and globalisation. Research (in particular policy oriented) on the spatial effects generated by these processes remains however quite traditional.

In particular, much of the general debate highlights the need to develop an interrelated approach to studying the contemporary world, to allow an understanding of spatial change to be developed on the basis of interdependences and relationships between places. Nevertheless, in particular in the urban field, the exploration of the contemporary aspects of the urban question are still too often strongly related to consolidated binary forms of spatial representation and conceptualisations: peripheries, cleavages, divides, delays and "fracture territoriales" are all terms that highlight the enduring reference to traditional geographical and spatial imaginaries and representations.

The most relevant consequence is that the design of urban and territorial policies is still based on (1) simplified indicators that aim to identify (2) target territories (the territorial geographies of problems) and designs, and (3) area-based policies, in which the local scale is seen as the most significant consideration on which policies should be based, to address a problem rather than being considered a problem in itself.

On the contrary, if we consider the interrelated nature of the contemporary world, policy design should now more than ever address the construction of interrelated solutions, able to link places and people, not only well beyond traditional administrative boundaries, but even beyond 20th century forms of extended cooperation (forms of interinstitutional cooperation essentially based on either vertical or horizontal cooperation; Behar 2017). The current transcalar nature of socio-economic and spatial changes necessitates new approaches to the understanding and design of the contemporary urban question.

This paper seeks to contribute to the debate on the interrelated nature of societal challenges, inspiring a new generation of "urban/territorial" policies based upon a new conceptual approach to the analysis and identification of the spatial effects of current processes of economic restructuring. From this perspective, it will specifically discuss the limits to current spatial imaginaries, in particular those that refer to the notion of "marginality".

ii) Practicing interrelated and transcalar spatial imaginaries

Cities and urban agglomerations have played a crucial role in the Fordist–Keynesian phase of capitalist development. But for some time now, new forms and processes of economic development have been emerging that involve contexts not traditionally at the centre of the urban scene (Scott and Storper 2015).

11 Both authors are professors at the Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy. They conceived this paper together, but A. Balducci in particular was responsible for section i), V. Fedeli for sections ii) and iii), and together they wrote section iv).

Economic development is taking place within new material and immaterial circuits, which escape traditional urban geographies: we are dealing in fact with new forms of labour, organisations of commercial exchanges, spaces/forms of production and cultural/recreational uses, and new networks/flows of production, consumption, exchanges of information, energy, raw materials and foods that escape both consolidated administrative boundaries and the many attempts to rebuild them on the basis of forms of vertical–horizontal cooperation (metropolitan areas or authorities, intermunicipal cooperation, consortia, etc.).

In the field of urban studies, scholars suggest that the urban can no longer be associated with the idea of the traditional city, but rather with the condition of urbanity, which is produced by new relationships among distant and different places, all participating to various degrees in the organisation of the global space, economy and society, and producing new profiles of social differentiation and inequity (Brenner 2016).

From a similar perspective, some authors maintain that today's era might be defined as one of regional urbanisation (Soja 2015): large urban regions are in fact substituting for cities on the international economic scene, accompanied by the emergence of new dimensions of the urban question (Balducci et al. 2017). On the one hand, urban regions now play the role that cities once played in the past; on the other hand, the contemporary urban question is conditioned by the new scale of the urban. In addition to that, unexpected in-between regions (Sieverts 2003; Nüssli and Schmid 2016) or societies are emerging (Bonomi and De Rita 2015), and places once referred to as "peripheral" or "suburban" now host some of the most important socio-economic-spatial innovations, often in the absence of specific recognition by both the research world and the policy-making one (Keil 2017). As Rodríguez-Pose (2018) puts it, acknowledging the new role that places that have not been central to the global economy so far play has become "the challenge".

This is particularly clear when we look, for example, at the location-choice logic of the new platform economy and the role played by urban areas once considered peripheral to development (e.g. logistics hubs); at the strategies/dynamics of the emergence of regions traditionally unrelated to the global economy in the promotion of niche tourism; or at the ability of marginal and depopulating territories to transform problems into opportunities (e.g. depopulated villages reinventing themselves with new identities and roles).

To explore and understand these kinds of dynamics we need to not merely extend the sphere or scale of analysis of the urban, basically enlarging the space of reference, but take a substantive step forward, to reconceptualise the urban without an outside based on a new interrelated understanding of socio-economic-spatial dynamics (as Brenner and Schmid (2015) puts it).

iii) Unpacking the marginality/centrality nexus

Under similar conditions, a simple act, such as mapping peripherality and marginality, has become harder than in the past. So much so that institutions, looking for simple criteria to address complex societal challenges, seem to be striving to capture the very nature of processes and to adopt simplified strategies to distribute resources and tools. They struggle to manage change, failing to leave behind 20th century socio-spatial-economic rhetoric and imaginaries, to formulate programmes and policies that can manage the desired and undesired effects of the economic restructuring processes under way.

While mapping the emergence of new profiles of marginality/centrality in terms of development trajectories has become one of the key challenges, many current developmental policies in fact tend to construct a narration/representation of problems in which the identification/stigmatisation of marginality is still largely anchored to 20th century urban and spatial imagery. Marginality is still defined based on parameters and criteria tied prevalently to the spatial dimension. Notwithstanding some recent attempts to innovate in this field (European Commission and UN-Habitat 2016; ESPON 2017), marginality too often remains a spatial metaphor indicating something on an edge with respect to a centre in geographical, social, economic and symbolic terms, the identification of which triggers the social construction of stigma.

By contrast, marginality must be considered not merely a phenomenon that has simple spatial or geographical connotations, but a universal phenomenon that unfolds in space in different ways (at the same time and within the same geographical space, different forms of "contingent, systemic, collateral and leveraged marginality" can exist (see Mehretu et al. 2000)).

In this respect, couples such as peripheral/central, exclusion/inclusion, global/local, city/country and proximity/distance are to be reconceptualised not as dichotomies, but rather as cohabiting conditions producing a fractal geography rather than geographies of fractures and cleavages (Behar 2015).

Indeed, spatial imaginaries, such as peripheries and marginality, inform and feed many national urban and territorial policies, which are still based on (1) simplified indicators (2) target territories – the territorial geographies of problems – and designs, and (3) area-based policies, in which the local scale is seen as the most significant consideration on which policies should be based, to address a local problem rather than being considered a problem in itself. Notwithstanding the historical tradition of "politique de la ville", for example, the recent reformulation of target territories based on a simplified indicator of poverty runs the risk of tackling only those problems that, although still urgent, are already visible, leaving invisible problems unresolved and other growing areas of socio-economic frailty misunderstood. At the same time, debates such as that promoted by the France Stratégie programme, reflecting on the necessity to admit that only redistributive policies can save lagging behind regions, as well as more and more intense processes of economic concentration, show that there is a risk of grossly simplifying problems. The same can be said in relation to the recent Italian programme for the urban regeneration of peripheries (Urban@ it 2018), and the dual approach to metropolitan areas and inner areas, which the country recently promoted. Despite the declared intention to develop innovative approaches to both defining what should be considered a periphery and how a territorial cohesion policy should depend on strong relationships between metropolitan agglomerations and inner areas, definitions have not moved beyond the binary definitions of centrality and marginality.

iv) How to reconceptualise marginality?

Conceptualisations such as Waquant's "advanced marginality" (2008) or Merhetu et al.'s (2000) "typologies of marginality" can help to restructure the way in which we measure and map these dynamics. In particular, the hypothesis of Mehretu et al. (2000) is based on the idea that marginality is a "complex condition of disadvantage which individuals and communities experience as a result of vulnerabilities that may arise from unfavourable environmental, cultural, social, political and economic factors". Based on this approach, different typologies of marginality are identified, in particular distinguishing between "contingent and systemic marginality" and "collateral and leveraged marginality", which depend on the intersection of "three structural dualities in a country's socioeconomic system which are: (1) competitive vs. controlled market mechanism, (2) endogenous vs. exogenous market dependency, and (3) neutral vs. vested regulatory state".

From the spatial point of view, the authors highlight the relevance of the spatial scale of inquiry (varying from megascales to *in situ* marginality), suggesting that the scale issue is crucial when considering marginality, as well as that the spatial dimension of marginality must be read at the intersection of scales, producing unusual and unexpected geographies of co-presence. From this perspective, in particular Leimgruber (2004) suggests that "all situations of marginality or of marginalisation – the process which contributes to augment the level of marginality – are entangled in a maze of systems. The only way to grasp a better understanding of how this marginality is created, and how the power relations have changed to bear this result, is to use a multilevel or multisystem approach. That means to draw the portraits of the various systems within which an individual or a group is part, illuminating the power relations in each of these systems."

How to operationalise such a perspective and go beyond the definition of marginality based on simple spatial indicators or socio-demographic ones

In a recent research project, we produced a conceptual framework based on Hirschman's exit–voice–loyalty model: the author formulated it in the 1970s to study not only power relationships, but more widely the new space–society–economy nexus. Originally, it was applied to study businesses, organisations and states, with the idea of enabling critical thinking about the necessity to reconceive development policy. The theory was later adopted by various disciplines to study organisations and decision-making processes. The original model interprets the ways in which businesses make their location decisions (and confirm whether or not they were good decisions), seeking places that satisfy conditions for their success.

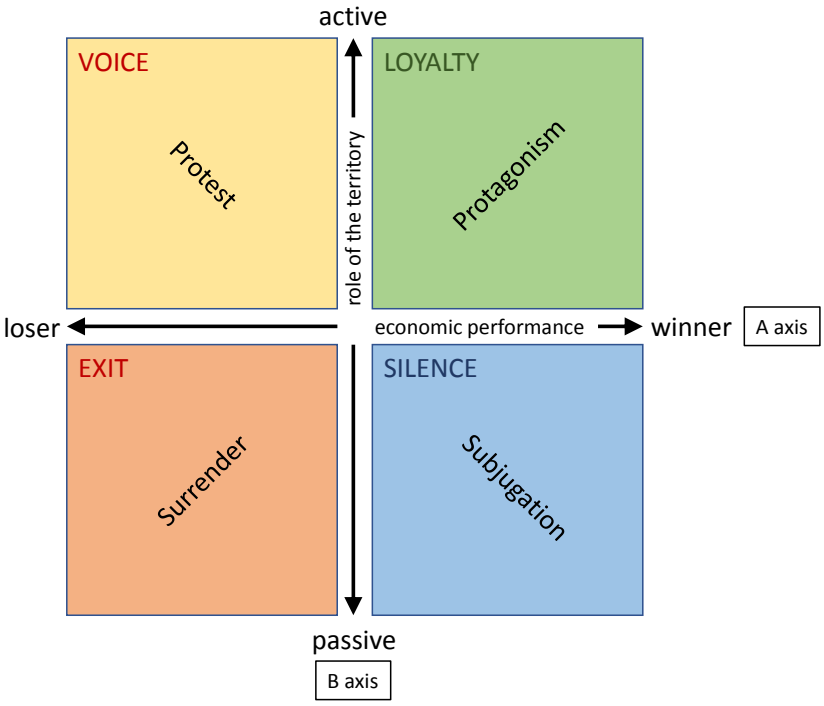
But what happens to places with respect to the behaviour of businesses and the economy? How do spaces, society, institutions – that is places – react to processes of economic reorganization? How do they observe, endure, reactivate and reorganise, and to what extent can this provide a definition of marginality not simply based on traditional indicators of centrality or marginality?

The research framework we are testing is based on a conceptual diagram. The trajectories of apparent success and failure, in terms of the economic performance, are positioned along an A axis, allowing winner/loser places to be identified, based on simple and complex socio-economic performance indicators. Starting from this first classification, the same cases are positioned along a B axis, which represents their ability to play an active or passive role (active/passive territories) in intercepting the processes of restructuring global capitalism. The marginality or centrality, in terms of this hypothesis, can be read as **a complex condition in which economic restructuring takes (or does not take) place locally as the result of a (presence or) lack of capacity to react and take advantage of a global local relationship dynamic.**

This conceptual scheme seeks to read "processes" rather than "states", identifying trajectories of change rather than stability (decline and passivity, development and protagonism). This could be done, in particular, by testing the hypothesis of Storper (2013), according to which the region is explored as a unit of analysis using the Hirschman (1970) model, the relevance of formal and informal institutions in influencing specialisation and human capital production is suggested, with particular attention being paid to spatial habits.

Marginality becomes, on the basis of this scheme, only slightly detectable in relation to a status – distance from resources, lack of accessibility and opportunities, or material poverty – and more detectable in relation to the capacity of a place/society to interact with translocal economic processes, from a predefined scalar geography. On this basis, new urban and territorial policies are expected to be designed, able to go beyond the simplified spatial imaginaries still largely based on the 20th century idea of the urban.

Figure 3.4.1.
Exploring marginality from an exit–voice–loyalty perspective



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3.5.
How can ethnography enrich the analysis of territorial interrelations? Insights from integrated territorial investments in Poland

Sylwia Borkowska-Waszak[12]

Key words: integrated territorial investments, functional urban areas

i) Introduction

The paper contributes to debates on methodologies that capture territorial interrelations in functional urban areas. In particular, it introduces an innovative approach to data collection in relation to EU Cohesion Policy (CP), discussing the advantages and limitations of ethnographic methods.

Research on territorial interrelations within EU CP has been based mostly on quantitative, statistical data. Such data often lack contextual meaning and may not capture deeper processes or relationships in particular territories (Demidov 2016). Recent studies focusing on the implementation of interterritorial instruments in CP called for more qualitative indicators, highlighting the need to capture the hidden effects of these instruments (Ferry et al. 2018). Moreover, such studies are based on the assumption that humans behave rationally, which was recently proven wrong by cognitive science (Shafir 2013). Consequently, policy interventions designed solely on quantitative data may potentially lack the actual mechanisms that most accurately explain the diagnosed problems.

This paper argues that ethnographic methods can fill this gap by gathering qualitative data at the micro-level of policy implementation. It shows how such in-depth approaches can capture territorial interrelations, revealing the hidden added value of particular policy instruments, explaining the reasons for their success in particular localities, discovering the informal aspects of governance, and assessing the rationality and quality of EU-funded projects. On this basis, the paper argues that ethnography can contribute to a stronger evaluation system and policy recommendations, allowing the design of better-fitted, human-centred policy interventions.

The paper uses an example of ethnographic fieldwork conducted by the author in Poland. It includes insights from 2 case studies of integrated territorial investments (ITIs): the Lublin Functional Area and the Central Subregion of the Śląskie Voivodship. Data collection included 3 months of participatory observation and 46 interviews.

First, the paper will briefly discuss main characteristics of ethnography and its typical methods. Second, it will introduce an example of an empirical application of ethnographic methods, highlighting their added value. Lastly, it will discuss the limitations of such methods and summarise the ways in which ethnography can be helpful for policy-makers in the context of territorial interrelations.

ii) Ethnography as a methodological approach

Ethnography is a methodology embedded in interpretivist–constructivist approaches to research design (Schwartz-Shea and Yanow 2012). They are based on the assumption that there is not a single objective truth that the research should discover. Instead, they observe that actors construct their own reality on the basis of their beliefs and interpretations, which strongly influence their behaviour, often more than objective facts. Such an assumption determines specific research questions and specific methods to answer them.

The most typical methods of data collection used in ethnography are **participatory observation** and interviews. In the first method, researchers enter the community or organisation under study for a significant period of time and interact with local actors (e.g. policy-makers). During observation, researchers gather a wide variety of data: field notes, photos, recordings, videos, documents, etc. They emerge themselves in the context being studied, accompanying research participants during their everyday activ-

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ities, and trying to understand their reality. To do this, researchers can take three possible roles (Gans 1962:396):

1. **anonymous observer:** when the researcher does not reveal his or her purpose when interacting with the environment being studied;
2. **researcher participant:** when local actors are informed that the researcher is conducting a particular study;
3. **participant in a role:** when a researcher enters the environment being studied in a particular role, e.g. through employment in the organisation being studied, and fulfils the obligations of this role while conducting observations for the research.

Depending on the chosen role, researchers have various levels of access to various types of information, which can influence the reality being studied in various ways. In the first scenario, "anonymous observer", the data collected will be least influenced by the researcher, as local actors will not realise that they are being observed and will behave in the usual way. For this reason, in some countries (e.g. the United States) academics prefer this approach, while researchers in other countries (e.g. the United Kingdom) argue that it does not comply with ethical standards, as research participants should be informed about being part of a study. The second scenario, "researcher participant", complies with these standards, as it usually requires the local actors' consent before participating in the study. However, this might influence local actors' behaviour, and they may not give the researcher access to all events and information. This issue of access is usually solved in the case of conducting observations in a chosen role ("participant in a role"), as the researcher acts as a typical employee. Nonetheless, what kind of data can be used for research purposes still needs to be agreed with the management.

For the purpose of studying public administration, it seems that participatory observation could be conducted in the second or third role. It is difficult to imagine an anonymous person entering an organisation every day for a few months, and following public officials' activities without revealing their identity and purpose. The third scenario allows civil servants to conduct observation while fulfilling their own jobs. Such studies could provide a way of gathering data without delegating a study to external institutions.

Another method used in ethnography is the conducting of **interviews**. A typical ethnographic interview differs from the typical interview methods in the fact that a non-structured scenario is adopted, in which local actors determine the order and scope of the topics discussed. In public administration, however, the interviews are often conducted with high-level officials, who have limited time, and therefore need to have be more organised and targeted. Thus, organisational ethnography typically includes a mix of the following kinds of interviews: semi-structured, in-depth, elite and expert (Ybema et al. 2009). This requires a lot of preparation and flexibility on the part of the researcher, but also allows more extensive, detailed data to be collected than are collected from structured interviews.

iii) Practical example: research on integrated territorial investments in Poland

The paper draws on the PhD research conducted by the author in autumn 2017. The aim of the research was to explore the role of political factors in ITI implementation, and to understand the process of inter-municipal collaboration from the perspective of local and regional actors. The field research included participatory observation (in the researcher participant role) in the intermediate bodies responsible for implementing ITIs in the Lublin Functional Area and the Central Subregion of the Śląskie Voivodship. Fieldwork included:

- 46 in-depth interviews with mayors, intermediate body employees, municipal ITI coordinators, Managing Authority representatives, experts assessing ITI projects and external beneficiaries;
- 3 months of direct participation in the everyday work of the intermediate bodies;
- attending internal and external ITI-related meetings of civil servants, politicians and beneficiaries of EU funds;
- study visits in 20 municipalities;
- familiarisation with internal documents;
- informal conversations with local actors.

The data gathered during the fieldwork included field notes, documents, photos, videos and recordings, which were transcribed to produce accurate, textual data ready for triangulation. All data were then systematically analysed using professional MAXQDA software.

This extensive field research revealed the aspects of policy implementation that are important from policy-makers' points of view, and that would not be accessible from surveys, publicly available documents, evaluation reports or even typical interviews. Below, such key aspects are briefly described.

Hidden added value of integrated territorial investments

While typical evaluations of ITIs focus on the speed of funds absorption, the data collected during this fieldwork allowed other dimensions of the effects to be revealed. On the basis of observations made during everyday work in the intermediate bodies and while attending ITI-related events, it is possible to conclude that ITIs have the following effects: they build trust thanks to more frequent meetings and efforts to realise joint interests; they lead to savings because of scale effects and mutual learning; they offer smaller municipalities more chance of succeeding in applications for EU funds as a result of governance reshaping; and they lead to a higher quality of projects because of information exchange, improved administrative capacity and the limited fragmentation of EU-funded investments. Some of these effects will be further explained in the context of the particular policy aspects. Finally, local actors had a stronger voice when speaking together, and got to know each other's investment plans, which stimulated the metropolitan perspective in their strategic planning. A good example is the launch of a comprehensive transport study covering the whole Central Subregion to measure inhabitants' mobility and contribute to the planning of a joint, coherent public transport system in the future. This is one of the spin-off projects that has emerged from ITIs.

Reasons explaining successful collaboration and integrated territorial investment implementation

The possibility to explore the context of policy implementation and informal conversations with local actors allowed the development of an understanding of the key factors involved in shaping intermunicipal collaboration. For example, the study showed that the crucial role in facilitating collaboration is played the leaders: the mayor chosen to chair the collaborative arrangement and the intermediate body director. Their attitude, initiative and principles strongly influenced trust building in the functional areas, especially between the capital city and surrounding municipalities. This is an important message for policy-makers, as future policy design should potentially support leaders through training, peer-to-peer exchange and facilitating their greater involvement in CP programming. In addition, the study strengthened previous studies suggesting that earlier experience in intermunicipal collaboration (before launching ITI) plays a crucial role (Feiock 2013; Krukowska and Lackowska 2016) in shaping successful collaboration. The research suggests that current ITIs have provided all key functional urban areas in Poland with a solid foundation for developing collaboration in the future.

Informal aspects of integrated territorial investment governance

The possibility to participate in official and unofficial meetings allowed the roles of particular actors in ITI implementation to be observed. This revealed a difference between the official delegation of governance tasks and the informal influence that actors exercise. One observation is related to the growing role of intermediate bodies and clear administrative capacity building, already observed at the beginning of the ITI implementation period (Ferry and Borkowska-Waszak 2018). The intermediate body played an important role in shaping the policy, often to a higher extent than officially delegated by the Managing Authority. Second, it showed that the most empowered group among local actors were mayors, who, for example, had a direct influence on the pre-selection of projects and created an informal, collaborative system of power and funds distribution. Lastly, the research provides insights into multi-level relations among the actors involved in implementation. For example, it suggests that ITIs limited regional "pork-barrel" politics, a party-based rationale for EU funds redistribution to municipalities. Local actors considered that ITIs limited marshal's power and provided more equal opportunities for municipalities regardless of party affiliation.

Rationality and quality of projects

Study visits guided by local actors and participation in internal meetings allowed an assessment of the extent to which ITI projects were strategic, collaborative and integrated. This was only possible thanks to the contextual knowledge of local actors and could not be obtained from official documents and indicators. The research uncovered examples of mutual learning when preparing the projects, which consequently raised the quality of the investments. This exchange of information was possible because of the pre-selection mode used, which limited competition among municipalities, and was supported by regular meetings organised by intermediate bodies, during which officials built collaborative networks. At times, this exchange led to the functional coordination of investments in various municipalities, e.g. to build a coherent, complementary system of cycling paths and in relation to the spatial distribution of kindergartens or supporting specialisation in vocational schools. In other cases, municipalities benefited from direct savings because of scale effects from joint public procurement and service delivery. This demonstrates that the fragmentation of EU-funded investments has been minimised. Savings were also achieved by avoiding non-strategic investments. For example, when a municipality wanted to build an aqua park, it first contacted a neighbouring community to enquire if it had conducted any cost–benefit analyses of such an investment. In this way, the municipality saved money on additional documentation, did not lose EU funds for a non-sustainable investment and did not generate debts in the municipality, as has happened in the past (Różalski 2012).

iv) Summary

The example of research outlined above shows that ethnography can be a useful approach to studying territorial interrelations. It appears to be highly innovative, as it has not previously been used in the context of territorial interrelations and broader CP. Moreover, it enables the collection of data that are inaccessible by other methods. In particular, it allows the broader effects of territorial instruments to be explored, explaining their success in some localisations and failure in others, and providing an understanding of the mechanisms of interrelations and the role of particular actors in governance processes, allowing the quality of EU projects to be better assessed.

However, ethnographic methods have a few limitations that need to be considered. First, findings based on ethnographic data are characterised by a low degree of generalisability. This is because the data are very context dependent, and factors proven to matter in one localisation may differ from those elsewhere. The added value of the data is their depth rather than breadth, and so such data can be useful for answering different policy questions. Second, ethnographic studies are relatively time consuming and, consequently, costly. They do not require any special equipment or programme, but they do depend on the placement of the researcher for a significant amount of time. This time is needed for the researcher to fully immerse in the new context, build connections with local actors, gain access to data and truly understand the local reality. Third, some researchers highlight that the data collected have limited objectivity. Indeed, the subjectivity of the data is unavoidable, as in ethnography researchers are tools for data collection, and they aim to capture the local actors' points of view. In this context, specialist training is needed to help researchers increase the transparency and accuracy of data collection and analysis.

As for the contribution to the EU context, ethnographic methods can be highly relevant. First, they allow the in-depth exploration of collaborative processes, which are relevant for all EU policies in accordance with the partnership principle. By explaining how and why actors involved in policy implementation behave and interact, ethnography can be an important way of improving, evaluating and designing future EU policies, including territorial interrelations. Second, they provide a broad overview of the local actors' perspectives on policy implementation. This micro-level exploration shows how policies are interpreted and how local contexts can change the original intentions of EU policy-makers.

Moreover, ethnographic methods provide useful data for policy-makers. By exploring usually hidden aspects of policy implementation and the mechanisms that drive the key processes involved, ethnography can form the basis of solid policy recommendations. The exploration of the unofficial effects of policy instruments can inform future indicators, so that they capture the broader added value of collaborative instruments. In this way, policy evaluations can become more informative and accurate. By exploring the mechanisms involved in the interrelations among partners, ethnography could also help in the design of more effective policy interventions, including the factors influencing the behaviour of actors actually implementing the policy at the micro-level.

The paper was presented during the ESPON Scientific Conference 2018 in London. The discussion focused on the challenges encountered by the researcher during her fieldwork, for example negotiating access to data, and the differences between the two cases studied. The presentation included two parts: (1) ethnography as a method for data collection; and (2) the Institutional Collective Action Framework (Feiock 2013) as a tool for data analysis. Panel participants expressed interest in both propositions, but the discussion focused mostly on ethnography and, for this reason, the final paper focuses solely on this approach.

In summary, ethnography can provide a useful approach for the in-depth exploration of territorial interrelations and for providing a better understanding of the actors involved in policy implementation. However, as with any other method, it is not suitable for studying all topics. The following list of research questions could be answered by ethnographic methods in future studies:

- How do local actors perceive/experience collaboration?
- What are the benefits of implementing a joint policy instrument?
- What do territorial interrelations look like in practice? What are the crucial arenas for interaction?
- How did interrelations change over time?
- What are the formal and informal roles of particular actors? What motivates their behaviour?
- What are the informal factors shaping territorial interrelations?
- What is the added value of particular policy instruments?
- Which elements of policy implementation structure open scope for the influence of particular actors?

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4

Monitoring integrated territorial development

4. Monitoring integrated territorial development

4.1. The Europeanisation of territorial governance and spatial planning: a tool for analysis

Giancarlo Cotella and Umberto Janin Rivolin[13]

Key words: Europeanisation, territorial governance, spatial planning systems, European territorial governance

i) Introduction

The Europeanisation of territorial governance and spatial planning (TG&SP) concerns both the possible influence of the European Union (EU) on national TG&SP systems and the contextual shaping of wider European territorial governance. This contribution presents the framework adopted by the COMPASS project to understand and analyse the Europeanisation of TG&SP in the 32 countries composing the ESPON space.

Section ii) proposes a model that conceptualises TG&SP systems as complex institutional technologies subject to socio-economic, cultural and political changes and embedded within a wider EU territorial governance framework. Section iii) presents in more detail the three types of top-down influences (structural, instrumental and discursive top-down) identifiable through the model, whereas section iv) describes the types of bottom-up influences (discursive bottom-up and practical) and a horizontal influence. Section v) rounds off the contribution, reflecting on the application of the model and its added value.

The proposed approach constitutes the first attempt to represent and analyse Europeanisation in the field of TG&SP in a comprehensive and systematic way. The results of the analysis led to circumstantial recommendations for policy-makers at various levels, with the aiming of enabling better cross-fertilisation between domestic TG&SP and EU Cohesion Policy.

ii) Theoretical foundations: territorial governance and spatial planning systems as institutional technologies

TG&SP systems can be conceived as "institutional technologies" that allow and rule, in a given institutional context (e.g. a state), the spatial organisation of economic development and social life (Janin Rivolin 2012). To fulfil their function, they operate "as a hinge between the government system … and the spatial production and consumption system" (Mazza 2003:54, authors' translation), and can change over time driven by external (e.g. socio-economic change) and internal (e.g. political choice) factors.

This concept encompasses the notions of "institution" and "technology", both recognised in science as subject to evolutionary processes of innovation. In brief, TG&SP systems can be seen as end products of a creative selection process of trial and error based on "(i) first, the generation of variety (in particular, a variety of practices and rules); (ii) second, competition and reduction of the variety (of rules) via selection; (iii) third, propagation and some persistence of the solution (the system of rules) selected" (Moroni 2010:279). However, "in practice the process to adopt changes is rather slow and restrained by high transactions costs" (Fürst 2006:31), because of path dependence and the complexity of institutional processes in the context of political conflict and socio-economic dynamics.

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In short, the variety of practices generated from the social experience of spatial development in an institutional context is the continuous trigger of this evolutionary process. As a result of this variety, successful experiences can arise, as a consequence of a competitive and iterative discourse concerning the technical and political assessments of territorial governance outcomes. Specific ideas and procedures may become "hegemonic", possibly leading to substantial and/or procedural changes in the system structure, i.e. the overall set of constitutional and legal provisions allowing the operation of the system. This institutional codification leads to the propagation of the selected solutions, with the established tools (e.g. plans and other devices and procedures) becoming the basis of the (new) operational framework for practice (see Janin Rivolin 2012).

Although the EU has no formal TG&SP competences, evidence of an ongoing process of European territorial governance (Zonneveld et al. 2012) encourages the adaptation of the same conceptual framework to its wider institutional context. European territorial governance can be imagined as a process in which one supranational and various national cycles (as many as the EU member states) are simultaneously active (Figure 4.1.1). As it will be described in the following sections, this representation may serve as an analytical tool suitable to identify the relations between the national and supranational contexts, and to consequently explore all possible influences concurring to the Europeanization of TG&SP.

iii) "Downloading" influences and domestic change

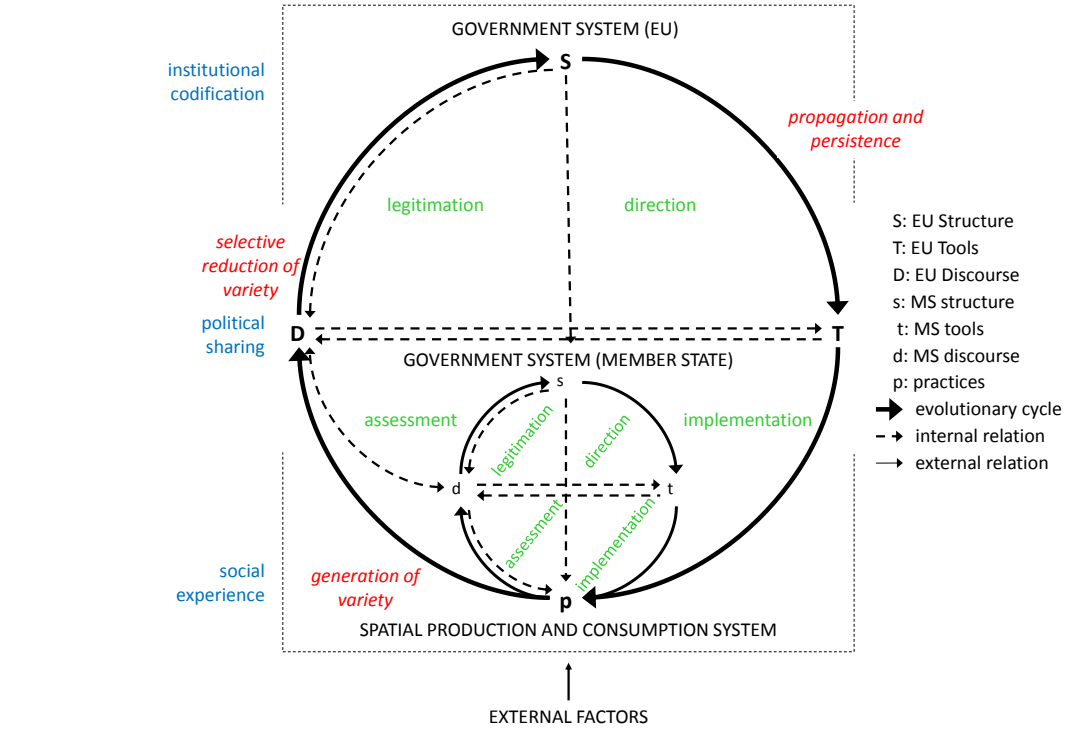
In exploring the domestic impact of EU policies, three mechanisms are usually identified: "First, and in its most 'explicit' form, European policy-making may trigger domestic change by prescribing concrete institutional requirements with which Member States must comply … Second, and somewhat more implicitly, … European influence is confined to *altering domestic opportunity structures,* and hence the distribution of power and resources between domestic actors … Third, in its 'weakest' form, European policy … affects domestic arrangements even more indirectly, namely by altering the beliefs and expectations of domestic actors" (Knill and Lehmkuhl 1999:1–2). The proposed analytical tool confirms that these mechanisms also operate in the field of TG&SP as outlined below.

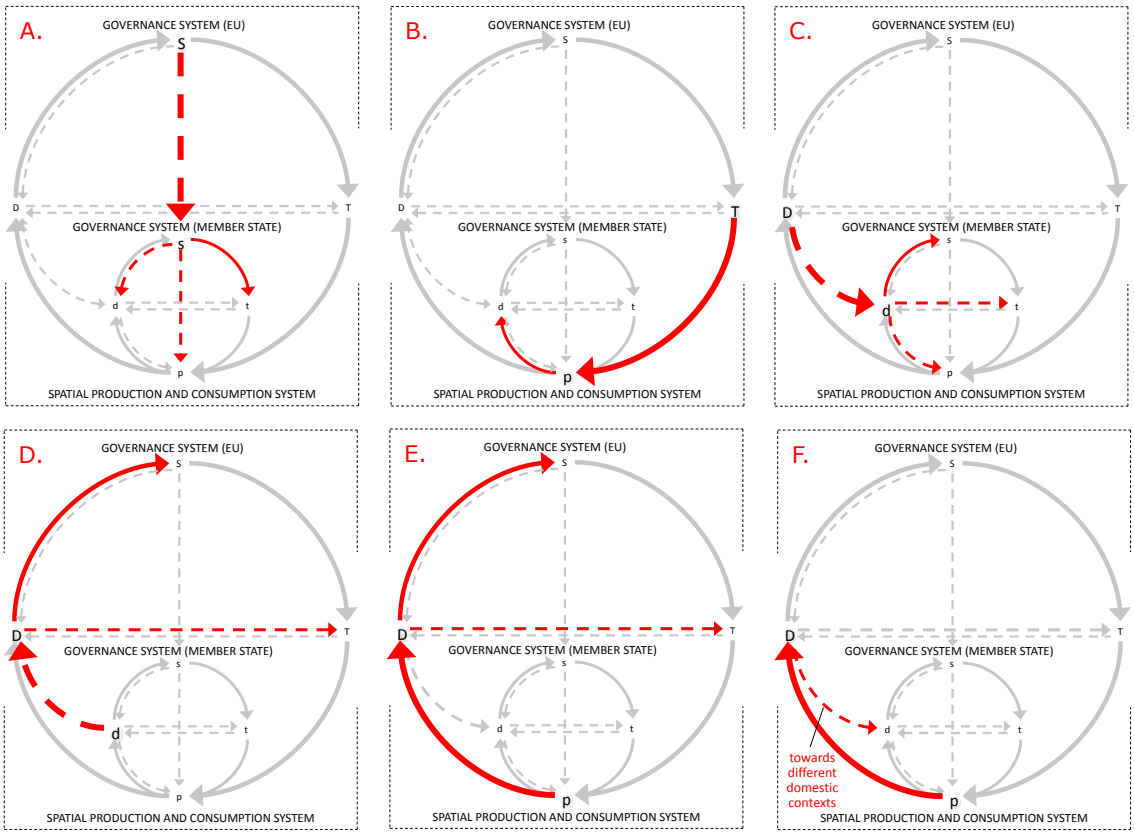
A **structural influence** ("A" in Figure 4.1.1) is delivered from the EU structure ("S") to each domestic structure ("s") (S → s), which then generates secondary influences on domestic tools ("t") (s → t), discourse ("d") (s → d) and practices ("p") (s → p). This structural influence follows the so-called "community method", i.e. based on the logic that EU treaties allow for the promulgation of EU legislation in established policy fields, to which Member States must adapt through the so-called "transposition" process. Although this is potentially the most coercive mechanism of influence that the EU exerts on Member States, the absence of EU competence in TG&SP makes it effective only for related policy fields (environment, energy, competition, etc.).

An **instrumental influence** ("B") is channelled from EU tools ("T") to practices (T → p) and may trigger a secondary influence on domestic discourse (p → d). The introduction of recursive policy instruments (e.g. European Structural and Investment Fund (ESIF) programmes) has progressively modified the decision-making of domestic actors on the basis of cost–benefit analyses and stimulated variations in established TG&SP practices. In this regard, the engagement of local actors in complex processes of economic convenience and "social learning" triggered by goals and means shared at the EU level is crucial. Domestic change occurs in accordance with a mixture of economic conditionality mechanisms and interactive socialisation and collective learning.

A **top-down discursive influence** ("C") is directed from EU discourse ("D") to each domestic discourse (D → d), potentially influencing structure (d → s), tools (d → t) and practices (d → p). It is embedded in a circular "discursive integration" process denoting an "example of European integration by networking and policy discourses" that "can be successful when there are strong policy communities active at European and national levels and direct links between them" (Böhme 2002:III). Changes in domestic actors' preferences are in this case based on cognitive conditionality, and the intensity and quality of change depend on the appropriateness of the EU discourse in terms of legitimacy, collective identity, values and norms (Radaelli 2004).

Figure 4.1.1.
Evolutionary pattern of European territorial governance and six types of Europeanisation influence





Source: Cotella and Janin Rivolin 2015, adapted

iv) "Uploading" influences and the feedback in "horizontal" exchange

The bottom-up dynamics of Europeanisation are addressed to gain an understanding of "the emergence and development at the European level of distinct structures of governance" (Wishlade et al. 2003:6). Whereas the impact of downloading influences can be observed separately in each domestic context, the "upload" of possible drivers of change at the EU level should be understood rather as the result of complex selective processes involving several institutional domains in a generally unstable constellation. Whereas the proposed bi-dimensional framework displays very little of this complexity, it can at least highlight the catalytic role played by EU discourse, in which ultimately the selection takes shape. Two "uploading" influences are distinguishable depending on whether they are triggered by domestic discourse or practices. Moreover, a third influence describes the increasing occurrence of "horizontal" exchange and policy transfer between two or more domestic domains (Lenschow 2006).

A **bottom-up discursive influence** ("D") converges from each domestic discourse into EU discourse (d → D) and may then generate secondary influences on EU tools (D → T) and structure (D → S). This influence is considered in the context of the "discursive integration" process presented above; however, the attention shifts in this case from the capacity of European "hegemonic concepts" to penetrate domestic contexts, to the process that leads to the definition of those concepts on the basis of competing domestic perspectives, with the European Commission (and in particular the Directorate-General for Regional and Urban Policy (DG REGIO)) representing the interests of the EU.

A **practical influence** ("E") links practices with EU discourse directly (p → D), potentially generating secondary influences on EU tools (D → T) and structure (D → S). As TG&SP practices constitute the "crossroads" between European and domestic rationales in action, they are not only determinant in conveying EU influences to domestic contexts, but also in providing more immediate "knowledge resources" for EU discourse. Admittedly, major problems are in this case related to the objective difficulty of learning through practices in a still weakly institutionalised context.

Finally, as a further opportunity driven by the practical influence, the **horizontal influence** ("F") describes the fact that, once practices from one context have been shared in EU discourse (p_1 → D), they can generate a secondary influence on the discourse in one or more other domestic contexts (D → d_n). This particularly occurs thanks to European Territorial Cooperation initiatives, through which the EU has constituted various platforms of interaction, fostering mutual learning and "horizontal" policy transfer (Dühr et al. 2007).

v) Application and added value: towards a systematic understanding of European territorial governance

The COMPASS project explored systematically the six types of influence described above in relation to the 32 countries of the ESPON space, to understand the mechanisms and impacts of Europeanisation in the field of TG&SP (Figure 4.1.2).

The overall influence of the EU on national TG&SP systems is highly variable by country, by sector and over time. Whereas the impacts of EU legislation – in the fields of environment, energy and competition in particular – are relatively uniform, as a result of their compulsory transposition, the impacts of EU policies are rather differential and closely related to the magnitude of the financial support delivered to each country and policy area. The impacts of EU discourse are even more varied, with countries joining the EU after 2004 and Mediterranean countries appearing to be subjected to the influence of EU concepts and ideas to a larger extent.

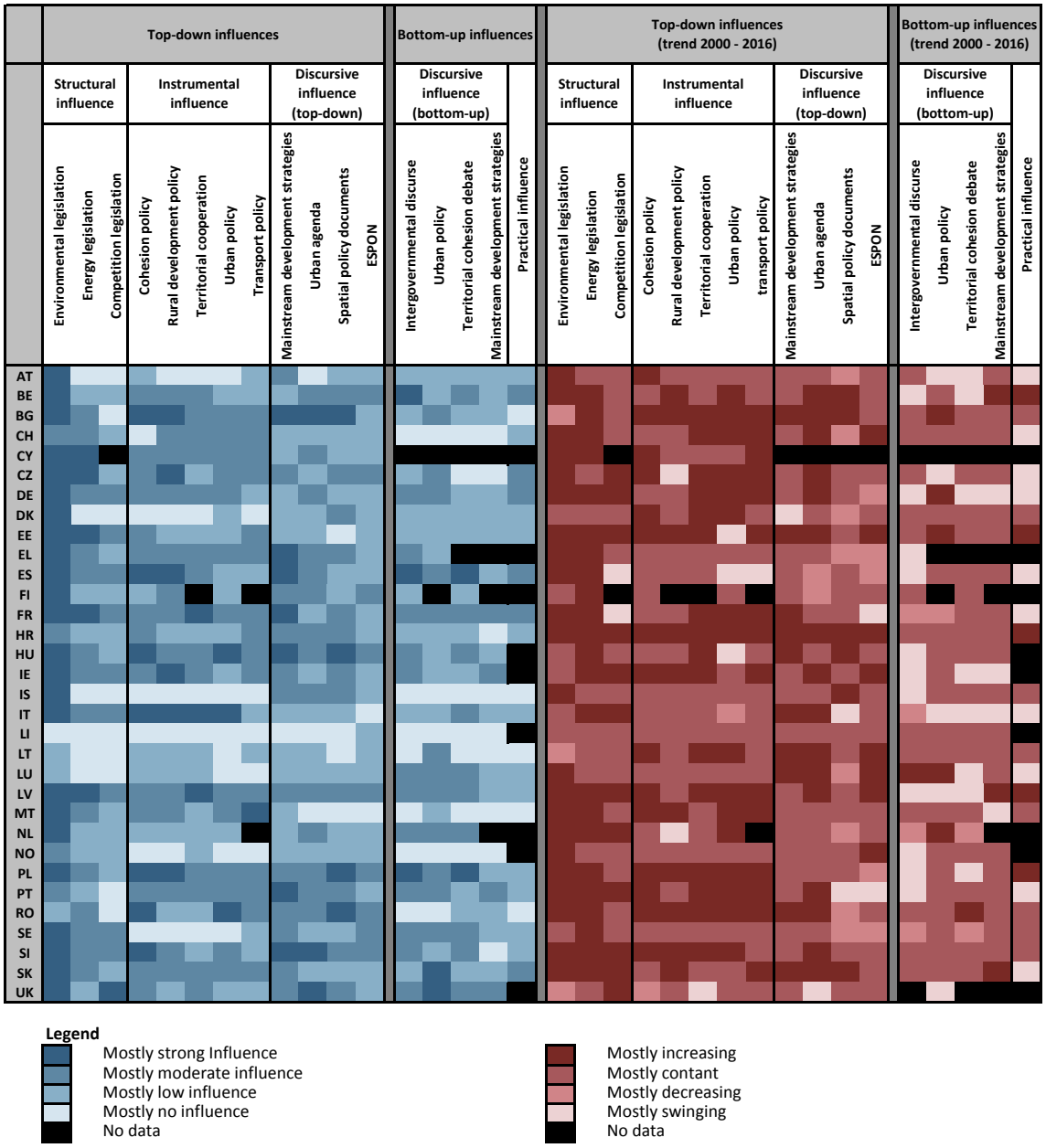
When it comes to bottom-up influences, the impact is less evident. The evidence collected confirms that these mostly occur as a result of competitive processes in which certain national actors are more engaged than others or are more able to find agreement within the main EU discursive arenas (e.g. the Network of Territorial Cohesion Contact Points). On the other hand, despite the progress made in evidence-based surveys, inspiration from specific practices remains sporadic at the EU level, and has only been relevant in a few cases for triggering domestic changes through horizontal episodes of Europeanisation.

The main innovative contribution made by the proposed analytical tool resides in the political awareness it can give rise to. In particular, it can reveal the institutional complexity of European territorial governance as the result of the differential levels of engagement of national TG&SP systems that, as ascertained by the COMPASS project, are extremely varied in nature (Map 4.1.1). Whereas European territorial govern-

ance can be seen as a complex, non-codified institutional process aimed at strengthening the coherence between EU policies and domestic TG&SP, the outcomes of this process are uneven across policy fields and countries, “filtered” as they are through the numerous substantive and procedural differences characterising domestic systems.

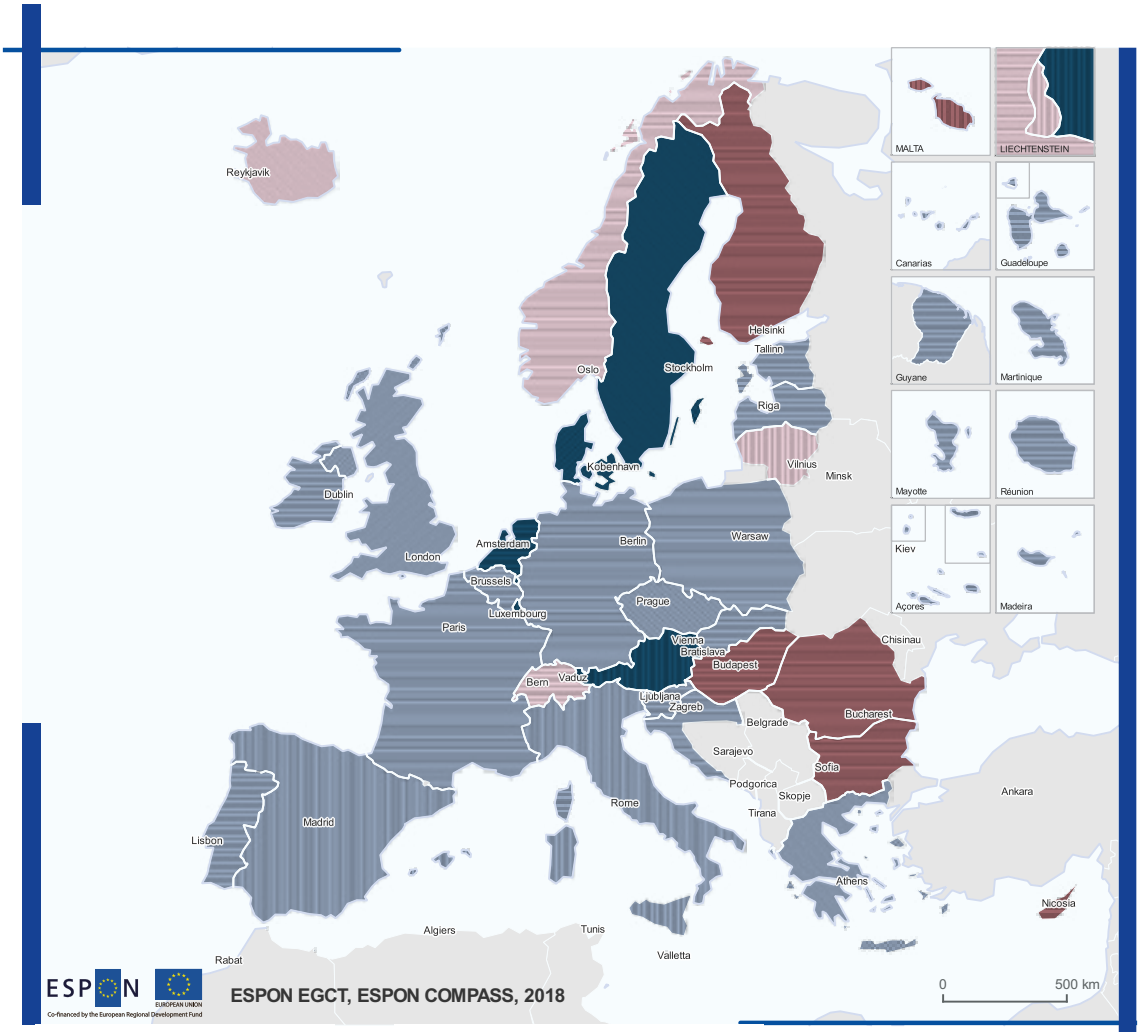
Ultimately, the heterogeneity observed suggests that any attempt aimed at improving TG&SP in relation to EU policies (and vice versa) should start from a formal clarification, in institutional terms, of the mutual role of the national TG&SP systems with respect to European territorial governance and EU Cohesion Policy. After all, the shared competence of “economic, social and territorial cohesion” established in the current EU treaties would make it possible.

Figure 4.1.2.
Top-down and bottom-up Europeanisation influences between 2000 and 2016, by significance and trend



Source: ESPON and TU Delft 2018

Map 4.1.1.
Typology and trend of perceived engagement in territorial governance and spatial planning systems within European territorial governance



Regional level: NUTS 0 (version 2013)
Source: ESPON COMPASS, 2018
Origin of data: ESPON COMPASS, 2018
CC - UMS RIATE for administrative boundaries

Typology of engament
- Mostly engaged
- Mostly leading
- Mostly following
- Mostly unengaged

Trend of engagement
- Increasing engagement
- Stable engagement
- Swinging engagement
- Decreasing engagement

Source: ESPON and TU Delft 2018

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4.2.
Capabilities and Performance Assessment of City (CAPAcity) dynamic model for potential investment and development

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Key words: decision support method, monitoring capacity, dynamic interactions, data structure, urban development

i) Introduction

Managing urban areas for sustainable capital and territorial redevelopment and cohesion is a top priority for urban and regional policy-makers in Europe. Urban comprehensive carrying capacity (UCCC) is an important conceptual foundation that guides local governments towards sustainable urban development. The methodological issues related to UCCC monitoring and evaluation have been studied in depth, but there is still a need to elaborate on the path to innovative applications, which is of high importance in the emerging framework of smart cities.

A decision-making methodology is proposed that will address this need by managing the data and monitoring the policy impacts and resulting territorial capacities, based on UCCC and a new index, based on the urban smartness (US) of an area. This research argues that in-depth knowledge of the dynamic relationships between city sectors is indispensable for efficiently addressing causes of risk and mainstreaming risk reduction into urban development scenarios. It enables city authorities and actors to improve weak areas and adapt planning, without adversely influencing interconnected risk factors and related impacts and losses.

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ii) Methodology

As argued by Onishi (1994) and Saveriades (2000), if urban populations and human activities continue to expand and exceed the "limit of urban capacity", urbanites will no longer perceive prosperity, but will be troubled by the overall deterioration in socio-economic and ecological aspects. UCCC reflects the potential that could be reached by urban development. To support this process, we have developed a model for quantifying the UCCC of a city/area/zone based on five subsystems: infrastructure, environmental, economic, society and traffic carrying capacities. Each subsystem is quantified by data in its two interacting pillars, demand and supply. Along the lines of a readiness index for smart cities (see Stephanedes et al. 2018), a five-dimension US quotient and an attraction index have been developed for UCCC evaluation. To address risks in urban development scenarios, risk analysis based on systems theoretic process analysis (STPA) methodology is proposed. The methodology framework is presented in seven steps below.

Step 1: target system definition

As the methodology can be applied to urban environments with differing characteristics and on multiple scales, the first step defines the specific target area(s). In each area, an operational comprehensive carrying capacity target system is established based on area characteristics. This includes the target system, criterion layer and indicators. Demand and supply indices are key criteria. Because of limited resources, the greater the demand for a resource, the higher the pressure on urban development. The more resources a city provides, the larger the development space and the greater its comprehensive bearing capacity (Table 4.2.1).

Step 2: data collection and normalisation

Operability in territorial government settings often heavily depends upon data availability. Existing databases and tools function as valuable data sources for urban areas. CityBench, European System of Accounts (ESA), Eurostat, Regional Reference Frame Sub-Commission for Europe (EUREF), transport fleets and social networks provide data (and big data) on fundamental variables, including gross domestic product (GDP), number of patents, places for rent, number of pedestrians, public transport access and quality, traffic flow, vehicle trajectories, internet access and use, use of renewable energy sources and waste management characteristics. The criterion layer includes two pillars, demand and supply. This work considers two types of indicator, the positive and the negative, characterised by how they contribute to urban comprehensive capacity. The value of negative indicators should be as low as possible and that of positive indicators as high as possible. Data on indicators carry different dimensions and units and thus need to be standardised.

Step 3: indicator weight assignments

The weights of the indicators and factors are determined by the entropy coefficient method. Entropy is a measure of system disorder and a measure of relevant information in the data. In this work, entropy is used to parameterise the evaluation model of UCCC.

Step 4: urban comprehensive carrying capacity assessment

The UCCC A = A(Y) of a city/area/zone adopts the integrated form:

$$A = \sum_{i=1}^{n} w_i Y_i \qquad (1)$$

The integrated assessment value of subsystem i adopts the evaluation model:

$$Y_i = \sum_{j=1}^{m} b_{ij} x_{ij} \qquad (2)$$

where, Y_i is the integrated assessment value of the i^{th} subsystem; w_i is the weight of the i^{th} subsystem; n is the integration index in the i^{th} subsystem; b_{ij} is the weight of the j^{th} indicator in the i^{th} subsystem; x_{ij} is the evaluation value of the j^{th} indicator in the i^{th} subsystem; m is the evaluation index in the i^{th} subsystem.

Table 4.2.1.
Proposed key performance indicators for calculating UCCC

Target system	Factor	Criterion	Indicators
Urban comprehensive carrying capacity	Infrastructure carrying capacity	Demand	Number of citizens per m^2
			Number of industries
		Supply	Per capita construction land area
			Per capita public spaces
	Environmental carrying capacity	Demand	Comprehensive energy consumption
			Per capita daily water consumption
		Supply	Green coverage ratio of construction land area
			Processing capacity of municipal sewage plant per day
	Economic carrying capacity	Demand	Unemployment rate
			Taxes on key industries
		Supply	Proportion of tourists in relation to total population per year
			Growth rate of gross value of production
	Society carrying capacity	Demand	Proportion of homeless people in relation to total population
			Proportion of citizens without access to education
		Supply	Percentage of social housing
			Percentage of population with access to health care
	Traffic carrying capacity	Demand	Number of registered cars
			Percentage of population commuting by public transportation
		Supply	Per capita road area
			Public transport network length

Step 5: calculation of urban smartness weight

The US weight is calculated based on specific key performance indicators that monitor the implementation of smart and innovative solutions across 5 dimensions: environment and construction; governance and public service; economy and industries; informatisation; and innovative human resources. For each of these dimensions, the indicators are assigned as in Table 4.2.2. The US weight of each city/area/zone *k* is obtained with scores ranging from 0 to 100, standardised using the sample city/area/zone with the highest score:

$$US'_k = \frac{US_k}{US_{max}} \qquad (3)$$

Step 6: urban areas attractiveness assessment

The value of attractiveness, *Tk*, is obtained by multiplying the UCCC value *Ak* with the US factor US'(*k*), for each study area k:

$$Tk = Ak \,.\, US'(k) \qquad (4)$$

Based on the above steps, the city/area/zone with the best ranking is proposed. The factors with the highest impact are identified (e.g. environmental factor) and the indicators with the highest impact on these factors are identified (e.g. per capita water consumption).

Step 7: urban development scenarios

A neural network is developed and trained based on historical data. The outcome is a value for the controlled process-related indicator (e.g. water consumption). The inputs contain:

- the parameters of the controlled process loop (e.g. technologies and water efficiencies, metering programme, innovative water tariffs);
- the values of the interconnected process-related indicators (e.g. number of habitants per house, short-term migrant population, tourism);
- other external parameters (e.g. climate change).

Alternative urban development scenarios can be extracted. Scenarios likely to have a highly negative impact can be further analysed using an STPA method for proactive risk control.

Table 4.2.2.
Dimensions and indicators proposed for calculating US

Dimension	Indicator	Unit
Environment and Construction	Urban grid management coverage	%
	Proportion of citizens using intelligent transportation	%
Governance and public service	Online openness of non-confidential governmental documents	%
	Proportion of citizens participating online	%
	Proportion of citizens using e-health records	%
	Emergency response performance	%
Economy and industries	Proportion of GDP spent on research and development	%
	Proportion of industry focussing on urban intelligence	%
Informatisation	Proportion of public spaces with free Wi-Fi	%
	Average mobile network access	%
	Building automatic system popularisation	%
Innovative human resources	Urban netizen ratio	%
	Proportion of employed people that are IT professionals	%
	Proportion of population with college education	%
	Proportion of population that makes e-purchases	%

iii) Urban development scenarios risk analysis

The need to analyse challenges and develop risk performance measures (reliability, resilience, vulnerability) for large, complex and critical infrastructures has been identified in the literature (Utne et al. 2012). Therefore, a framework for understanding and addressing risks in urban development scenarios is proposed that examines the risk dynamics in urban settings by considering the interrelationships between urban systems. Based on systems-of-systems theory, urban areas are considered as target systems consisting of subsystems. For instance, the density and spatial concentration of housing can negatively affect access to services and service efficiency (e.g. transportation, energy, water and waste management).

This research adopts STPA's definition of a hazard (Leveson and Thomas 2018), stating that a hazard is "a system state or set of conditions that, together with a particular set of worst-case environmental conditions, will lead to an accident (loss)". STPA is a method that analyses the potential cause of accidents during development so that hazards can be eliminated or controlled. The framework provided could be used as a tool for local and regional authorities, enabling them to analyse critical dependencies in their contingency plans.

STPA application

The STPA method has been applied to a case study considering the impact of the water consumption indicator as the most critical for the calculation of the urban attractiveness value.

Step 1

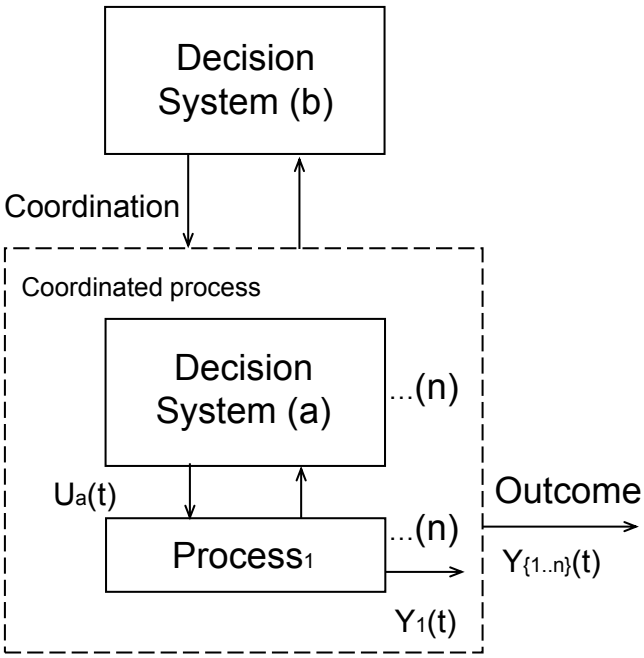
Defining the purpose of the analysis is the first step. This includes defining the kinds of loss the analysis aims to prevent, the system to be analysed and its boundary.

Step 2

The second step is to build a model of the system in a hierarchical control structure. A control structure captures functional relationships and interactions by modelling the system as a set of feedback and feedforward control loops. The control structure usually begins at an abstract level and is iteratively refined to capture more detail about the system. In the case study, assuming that, for the environmental factor, the indicator "per capita daily water consumption" is the one with the highest impact, a hierarchical control structure, based on STPA methodology is created (Figure 4.2.2). This bottom-up approach begins by extending the upper legislation and policy layers to the lower operation process layer. In addition, the interrelationships with other factors/decisions and systems are described. The controlled process can be considered a coordinated process or a physical process.

In the case study, vertical coordination between decision systems for a single process is the appropriate fundamental coordination relationship (Figure 4.2.1). The selected indicator is strongly connected with the economic factor, and especially with the "tourist population ratio per year" indicator. The alternative development scenarios should consider that their corresponding outcomes both affect and are affected by the processes in the related decision systems. In this case, the potential reduction in water consumption should be addressed on the basis of hazards arising from environmental and economic factors.

Figure 4.2.1.
Vertical coordination between decision-making systems for a single process



Step 3

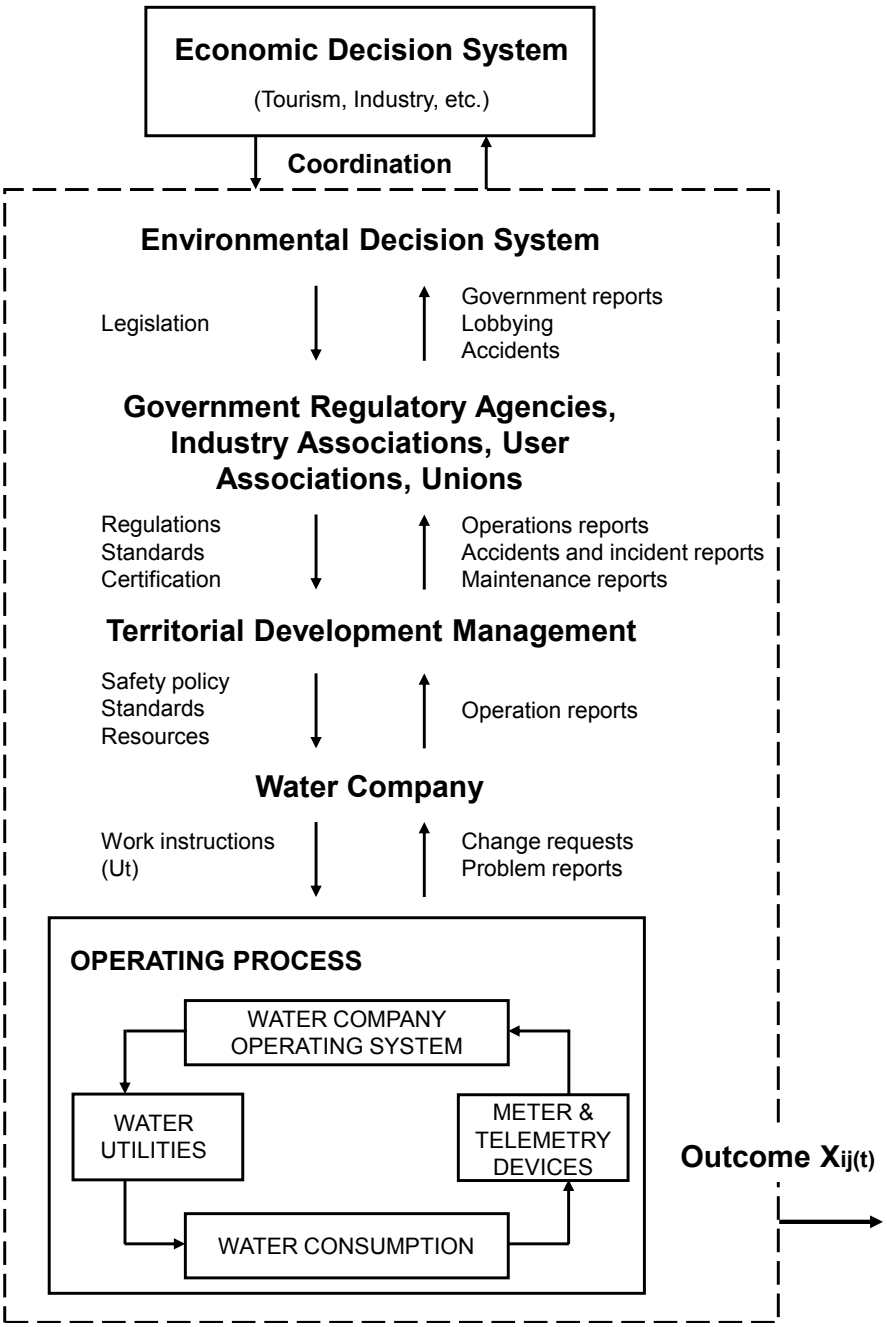
The third step is to analyse control actions in the control structure to examine how they could lead to the losses defined in the first step. These unsafe control actions are used to create functional requirements and constraints for the system.

Step 4

The fourth step identifies the reasons why unsafe control might occur in the system.

Once scenarios are identified, policy-makers can use them to create additional requirements, identify mitigations, drive the architecture, make design recommendations and new design decisions (if STPA is used during development), evaluate/revisit existing design decisions and identify gaps (if STPA is used after the design is finished), define test cases and create test plans, and develop leading indicators of risk.

Figure 4.2.2.
Hierarchical control structure for water consumption



iv) Conclusions

Comprehensive carrying capacity is essential for improving conditions for urban territorial development and cohesion and citizens' quality of life. An assessment framework with reference to the UCCC concepts has been developed to fill the gaps felt by urban planners and managers. Within this framework, urban planning and management authorities should monitor credible indicators and make use of the US index to provide strategic solutions across sectors and to achieve the goals of urban sustainability. Decision-makers can reap the beneficial sustainability outcomes by detecting and improving the limiting factors and by reducing potential risks. The need for specialised urban knowledge in approaches to risk reduction goes hand in hand with the need for a more interdisciplinary and multisector approach. In this context, STPA, interdisciplinary research and transdisciplinary collaboration are critical to narrowing the gap between theory and local realities.

The framework proposed could be applied in various ways across cities, based on the assumption that the necessary data are available. This method is at a preliminary stage, planned to be implemented in the near future.

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4.3.
Measuring the progress towards territorial cohesion: a territorial impact assessment application of the regional development programmes[17]

Maria Prezioso[18]

Key words: territorial cohesion, territorial impact assessment, regional capacity building in spending

i) Introduction

During the 2014-2020 mid-term review (European Commission 2016), disparities across European regions have emerged as being directly linked to the ineffective capacity building in spending of Cohesion Policy funds, as well as to the poor use of innovative financial instruments. Therefore, European regions face the challenge of improving, in a short time, the effectiveness of their spending if they are to reach Cohesion Policy goals, improving territorial cohesion (TC). This is the main factor (pre-condition) determining involvement in post-2020 programming.

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17 This paper originated from an ongoing project of the Italian National Research Council (PRIN 73 PI Maria PREZIOSO – 20155NXJ8T – SH3), entitled "Territorial Impact Assessment of the Territorial Cohesion in the Italian regions. Place Evidence Model for Assessing Policies Devoted to Green Economy in Internal Area and Metropolitan Inner Peripheries".

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According to the Investment Bank (Hyzyk 2018), the integrated use of the European Fund for Strategic Investment (EFSI) and the European Regional Development Fund (ERDF) (Lee et al. 2018) helps with the implementation of TC. On the other hand, CEMAT (2017) proposed that functional regional typologies (FRTs) should be drafted to measure the level of TC in territorial comparative analysis of spending. In this regard, this paper suggests building systemic territorial functional typologies (STFTs) – beyond administrative borders – so that regions can consider and valorise geographical features in a cohesion-oriented spending process.

The STFTs were developed using the sustainable territorial environmental/economic management approach (SteMA), an original territorial impact assessment (TIA) methodological approach, implemented via the Italian National Research Council, that highlights the relationship between territorialised spending and TC (Prezioso 2018). The paper addresses the following policy-related questions: (1) whether or not the level of TC influences capacity building in spending; and (2) whether or not TC is increased by building capacity in "good spending" by basing decisions on knowledge of local needs within geographical specificities. Taking inspiration from the Italian regions as a case study, a feasible option – to politically reconsider regional spending linked to TC – is put forward.

ii) Measuring territorial cohesion by SteMA TIA application

Regional authorities are responsible for matching local territorial policy needs with needs addressed by EU/national policies and related investments. According to the European Commission, the European Committee of the Regions and the Directorate-General for Regional and Urban Policy (DG REGIO), European regions should fund actions by evaluating potential territorial capital in the different sub-regional areas and monitoring the adequacy of spending targets for the strategies adopted.

Empirical and targeted regional studies (e.g. by ESPON) have highlighted how economic and geographical diversity and the choice of assessment tool affect the estimation of regional investments in all policy sectors, which are interrelated.

Some obstacles to ensuring efficient spending have been identified within regional operational programmes (ROPs): (1) difficulty in capturing real needs in the policy elaboration process; (2) difficulty in selecting appropriate beneficiaries for local investments; (3) limited involvement of territorial stakeholders and citizens; (4) the use of unsuitable (not place-based) expenditure monitoring systems; and (5) a lack of well-suited territorial assessment tools.

Several instruments used by the EU since 2000 (TIA, financial models, interoperable databases and open cohesion data systems, etc.) have partly innovated spending processes (Prezioso 2018). However, the absence of territorialised FRTs still prevents TC goals from being achieved and the post-2020 pre-conditions from being met.

In this regard, starting from consolidated experience, the SteMA TIA method (Prezioso 2011a and b) builds seven STFTs (Prezioso 2018), which can be used to evaluate the spending capability related to geographical diversity. STFTs are designed to overcome some of the disadvantages of using territorialised FRTs in applying the TIA approach to ROPs.

STFTs are obtained by combining four typologies of territories with geographical diversity (ESPON 2016), four inner periphery typologies and five FRTs (ESPON 2017a, b), and the seven typologies of SteMA (Prezioso 2011a). All seven STFTs are included in four different morphological typologies and are characterised as follows:

1. MEGA and metropolitan systems with high urban influence and transnational/national functions that can facilitate cooperation between cities (or city parts) at regional, national and transnational levels.
2. High urban influence systems with transnational/national specialised functions that can facilitate urban–rural cooperation between authorities in interconnected areas at regional, national and transnational levels.
3. High urban influence systems without specialised functions and with few transnational/national functions that can facilitate urban–rural cooperation between authorities in interconnected areas at regional, national and transnational levels.

4. High urban influence systems without specialised functions and transnational/national functions, thus not able to facilitate urban–rural cooperation between authorities in interconnected areas at regional, national and transnational levels.
5. Low urban influence systems with regional/local specialised functions that can facilitate urban–rural cooperation between authorities in interconnected areas at regional, national and transnational levels.
6. Low urban influence systems with regional/local functions that can facilitate urban–rural cooperation between interconnected areas at regional and local levels.
7. Low urban influence systems without specialised functions and transnational/national functions, thus not able to facilitate urban–rural cooperation between authorities in interconnected areas at regional, national and transnational levels.

The link between STFTs and TC is based on theoretical and applied studies, incorporating literature on cohesion and developing relationships with models of territorial organisation. A review of the literature[19] suggests that the TC of a geographical region depends on the quality, efficiency and identity of territorial systems, as well as territorial interrelations. TC is founded in the capacity to combine existing resources, valorising the efficiency of territorial systems. TC reflects the milieu capacity to create socio-territorial and governance models, through adhering to shared principles. Its potential positively influences income, gross domestic product (GDP) and wealth. TC results in regional individualities and is able to strengthen the territorial capital of an area. Italian STFTs are the result of an evaluation of the level of TC before the TIA process, at time zero (T0).

The analysis uses a combination of 73 selected indicators organised on the basis of the Europe 2020 Strategy (E2020) pillars and flags; of these, 10[20] concern the spending level at 2017.

The TC level within the seven STFTs is the result of the capability of the regions to valorise territorial capital. The regional level of TC depends on the quality, efficiency and identity of territorial systems and their cooperative interrelations with public and private stakeholders by socio-territorial and soft governance models. It influences spending capability, allowing local needs to be matched with political goals. SteMA TIA addresses these policy-/decision-making challenges by working within STFTs on different geographical scales.

iii) Italian case study

In the context of E2020 programming, the spending of 19 Italian regions and 2 autonomous provinces was meant for public and private stakeholders, metropolitan cities and small to medium-sized towns and peripheral areas. Some of the declared regional goals (declared in 2014 and reviewed in 2017, ROPs negotiated in 2015) were not achieved[21], because they were related to the previous programming results. Nonetheless, the attainment of targets did not consider the STFTs, which bring robust knowledge of the local needs related to geographical diversity (the level of TC at T0). In fact, the main policy choices, which help increase TC, do not take the initial level of TC or the incremental positive δ as an effect induced by policy spending actions into account (Prezioso 2011a).

In the Italian case study, 10 indicators of spending (at NUTS 2 and 3 levels) are used to calculate the incidence of the regional spending capability of ROPs, to evaluate the performance of these programmes in terms of the related STFTs. The following demonstrates how policy choices in relation to spending should meet the territorial needs expressed by STFTs, to increase the initial level of TC and meet the required pre-condition for post-2020 participation.

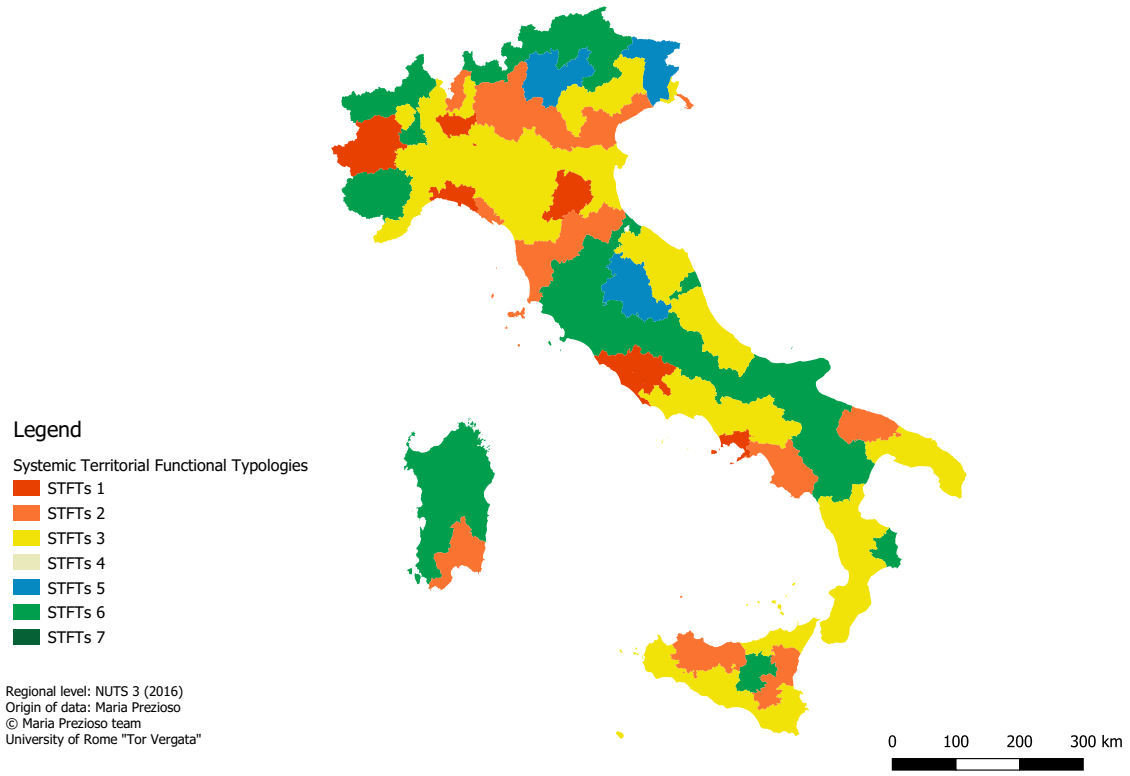
19 The huge number of contributions is set out in Prezioso 2018.

20 Expenditure in R&D; enterprises support; professional education; employment; environmental protection and enhancement; civil protection, waste management, park; transport and mobility; health, sports and recreation, culture, libraries and museums; social inclusion, EU funds; INTERREG projects.

21 In the related policy sectors, investments concern (Agenzia per la Coesione 2018): transport (27 %); research and innovation (13 %); environment (12 %); education (9 %); employment (8 %); culture and tourism (6 %); social inclusion (6 %); enterprise competitiveness (5 %); the Digital Agenda (3 %); capacity building reinforcement (3 %); cities and rural areas (3 %); energy (3 %); childhood and the ageing population (1 %).

Map 4.3.1 highlights the Italian STFTs that are able to make regional spending capability more or less efficient. Some metropolitan areas demonstrate a high level of performance in terms of TC, while this level is medium for a large part of the country and medium-low to low in transboundary mountain zones, Sardinia and isolated rural areas. A diagonal area stretching from coast to coast (in green) shows that the cohesive capacity is independent of the regions' north or south localisation. It mainly depends on a coherent interpretation of the potential capital of a territory in programming spending and in managing the needs of the local area. A medium-high TC level also occurs in areas that have developed cross-border interregional policies, showing that a good level of TC is also due to participating in cooperation projects.

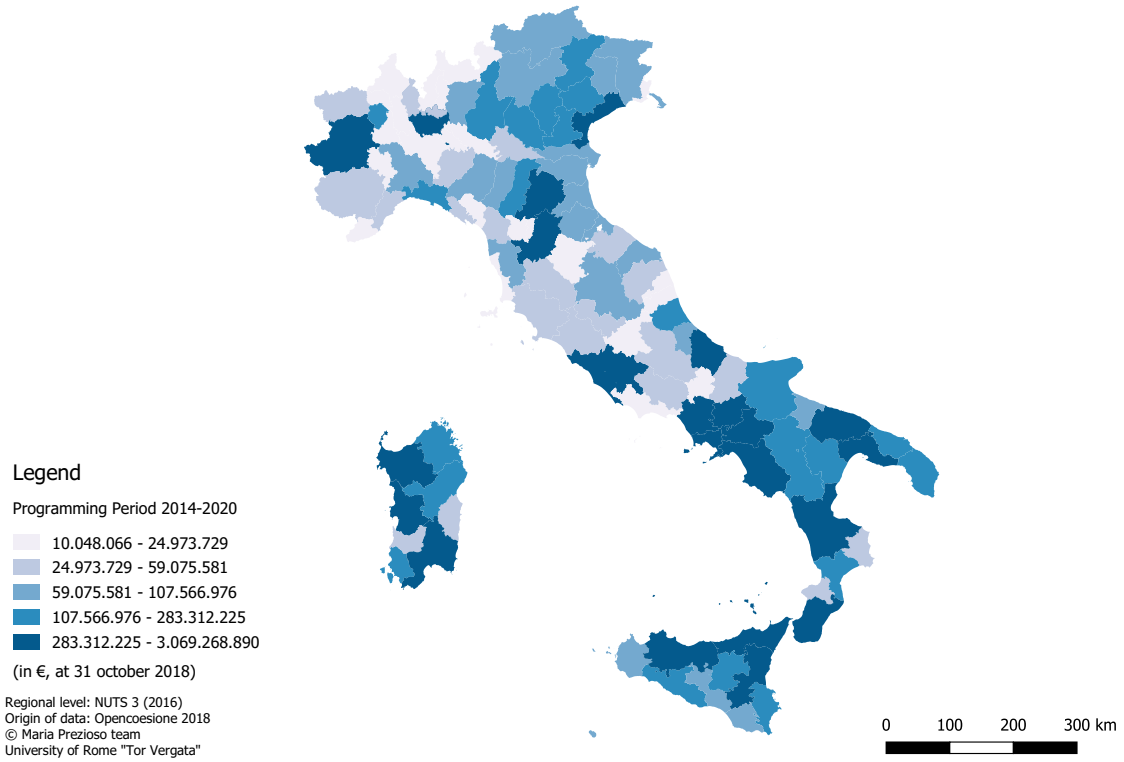
Map 4.3.1.
Systemic territorial functional typologies in Italy at NUTS 2 and 3 levels



Source: Prezioso 2018

Map 4.3.2 shows regional spending effectiveness in 2018 related to European Structural and Investment Funds (ESIF) (absolute values) aimed at supporting TC through place-based investments. Some regions and provinces have a high level of spending performance, such as metropolitan cities and some coastal zones. Low levels of spending performance are confirmed for some mountain zones and isolated rural areas in the north, as well as in the south. Territories more active in cooperation projects enhanced the capacity of their regions.

Map 4.3.2.
Spending of Italian regions and provinces, 2014–20 (clusters of absolute value)

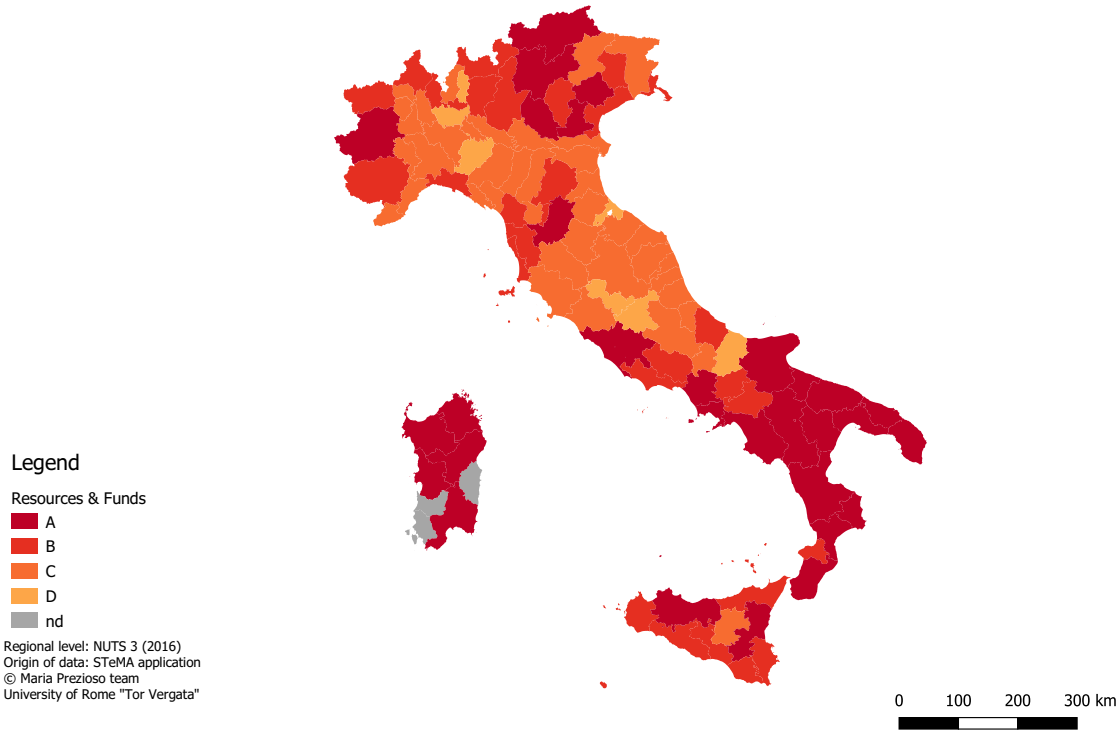


Source: Prezioso 2018

Map 4.3.3 shows the results from applying SteMA TIA to measure the effectiveness of the territorialised spending level within STFTs. It highlights the usefulness of STFTs in expressing the initial level of TC, which can influence assessments of the effectiveness of spending measures. In some cases (i.e. in the south), the territorialisation of spending shows that a high level of local investment involving neighbouring territories can increase TC.

Some localised systems remain isolated, failing to interconnect with the transnational policy level. On the other hand, some areas close to metropolitan cities are excluded from direct participation in cooperation projects, but they indirectly benefit from the advantages “per contact”, confirming that regions should use more contiguous systems by carrying out interdependent projects at local level, to extend the benefits of a localised spending.

Map 4.3.3.
Ex ante measure of the effectiveness of the territorialised spending level at 2017



Source: Prezioso 2018

iv) General remarks

The process of developing TC within European policy post 2020 is at a crucial turning point. Treating territorial diversity as an exogenous variable does not prevent disparities in regional capacity building in terms of spending, which is taken into account in the assessment of changes in the level of TC.

The assessment of TC, as a pre-conditionality for being involved in post-2020 programming, needs STFTs to be recognised as providing useful evidence with which to evaluate spending capability in relation to geographical diversity. The application of SteMA TIA to the large regional diversity in Italy suggests that it is possible to extend this method to all European countries, opening up the potential for the generation of new territorialised policy. Thanks to its flexibility in adapting and valorising geographical diversity, it is possible to transfer this approach to decision-making processes at European level and in different regional contexts.

STFTs also aim to make the negotiation process towards post 2020 between regions and the European Commission more transparent, a process that requires a review of the fulfilling of the ex ante conditionality, and of reducing the risk of underspending funds. Basically, STFTs through SteMA TIA also provide a basis for sharing knowledge in both designing and evaluating programmes in territories, implementing the regional capacity to intervene and modify current funds allocations.

Based on the Italian experience, the NUTS 3 scale of STFTs seems to be suitable for matching local needs with cohesive solutions, to ensure that regulation and expenditure (control, simplification, effectiveness in funds spending) properly support an increase in regional capability and its spill-over effects.

STFTs represent a useful way of depicting the level of TC at the beginning of a programming period and a flexible instrument for assessing the regional progress made during a fund spending period. They are “the sentinel”, able to re-address the initially declared ROP targets, to give an appropriate solution to local policy needs, while maintaining coherence with national needs.

Therefore, measuring the progress made towards TC as a pre-condition for post-2020 programming is important, as it makes policy-/decision-making institutions responsible for strategic, integrated investment choices. It will be especially useful in the context of the architecture proposed for the new Cohesion Policy, in which the southern macro-region could become more segregated from the competitive European core, potentially having very severe consequences for European TC overall.

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4.4.
RIS3 in macro-regional strategies: tools to design and monitor integrated territorial development paths[22]

Margherita Russo, Francesco Pagliacci, Pasquale Pavone[23] and Anna Giorgi[24]

Key words: integrated territorial development, EU macro-regional strategies, RIS3, data classification with non-supervised techniques

i) Introduction

In the current debate on post-2020 EU Cohesion Policy, it is important to capitalise on two pillars of ongoing policy programmes: macro-regional strategies (MRSs) (European Commission 2017a) and the Research and Innovation Smart Specialisation Strategy (RIS3) (Foray et al. 2012; Foray 2015; McCann 2015; McCann and Ortega-Argilés 2015). If the EU macro-regions are considered relevant territorial units to enhance bottom-up policy planning in support of development policies across sectors, how can integrated territorial development be supported?

The EU MRSs initially launched in the 2007–13 programming period, align with the EU goals of inclusive and sustainable development, which would be realised by enhancing synergies among neighbouring regions. So far, four MRSs have been designed, one for regions in the Baltic area (EU Strategy for the Baltic Sea Region (EUSBSR)), along the Danube (EU Strategy for the Danube Region (EUSDR)), surrounding the Adriatic and Ionian Sea (EU Strategy for the Adriatic-Ionian Region (EUSAIR)), and in the Alpine area (EU Strategy for the Alpine Region (EUSALP)), respectively approved in 2009, 2011, 2014 and 2015[25].

The core aim of all four strategies is to enhance complementarities and synergies among regions in the macro-region, with a bottom-up regional policy design across the many countries involved (European Commission 2017a). MRSs provide opportunities for cross-fertilisation across countries and domains of interventions, from education to health and social innovation. “The added value of macro-regional strategies is characterised by its cross-sectoral approach, its transnational dimension (including the participation of non-EU countries) and its contribution to better multi-level governance. But this is an ambitious concept that needs time to be consolidated and to bear fruit” (European Commission 2017b). With significantly different durations so far, the four strategies are at various stages of maturity in terms of policy programmes. This appears to be a critical issue in the further implementation of the strategies in the next Cohesion Policy programming period (2021–27), with the aim of “investing in all regions” with “a tailored approach to reduce disparities and help low-income and low-growth regions catch up”, and “locally-led development strategies”[26].

The development path of such policy design might leverage on the regions’ implementation of RIS3, characterised by the identification of strategic areas for intervention, based both on the analysis of the strengths and the potentials of the local economy and on an entrepreneurial discovery process (Foray 2015).

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22 This paper builds on Pagliacci et al. (2019) and Pavone et al. (2019). It is part of work package T-3 “Enhancing shared Alpine Governance project” of the project “Implementing Alpine Governance Mechanism of the European Strategy for the Alpine Region” (AlpGov) of the Interreg Alpine Space Programme – Priority 4 (Well-Governed Alpine Space), SO4.1 (“Increase the application of multi-level and transnational governance in the Alpine Space”). For a discussion of the topics presented in the paper, the authors wish to thank all members of EUSALP’s Action Group 1.

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24 Leader, Action Group 1, EUSALP Lombardy Region representative, and Gesdimont Research Centre, University of Milan, Milan, Italy.

25 Official documents are available online at https://ec.europa.eu/regional_policy/it/policy/cooperation/macro-regional-strategies/

26 http://ec.europa.eu/regional_policy/en/newsroom/news/2018/05/29-05-2018-regional-development-and-cohesion-policy-2021-2027

Building on this broad and diverse picture of strategic interventions at regional and at meso-level (i.e. the macro-regions), this paper aims to answer the following research questions:

- Is it possible to outline a comparative framework that could help policy-makers and stakeholders improve their innovative performance by learning from other regions?
- What can we learn from such a comparative framework in terms of identifying which synergies and complementarities can be enhanced within the MRSs?

To answer these questions, we suggest endowing policy-makers with a set of comparative tools on RIS3 priorities (to outline the development path that regions intend to follow) and on socio-economic conditions (to describe the structural features as they emerge from Eurostat data). Taken together, these tools, developed in two companion papers by Pavone et al. (2019) and Pagliacci et al. (2019), help to address the multidimensional perspective on similarity across regions. Identifying what these similarities are is essential in a comparative analysis that aims to measure and monitor the impact of integrated investments on the development of the territory across sectors.

Given the limited space for a summary of the literature on RIS3 and MRSs, as presented in Pagliacci et al. (2019), this paper summarises only the tools and the results in relation to RIS3 data and socio-economic data in Sections ii) and iii), respectively. Section iv) returns main results that combine RIS3 priorities and socio-economic characteristics of regions, focusing on EUSALP. Section v) discusses the implications of the methodology proposed in the paper, with suggestions for policy-makers.

ii) Classification of RIS3 priorities

Information about RIS3 can be accessed with the online tool "Eye@RIS3: Innovation Priorities in Europe" (European Commission 2018)[27]. Although it is not intended to be used as a source of statistical data, the broad coverage in terms of territorial entities and the large homogeneity of information at sub-national level suggest that information in the Eye@RIS3 platform can be considered suitable for supporting a robust comparative analysis of RIS3's priorities across the EU-28. On the basis of this information[28], Pavone et al. (2019) classified RIS3's priorities by using both the descriptions provided in free-text format and the series of related codes for economic domains, scientific domains and policy objectives. With regard to regions, similarities are not identified by browsing the words in the descriptions entered in the database or by the exact combination of codes: each category of descriptions refers to a statistically significant semantic domain, in which the words used by regions are associated with, and each category of codes embraces, a statistically significant combination of the various sets of codes. The dictionaries associated with each category help in checking for nuances (and also in controlling for ambiguity and misinterpretation). As a result of this priority classification, we not only have categories and related dictionaries to name these categories, but are also able to automatically classify regions according to the categories of priorities identified.

The cross-tabulation of the two classifications reveals that regions show a coherent attribution of codes to descriptions (Table 4.4.1). In particular, categories of codes in the cluster "Agrofood, forestry and tobacco" are also associated with descriptions in other related domains (e.g. bio-economy, tourism, leisure and sustainable energy), while categories in the macro-groups of codes referring to "Health & Life Science", "New economy & Leisure industry", "Logistic & Manufacturing" are largely associated with descriptions within the same domain. In the case of the macro-category "Bio Economy, Blue Economy & Energy", the groups of records relate to many diverse descriptions, with a significant overlap with descriptions in the macro-group "Production & Transport, Manufacturing & Energy"[29]. In general, the results of

27 As stated on the website http://s3platform.jrc.ec.europa.eu/map, "The tool has been fully upgraded in September 2018. Data are continuously updated based on inputs from European regional and national authorities and their stakeholders (also called the 'entrepreneurial discovery process' in the literature on smart specialisation)".

28 In the Eye@RIS3 platform, regions entered their own record descriptions, from a minimum of 1 to a maximum of 15 priorities.

29 This result is due to the highest cut-offs being used in clustering the two classifications, one referring to descriptions and the other referring to codes: a similar set of macro-groups emerges, but in the case of codes a better cut-off is with five macro-groups, instead of four (as in the case of descriptions), with a split of "Bio Economy & Energy" from "Logistic & Manufacturing".

cross-tabulation provide hints about the specific priorities emerging both within and outside the overlapping of the same categories of descriptions and codes[30].

Each cell in the cross-tabulation of the categorisation of priority descriptions and codes returns either no region or one or more regions associated with those priorities. Regions are also characterised by other features, but the features summarised in Table 4.4.1 may guide regions to explore which other regions have similar priorities.

iii) Socio-economic comparison of regions

Building on Eurostat data, Pagliacci et al. (2019) adopted both a principal component analysis, to reduce the number of dimensions under analysis, and a cluster analysis, to single out groups of EU regions with relatively similar socio-economic features. Their methodology resulted in a picture of significant regional heterogeneity in terms of socio-economic features. They classified the socio-economic features of NUTS 2 EU-28 regions[31] based on a set of 31 input variables covering 3 domains: population and other demographic features (6 variables); the regional economy and the labour market (3 variables); and sectoral structure, covering both sections (agriculture, industry, construction, wholesale and trade) and the division of manufacturing (22 variables).

Map 4.4.1 displays the maps of the resulting 19 clusters of regions of the 4 existing macro-regions.

30 For instance, in the case of NL2-Eastern Netherlands, the text description “development of robotics for transcranial Magnetic Stimulation” is classified as “Mechatronics” in the “Description Classification” and as “Health & Life Science” in the “Codes Classification”.

31 The analysis uses data at NUTS 2 level according to the EU classification. The authors are aware that, for some countries (e.g. the Baltic states), this level overlaps with the national level.

Table 4.4.1.
Eye@RIS3 records by category of RIS3 priorities: descriptions and codes

	Agro	H&L	New Economy & Leisure industry			Bioeconomy, Blue Economy & Energy			Logistic & Manufacturing			
	Agro	H&L	Crea	ICT	S&E	Bio-Econ	Blue-Econ	Ener	Aero	Manu	T&L	Total
AGROFOOD												
Agrofood	7,92	0,16				0,57		0,08	0,16			8,90
Healthy Food	1,22	0,16										1,39
HEALTH & LIFE SCIENCE												
Health	0,16	5,63	0,08	0,16	0,16	0,33			0,24			6,78
Life Science	0,08	5,71										5,80
NEW ECONOMY & LEISURE INDUSTRY												
Bioeconomy	0,57	0,33	0,41	0,33	0,98	1,14	0,41	0,08	1,22	0,24		5,71
Creative industry			0,16	1,22								1,39
Digital & ICT	0,08	0,65	8,08	0,33	0,57	0,57	0,08		0,41	0,08	0,16	11,02
Fashion				0,08					0,73			0,82
Growth & Welfare	0,08	0,65	0,41	0,33	1,22	0,24	0,08		0,49	0,08	0,08	3,67
ICT & Tourism			0,08	1,96	0,08	0,08			0,08			2,29
Tourism	0,41	0,33	0,33	4,49	0,16	0,16						5,88
PRODUCTION & TRANSPORT MANUFACTURING & ENERGY												
Automotive & Aerospace	0,08		0,16		0,16	0,73	0,16	0,08	3,59	1,06	1,06	7,10
Energy Production						0,49	2,69	0,08	0,16			3,43
Manufacturing	0,33	0,08				0,65	0,08		4,24	0,33	0,08	5,80
Marine & Maritime						0,41	0,65	1,39	0,41	0,41		3,27
Mechatronics		0,08	0,08			0,16	0,08		2,78	0,16	0,08	3,43
Optics		0,08				0,08			0,24			0,41
Photonics		0,08	0,41			0,16		0,08	1,88		0,16	2,78
Sustainable Energy	0,49					6,69	4,33		0,57	0,24		12,33
Transport & Logistics			0,16			0,16	0,08		0,73	2,78	0,73	4,65
Water jet cutting									0,08			0,08
No Description	0,33	0,08	0,08		0,57	0,16	0,24	0,16	1,31	0,16		3,10
	11,76	14,04	10,45	8,90	3,92	12,82	8,90	1,96	19,35	5,55	2,37	100,00

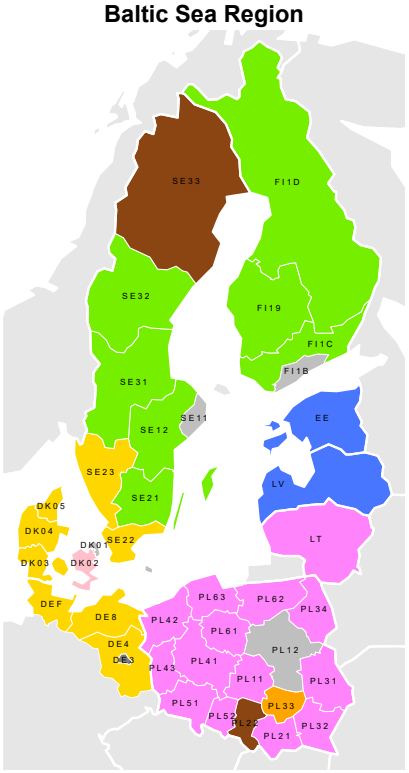
Legend

Agro	Agrofood, forestry and tobacco	**Bio-Econ**	Bioeconomy & Waste collection, treatment, etc
H&L	Health & Life Science	**Blue-Econ**	Blue Economy
Crea	Creative industry, Tourism & cultural and recreative services	**Ener**	Energy Production, Efficiency & Sustainability
ICT	ICT & digital transformation	**Aero**	Aeronautics, Aerospace & Automotive industry
S&E	Social innovation & Education	**Manu**	Manufacturing
		T&L	Transport & Logistics

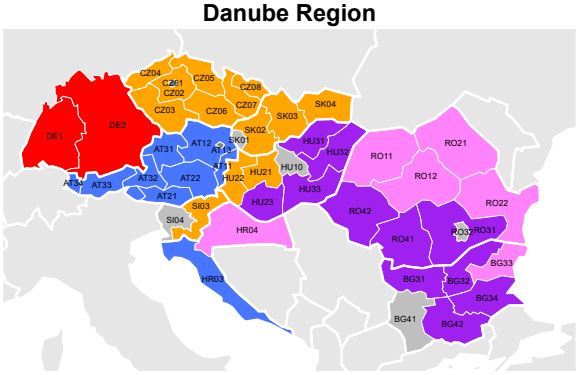
Note: Data refer to 1 225 records (covering 206 territorial entities) in the database Eye@RIS3 and were retrieved on 1 October 2018.
Source: Pavone et al. 2019.

Map 4.4.1.
Maps of socio-economic clusters of regions, by macro-region

Baltic Sea Region

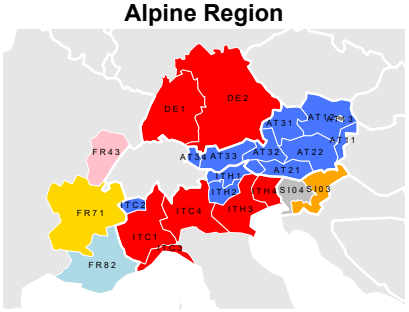


Danube Region



Adriatic-Ionian Region

Alpine Region



North-Western EU regions

- Very-high income; high-density city-regions; high-employement; highly educated; touristic
- Very-high income; capital city-regions; diversified services
- Very-high income; financial centres; foreigners
- Very-high income; large urban regions; high-employment; highly educated
- Urban regions; high-income; poorer employment conditions; touristic
- Very-high income; manufacturing; population imbalances
- High-income; high-employment; low-manufacturing; services & public sector
- Medium-income; employment imbalances; low-manufacturing; services & public sector
- Medium-income; high-employment; manufacturing & private services
- Medium-income; high-employment; highly educated; manufacturing: mining & quarrying
- High-income; sparsely populated; public sector; highly educated
- High-income; low-population density; tourism

Eastern manufacturing regions

- Low-income; high-employment; manufacturing; no foreigners; very highly educated
- Very low-income; manufacturing; no foreigners; highly educated
- Very low-income; agricultural; manufacturing: textile, electric, transport; low-population density

Mediterranean traditional-economy regions

- Medium-income; employment & population imbalances; manufacturing: textile, basic metal, tranport; very-low educated
- Low-income; high-density; high unemployment; agriculture; food & drinks; very-low educated
- Very-low income; agriculture; sparsely populated; very high unemployment; traditional services (G-I)
- Low-income; high-unemployment; touristic; food & drinks; traditional services (G-I); very-low educated

Source: Authors' own elaboration

iv) Focus on EUSALP

The results of applying cross-tabulation to EUSALP are shown in Table 4.4.2. This example supports the comparative analysis of specific policy measures and projects implemented by regions within the same domain of priority. For instance, “New technologies for health” (third category of codes in columns) is relevant for 10 territorial entities in 4 countries, with a specific focus on health and life science, but also tourism. What matters in this comparison is the potential of comparing projects in terms of these priorities, in regions with similar or different socio-economic conditions. In learning from other regions, it is important to tailor policy interventions based on an awareness of structural differences, as they emerge from socio-economic benchmarking.

This tool would be of particular use for, for instance, Action Group 1, namely the group that elaborates on actions “To develop an effective research and innovation ecosystem”. The ingredients for such actions are within the RIS3 already implemented by the MRS regions. Some options for orienting the activities are now available so that the selection of projects can begin and making progress on the further implementation of smart specialisation strategies in MRSs can be made.

v) Discussion

This paper proposes an analytical framework of several dimensions, characterising both socio-economic features of regions in the EU-28 and their RIS3 priorities. This multidimensional perspective has been adopted to highlight similarities across regions.

The resulting information can be used by local stakeholders interested in the further implementation of their own RIS3 and to consider their territory from a comparative perspective, finding potential partners for collaboration (European Commission 2018). To enhance the effective use of the two sets of results, on the priorities of RIS3 and on the socio-economic features of regions, their implementation in the Platform of Knowledge (EUSALP 2018)[32], as well as in the Eye@RIS3 platform (European Commission 2018), is advocated.

In addition, this methodology may strongly support instances of participation in the coordination and implementation of macro-regions (e.g. national coordinators, policy area coordinators, policy area focal points, thematic steering groups or action groups) in the design of more integrated territorial strategies, which could take advantage of the capitalisation of both intra- and inter-MRS multidimensional comparisons with RIS3 (the development path that the regions intend to follow) and socio-economic conditions (summarising the current structural features).

As soon as that type of query is implemented online, through the Eye@RIS3 platform or the EUSALP Platform of Knowledge, regions within the same macro-region could start performing more focused analyses and more effective dialogue on potential synergies or complementarities when considering the same priorities, as they are outlined in the regions’ strategic documents.

32 https://www.alpine-region.eu/p/dashboard

Table 4.4.2.
Classification of EUSALP regions[33], by RIS3 priorities and socio-economic features

	Agro	H&L	New Economy & Leisure industry		
	Agro	H&L	Crea	ICT	S&E
AGROFOOD					
Agrofood	AT12, AT31, FR43, ITC1, ITC4, SI				
Healthy Food	ITH1, ITH2, ITH3, ITH4				
HEALTH & LIFE SCIENCE					
Health	AT11	AT12, AT33, DE1, ITC3, ITC4, SI		AT34	AT34
NEW ECONOMY & LEISURE INDUSTRY					
Life Science		AT13, AT31, AT32, DE2, FR71, FR82, ITC1, ITH1, ITH4			
Bioeconomy		AT22			
Creative industry			ITC4		
Digital &ICT		ITH2	AT32, FR82	AT21, AT32, AT33, DE2, FR43, FR71, ITC2, ITH1	
Fashion					
Growth & Welfare					
ICT & Tourism			AT33, ITH1, ITH4		
Tourism		AT33	AT13, FR71		SI

Legend

Agro	Agrofood, forestry and tobacco	**ICT**	ICT & digital transformation
H&L	Health & Life Science	**S&E**	Social innovation & Education
Crea	Creative industry, Tourism & cultural and recreative services		

Legend of regions' socioeconomic features, NUTS codes and names of regions

NUTS	Region	Socioeconomic features
AT11	Burgenland (AT)	High-income; low-population density; tourism
AT12	Niederösterreich	High-income; low-population density; tourism
AT13	Wien	Very-high income; high-density city-regions; high-employement; highly educated; touristic
AT21	Kärnten	High-income; low-population density; tourism
AT22	Steiermark	High-income; low-population density; tourism
AT31	Oberösterreich	High-income; low-population density; tourism
AT32	Salzburg	High-income; low-population density; tourism
AT33	Tirol	High-income; low-population density; tourism
AT34	Vorarlberg	High-income; low-population density; tourism
DE1	Baden-Württemberg	Very-high income; manufacturing; population imbalances
DE2	Bayern	Very-high income; manufacturing; population imbalances
FR43	Franche-Comté	Medium-income; employment imbalances; low-manufacturing; services & public sector
FR71	Rhône-Alpes	High-income; high-employment; low-manufacturing; services & public sector
FR82	Provence-Alpes-Côte d'Azur	Urban regions; high-income; poorer employment conditions; touristic
ITC1	Piemonte	Very-high income; manufacturing; population imbalances
ITC2	Valle d'Aosta/Vallée d'Aoste	High-income; low-population density; tourism
ITC3	Liguria	Very-high income; manufacturing; population imbalances
ITC4	Lombardia	Very-high income; manufacturing; population imbalances
ITH1	Prov.Autonoma di Bolzano	High-income; low-population density; tourism
ITH2	Prov.Autonoma di Trento	High-income; low-population density; tourism
ITH3	Veneto	Very-high income; manufacturing; population imbalances
ITH4	Friuli-Venezia Giulia	Very-high income; manufacturing; population imbalances
SI	Slovenia	

Source: Authors' own elaboration based on data from Pagliacci et al. (2019) and Pavone et al. (2019)

RIS3 priorities: categories of descriptions on rows; categories of codes on columns; socio-economic clusters highlighted by colours (see the legend below)

33 Twenty-two regions under analysis; no information in Eye@RIS3 platform for Switzerland and for Slovenian regions (only national-level RIS3 data are available for Slovenia).

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4.5. Future-oriented approaches – the case of territorial foresight

Frank Holstein, Kai Böhme and Christian Lüer[34]

Key words: territorial, foresight approach, policy development

i) Introduction

Policies benefit from strong territorial and future dimensions (ESPON 2018c). Territorial foresight approaches are an adequate means of enhancing the territorial and future dimensions of any policy. Territorial foresight is a structured process that (1) focuses on long-term developments and their territorial impacts, (2) is based on lateral thinking in participative approaches and (3) provides support for decision-making processes (cf. Steinmüller and Steinmüller 2006; Loveridge 2009; ESPON 2018a).

A new approach to territorial foresight has been developed and tested under the framework of the ESPON project Possible Territorial Futures (ESPON 2018a). This approach furthers the approach developed by the Seventh Research Framework Programme (FP7) Flagship projects (Lüer et al. 2015; Böhme and Lüer 2016) and has also been tested at national level in Luxembourg (Böhme et al. 2018). The results of these studies show that the approach is applicable to a large variety of visions, policy objectives and trends, both negative and positive trend developments, and on different territorial scales.

This paper discusses why territorial foresight approaches are relevant to enhancing integrated territorial development. In doing so, the paper first presents key features of the territorial foresight approach developed. Second, the steps for conducting territorial foresight are presented. The last section explains why this territorial foresight approach should be considered by policy-makers. The paper concludes that territorial foresight can support policy-makers when developing and implementing integrated territorial policies.

34 Spatial Foresight, Luxembourg.

ii) Key features of territorial foresight

The newly developed territorial foresight approach distinguishes itself from other territorial foresight approaches by taking a vision, trend or policy objective as a starting point. The aim is to assess the territorial consequences of these future events and what can be done to encourage or prevent possible consequences. To arrive at this outcome, territorial foresight combines foresight (e.g. Loveridge 2009) and territorial impact assessment (TIA) (e.g. ESPON 2012; Essig and Kaucic 2017) approaches.

Territorial impact assessments allow the identification of territories that are exposed and sensitive to the visions, policy objectives and trends assessed (ESPON 2012; Essig and Kaucic 2017). Exposure relates to whether or not and to what degree a region or place is affected by the policy objectives, visions or trends assessed. Sensitivity relates to the way in which the development perspectives of the regions or places assessed are affected, taking into account the intensity of the impact due to their specific territorial characteristics (ESPON 2012; Böhme and Lüer 2017).

Territorial foresight approaches encourage systemic thinking to deal with the uncertainty of future events. Therefore, participatory approaches are at the heart of the method. The involvement of various stakeholders allows the territorial implications of trends to be discussed from multiple perspectives and uncertainties to be addressed. Therewith, the approach supports the creation of ownership of possible policy responses to future situations. In addition, various quantitative and other qualitative research methods are used to support the participatory approach. Territorial analysis and forecasts can be used as supplementary inputs to discussions.

The final outcome of the approach is twofold. First, maps depict the areas that are exposed and estimates their sensitivities in future territorial situations. Second, a territorial narrative describes the main determinants that would cause this new territorial situation.

iii) From vision building to assessing territorial consequences

Several steps guide researchers and policy-makers in assessing the territorial consequences of a policy objective, vision or trend. The following paragraphs briefly present the main steps involved in the territorial foresight approach, as presented in the handbook developed during the ESPON project Possible Territorial Futures (ESPON 2018b).

At first, the foresight topic needs to be further defined. The first exploration and definition of the topic must be discussed as part of the participatory process. This entails exploring possible factors that could play a role in the future situation, assessing the current situation and considering disruptors. Participants of the participatory process must be selected in accordance with the foresight topic. Ideally, invitees will represent various types of organisations (e.g. academia, public authorities, non-governmental organisations) and places in the territory covered. Including a variety of different stakeholders allows the understanding of the topic to be broadened, to cross-fertilise insights and offer a platform for learning. Involving participants early in the processes supports the creation of ownership and allows participants to be thoroughly prepared for territorial thinking.

PARTICIPATORY PROCESS 1

Setting the scene for participatory processes in the ESPON Possible Territorial Futures project

The workshops held during this ESPON project were attended by a wide variety of stakeholders, namely researchers, policy-makers, politicians and representatives from civil society, from various places in Europe. Discussion papers were prepared to provide a common understanding of the foresight topic. The discussion papers presented the overall study methodology, the expected outcome of the workshop and a first description of the future situation. This description presented the main concepts relevant to the topic as well as key determinants describing future territorial diversity. For the latter, the project team used results from ESPON projects, literature review and forecast models.

(Source: ESPON 2018a)

In the second step, the territorial implications of the foresight topic are defined. Elements of the ESPON TIA approach (ESPON 2012; Essig and Kaucic 2017) are used to discuss key factors and their relationships from different perspectives to break down the complexity of future thinking. In line with the ESPON TIA approach, environmental, economic, societal and governance aspects of the vision, trend or policy objective are discussed (ESPON 2012). Subsequently, participants select key factors for mapping, based on their direct relationship with the topic and the relationships to other factors, and on their territorial dimension expressed as exposure or sensitivity.

The territorial impact of the future situation results in a sketch of the future situation and a foresight narrative. The sketch illustrates the territorial dimension of the future situation. Different inputs such as maps of the current situation in terms of key territorial features and their changes over time, e.g. with regard to population structures, geographical specificities or economic structures, help participants to map the territorial dimension. The foresight narrative supports this sketch and details the rationale of the future situation.

PARTICIPATORY PROCESS 2

Discussing territorial dimensions with stakeholders from various backgrounds

Encouraging participants to discuss territorial matters was one of the main challenges to overcome, since participants were selected based on their knowledge of the foresight topic rather than on their territorial knowledge. In addition to a discussion paper, the following techniques were applied to encourage territorial thinking among participants.

Applying elements of the ESPON TIA approach allowed territorial thinking to be gradually introduced. After the first day of discussions, posters summarising the territorial impact of the discussions were produced and presented during dinner. This food for thought was the starting point for discussing territorial implications on the second day. The research team prepared a set of maps displaying possible relevant content and main territorial features that could play a role, for example population density, the presence of mountains or distance to services of general interest. These maps helped participants to imagine the territorial implications of the foresight topic and locate them on a map.

(Source: ESPON 2018a)

The third and final step requires further processing of the outcomes of the participatory process. The participatory approaches of the second step provide new or detailed insights from the experts' points of view. In addition, new and further uncertainties about future territorial implications might have been discovered. All these insights and aspects have to be addressed through additional research, which requires additional quantitative and qualitative information. Forecasts or literature reviews of the territorial implications will enrich the expert opinions collected during the participatory processes. The foresight narrative in particular supports this step.

Finally, the entire territorial foresight process and all relevant steps also need to be documented. This may include developing final maps based on the sketches from the participatory process (see for example Map 4.5.1), as well as developing recommendations on how to deal with territorial implications. In particular, the latter may require various feedback loops with the participants with a particular focus on policy- and decision-makers.

PARTICIPATORY PROCESS 3

Producing fuzzy maps to depict the territorial consequence of future situations

Fuzzy maps were produced to support the overall territorial narrative as an outcome of the territorial foresight. Fuzzy maps focus on a certain theme or impact rather than on the exact location of the impact. They reflect at best a certain level of uncertainty about the future situation, i.e. the possibility or likelihood of a future situation and a number of alternative development paths, and depict the types of territories likely to be affected in the future situation, rather than specific territorial units. Fuzzy maps support decision-making processes by focusing on types of territories. They offer detailed yet politically neutral evidence that supports discussions of ways to anticipate the future situation.

(Source: ESPON 2018a)

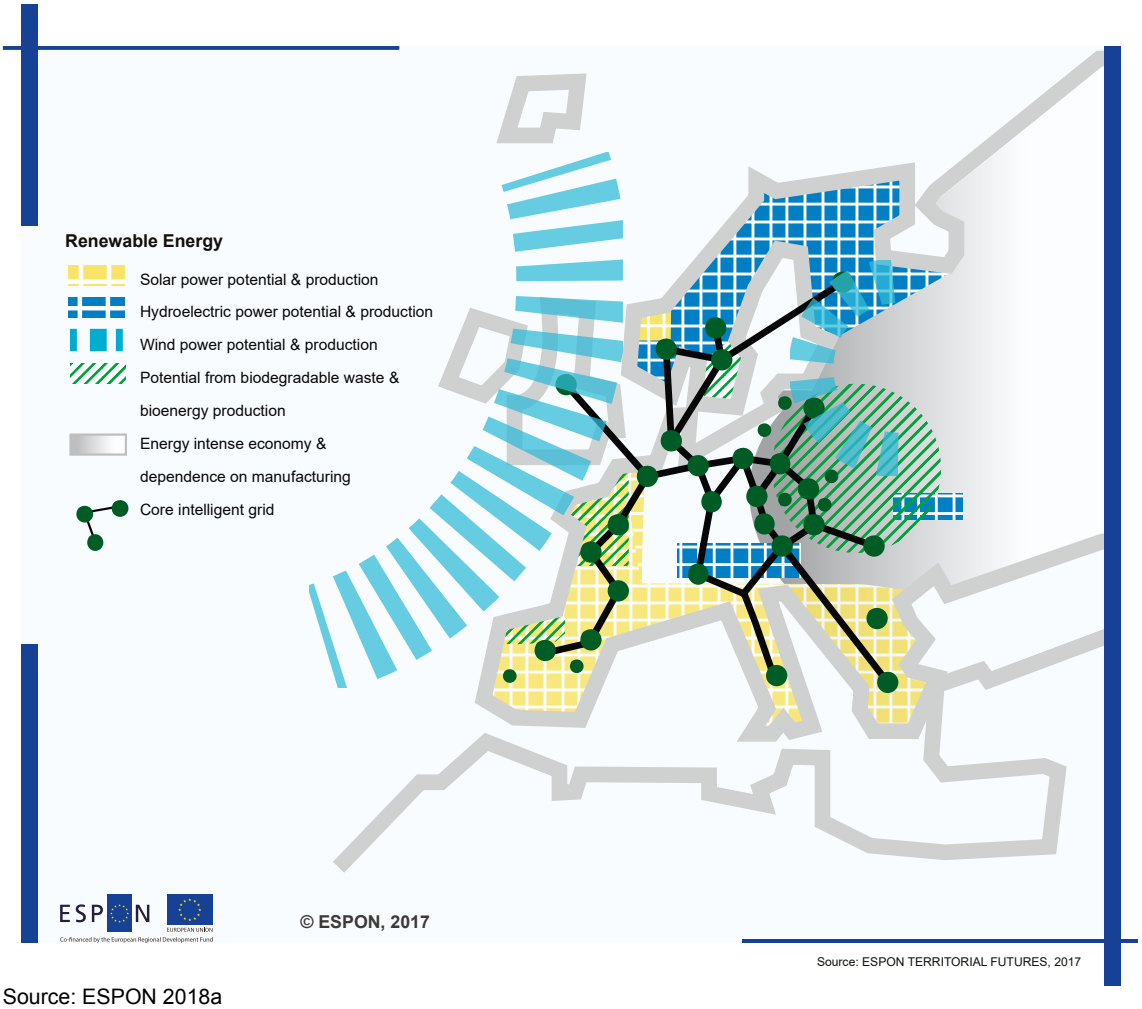
iv) Conclusions: making policies fit for the future

This paper presents key features and ways of adopting territorial foresight approaches for policy-making and implementation. Like other foresight approaches, this newly developed territorial foresight approach deals with uncertainty by combining different research methods and focusing on lateral thinking through participatory approaches. The newly developed approach primarily focuses on the territorial consequences of a future situation. A vision, policy objective or trend is used as the starting point for discussions. Mapping and a description of the territorial dimension are outcomes of the exercise. These can be used by policy-makers as input for developing integrated territorial policies.

Territorial foresight approaches support policy-makers in territorial thinking. The various steps of the approach allow the territorial dimension of future situations to be gradually unravelled. In particular, interactions with experts with diverse backgrounds allow the foresight topic to be considered from different perspectives. This supports the development of an integrated view of the future situation.

Territorial foresight allows future situations to be anticipated. The insights gathered during territorial foresight provide tools to determine ways of dealing with the future situation. In particular, the mapping of territorial implications and the territorial narrative detailing the key factors and causal relationships provide policy-makers with tools to anticipate future developments.

Map 4.5.1.
Example of a fuzzy map as an outcome of the foresight approach



Source: ESPON 2018a

Territorial foresight increases ownership among key stakeholders. The approach offers a platform for discussion, exchange and learning. This platform is not only beneficial for policy-makers performing the territorial foresight, but also creates a window of opportunity to engage experts in policy-making processes. Moreover, the fuzzy maps may be used to further stimulate discussions on the future situation.

In short, territorial foresight approaches support better policy-making. Territorial foresight processes can therefore be recommended for policy-makers that (1) are uncertain about the future territorial dimension of visions, trends or policy objectives, (2) are seeking tools with which to anticipate or address the territorial dimension of future situations and (3) want to build ownership among a wider group of stakeholders. In other words, territorial foresight helps to make policy- and decision-making processes better fit for the future.

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4.6.
Assessing integrated territorial development strategies

Eduardo Medeiros[35]

Key words: urban dimension, EU Cohesion Policy, polycentrism, integrated sustainable urban development strategies, Urban Community Initiative, Polis

i) Introduction

This article seeks to propose a framework for the assessment of EU integrated sustainable urban development strategies (ISUDSs) based on a six-vector typology. It starts by discussing the advantages associated with the implementation of ISUDSs, while justifying the framework of the methodological approach proposed (section ii). The Portuguese case study is then used to empirically test the methodology proposed (section iii). More concretely, it examines the extent to which the implementation of two Urban Community Initiative (CI) programmes (1994–2006) and two Polis programmes (2007–13) had a fully integrated territorial policy approach, based on available evaluation reports.

ii) Evaluating integrated sustainable urban development strategies

Integrated territorial investment (ITI) is a new policy tool for the European Structural and Investment Funds (ESIF) programming period, the main goal of which is to “make it easier to run territorial strategies that need funding from different sources. ITI also promotes a more local or ‘place-based’ form of policy making” (European Commission 2015). This more integrated approach to policy intervention entails more collaborative models of governance and covers different territorial scales. In the present EU Cohesion Policy programming period, at the urban level, the European Commission supports the implementation of ISUDSs across hundreds of European cities, as a somewhat novel policy tool for urban development.

Conceptually, the paper proposes a framework for the assessment of the territorial approach that is based on six vectors (integration of policy areas, impact of operations, planning horizon, territorial targeting, inclusiveness and strength of the monitoring framework). The article focuses on the case of Portugal, which has offered a wide set of EU-financed integrated urban development strategies since 1994 (under the Urban CI, Polis and Portuguese sustainable urban development strategies (SUDSs)) in the major urban agglomerations.

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From a methodological standpoint, this paper is mostly based on literature review. However, it also uses data collected for a case study, carried out during 2017, that analysed the 103 Portuguese SUDSs (van der Zwet et al. 2017), as well as information collected several years ago to evaluate the implementation of the Urban CI in Portugal.

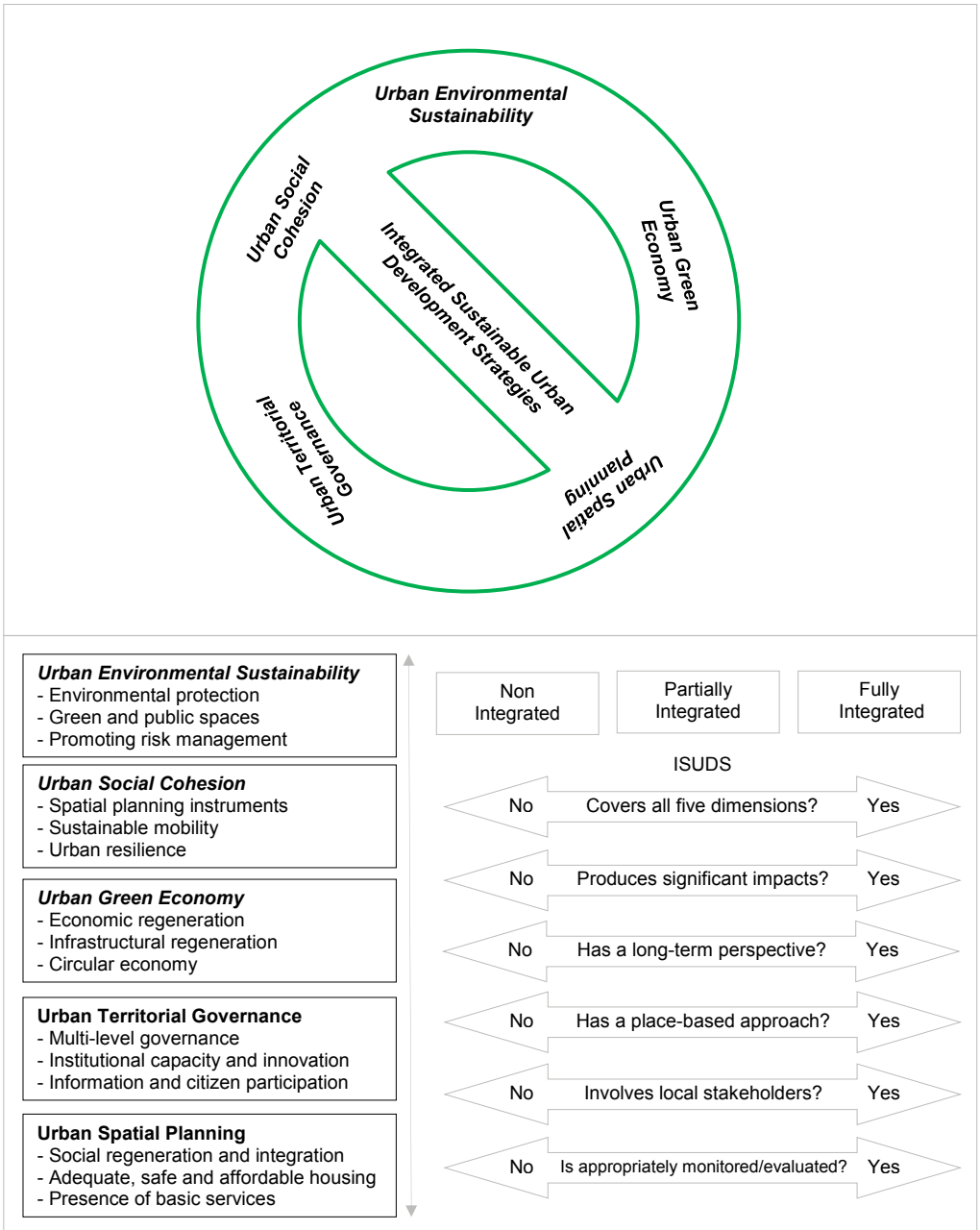
The idea behind the implementation of integrated territorial policy approaches is not new. By way of illustration, any sound and effective policy development plan requires a holistic and integrated intervention strategy. This rationale is based on the notion that the efficiency of policy implementation is increased by combining several types of funding and thematic objectives when addressing territorial development and territorial cohesion goals (Medeiros 2016).

The implementation of integrated territorial strategies is, nevertheless, difficult to achieve. First, there are issues in terms of competing policy agendas, which may prevent integration. Second, benefits are only achieved as part of a long-term visionary framework. Third, the lack of or insufficient coordination between levels of governance and sectoral legislation can affect the effectiveness of these strategies. Fourth, integration can only take place once a specific territorial scale has been defined in a functional (rather than administrative) manner. Lastly, the impact of the integrated approach has to be clearly defined and, added to that, the monitoring and evaluation processes of ISUDSs needs to be redefined, since available indicators favour a policy sectoral evaluation prism.

Among the identification of 12 major priority themes and cross-cutting issues, the Urban Agenda for the EU identified the need to promote a balanced, sustainable and integrated approach towards urban challenges with a “focus on all major aspects of urban development”. This requires the establishment of “more effective integrated and coordinated approach to EU policies and legislation with a potential impact on Urban Areas” (Urban Agenda 2016:5). Assessing the achievements and the effectiveness of these ISUDSs is, however, a complex process, despite being fundamental. In roughly equal parts, successful ISUDSs require a place-sensitive approach, as well as an effective territorial governance system and a proactive mobilisation of local/regional actors.

Despite these challenges, from a methodological standpoint, I propose an evaluation typology built around five main analytical dimensions, and their respective components (Figure 4.6.1). In essence, I suggest that ISUDSs can fit within three different categories: (1) non-integrated; (2) partially integrated; or (3) fully-integrated. To guide this assessment, I propose the analysis of six distinct evaluation vectors. First, from a strategic viewpoint, fully integrated ISUDSs should account for all urban development dimensions and most of the related components shown in the model. Second, ISUDSs should produce the desired results and impacts. Third, ISUDSs should take a long-term perspective and be integrated within local/regional development strategies. Next, they should follow a place-based strategic approach and be built from a bottom-up perspective. The design of the ISUDS is also important and its implementation should involve local/regional stakeholders. Finally, fully integrated ISUDSs should incorporate well-designed, holistic, realistic and fully functioning monitoring and evaluation systems.

Figure 4.6.1.
The dimensional circle of ISUDSs and a proposed evaluation typology



Source: Author's own elaboration, 2018

iii) The Portuguese case study

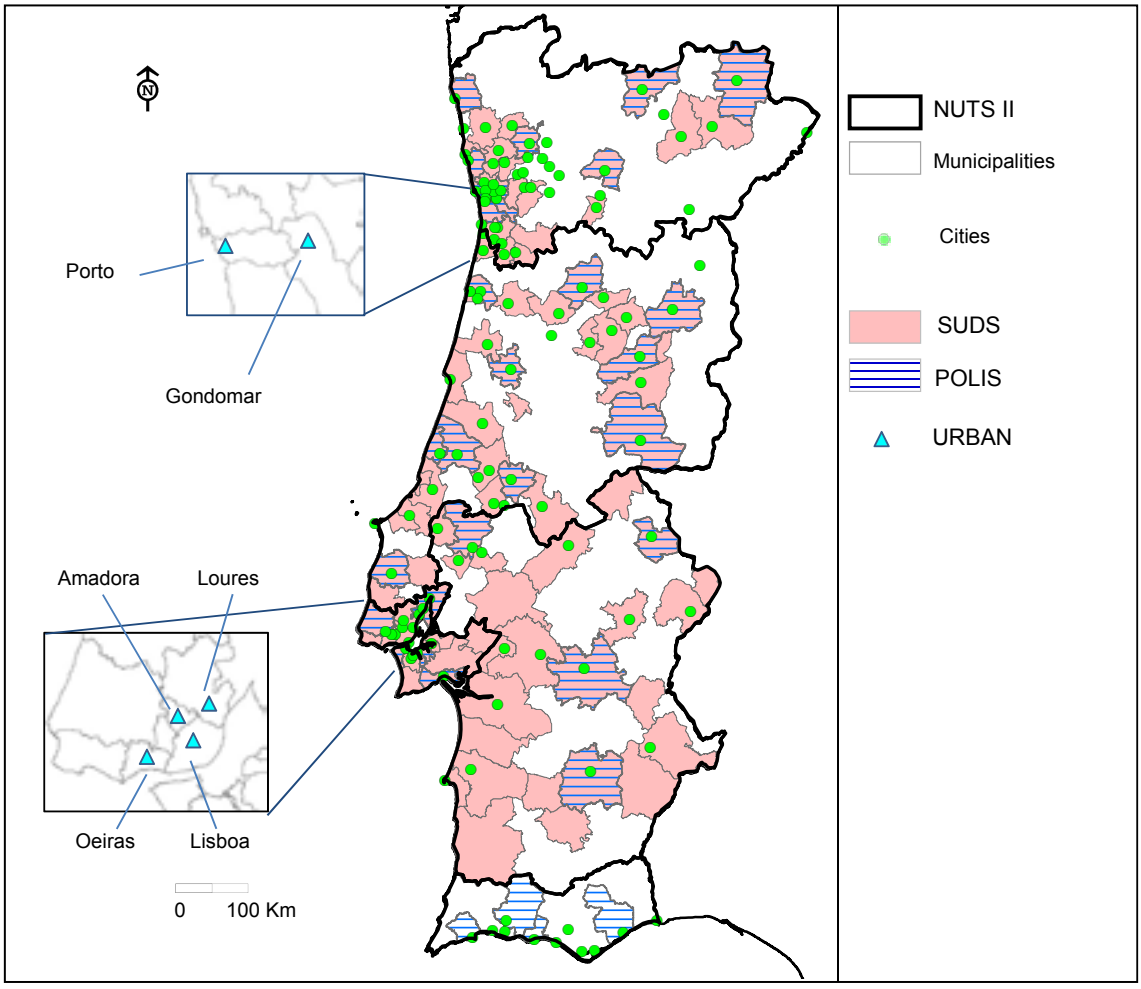
By envisaging an integrated approach, the implementation of Portuguese SUDSs encompasses at least 3 of the 11 thematic objectives of EU Cohesion Policy 2014–20: (1) supporting the shift towards a low-carbon economy in all sectors; (2) preserving and protecting the environment and promoting resource efficiency; and (3) promoting social inclusion, combating poverty and any discrimination. For Portugal, 103 SUDSs were approved, covering all Portuguese NUTS 2 regions with the exception of the Algarve region, with a total budget of EUR 19 million. For the most part, the approved SUDSs follow previous urban development strategies, implemented via the Urban CI and the Polis programme. Their strategic guidelines incorporate suggestions from public consultation processes and propose monitoring and evaluation plans, with clearly defined results and indicators, and risk analysis. For the most part, the responsibility

for the preparation of the SUDSs was adopted by local authorities, giving these types of strategies a clearly decentralised stance. It is still too early, however, to assess the impacts and added value of the Portuguese SUDSs, as they have been approved and implemented only in the last 2 years (2016–18). However, available literature points to their potential positive effects (van der Zwet et al. 2017:61):

- strengthening the profile and strategic framework of regional policy;
- encouraging integrated governance and strengthening capacities;
- promoting experimentation and innovation, with interventions facilitating greater cooperation and collaboration among policy-makers and stakeholders at different levels.

The large majority of the 103 Portuguese SUDSs focus on supporting social integration, physical renovation and sustainable mobility trends, while a few (between 1 and 4) focus on problematic urban neighbourhoods, which are either an old city centre or peripheral, socially degraded urban areas. Furthermore, in certain cases, the SUDSs use place-based measures to stimulate the local economy, for instance through the promotion of tourism-related activities. In a few cases, the improvement of governance models is also promoted, namely in larger urban areas. Curiously, the Algarve NUTS 2 region did not apply for a SUDS, as it did not have enough financial capacity for an autonomous development axis with the 3 required intervention dimensions, and also because the required 5 % for European Regional Development Fund (ERDF) urban investments was already assured by the remaining Portuguese regions.

Map 4.6.1.
Urban CI, Polis programmes and SUDSs in Portugal



Source: Author's own elaboration, 2018

Finally, one relatively positive outcome of the implementation of SUDSs in Portugal has been the allocation of responsibility for developing strategies, implementing projects, and monitoring and evaluation to municipality associations and metropolitan areas. In a sense, the SUDSs can be seen as a tangible policy tool for implementing bottom-up and place-based territorial development strategies. At the same time, "several ITIs are planned for the metropolitan areas Lisbon and Porto and for intermunicipal associations at NUTS 3 level (or spanning several contiguous NUTS 3 areas)" (van der Zwet 2014: 19). In other words, the regional level is taken into consideration for implementing SUDSs, as long as they are linked to the thematic objectives set out in the relevant operational programme(s). Based on previous remarks and our own field work, namely in evaluating the Urban CI and Polis, an attempt to fit Portuguese SUDSs into the evaluation typology proposed leads to the following conclusions concerning their integration level:

1. **Do Portuguese SUDSs cover all five dimensions?** Portuguese SUDSs, as a group, tackle, in general, all aspects related to the main dimensions for promoting urban development (urban environmental sustainability, urban social cohesion, urban green economy, urban territorial governance and urban spatial planning). Indeed, they are mostly focused on improving environmental aspects of urban development, as well as on promoting social regeneration and integration. Furthermore, economic regeneration, governance and spatial planning goals are directly and indirectly covered in the SUDS strategic documents, although to a minor degree.
2. **Do Portuguese SUDSs produce significant impacts?** Based on previous experiences (Urban, Polis), there is an expectation that the implementation of SUDSs in Portugal will have a positive impact. These, however, are not likely to fully solve all the urban problems that affect the targeted neighbourhoods. Instead, they are likely to mitigate them, while introducing and reinforcing new policy approaches that could bring longer term policy benefits to the development of Portuguese urban areas.
3. **Do Portuguese SUDSs have a long-term perspective?** For the most part, the Portuguese SUDSs follow previously designed and implemented urban development strategies. This means that there has been a continuation in implementing them in past decades. As such and taking into account the unlikelihood of solving all urban related issues in the following years, there will be a need to continue the implementation of ISUDSs after this programming period.
4. **Do Portuguese SUDSs have a place-based approach?** The strategies proposed in the 103 Portuguese SUDSs have instructive elements that demonstrate that they follow a place-based approach, adjusting policy interventions to the needs of specific urban areas.
5. **Do Portuguese SUDSs involve local stakeholders?** As previously mentioned, one of the most positive outcomes of the implementation of the Portuguese ISUDSs is their governance framework, which is based on a bottom-up and a place-based policy rationale, involving local/regional stakeholders in policy strategy design, implementation and evaluation processes.
6. **Are Portuguese SUDSs appropriately monitored/evaluated?** All Portuguese SUDSs propose concrete mechanisms to be evaluated, mostly by the urban authorities that implement them. These mechanisms include the collection of qualitative and quantitative data to analyse the changes/causalities of previously identified indicators, and the consultation of monitoring committees. It remains to be seen, however, how effective these monitoring and evaluation procedures will become.

iv) Conclusion

Based on the conclusions of the evaluation reports of the two abovementioned Urban CI programmes and the two Polis programmes, it can be concluded that the Portuguese SUDSs can be situated between the partially integrated and fully integrated types of ISUDSs, as there is still a need to assess their potential impacts in the urban areas being targeted. From a purely strategic perspective, however, they are able to reflect this emerging axiom for a more integrated policy approach, which has been permeating academic and EU political discourses in the past decades. In view of the above, one needs to revise this evaluation proposal a few years after the first set of Portuguese SUDSs have been fully implemented, to make a more robust evaluation.

Since the implementation of SUDSs is relatively recent, this article adds an innovative perspective to their potential evaluation, by presenting a concrete methodology and applying it in a case study. At the same time, it contributes to improving the understanding of European territorial development and cohesion by highlighting the most positive impacts of the ISUDSs analysed in promoting urban development in the intervention areas. Furthermore, the proposed methodology can be generalised to other European countries and adjusted to all territorial levels, as it can easily be adapted, for instance, to be used in the evaluation of regional ITIs, making it particularly relevant for policy-making.

Evidently, as regards the currently implemented Portuguese SUDS, our findings are still preliminary, since the implementation process is still at an early stage. As such, a more robust and sound evaluation needs to take place after they have been fully implemented. For this, a rigorous quantitative (statistical indicators) and qualitative (questionnaires to involved stakeholders and population) approach must be applied, to fit each ISUDS into our typology appropriately.

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5

New data sources

5.
New data sources

5.1.
Producing regional data for circular economy monitoring in Europe: an econometric approach to downscaling official statistics on material consumption and waste generation

Marco Bianchi[36] *and Carlos Tapia*[37]

Key words: circular economy, regional data, statistical downscaling, territorial analysis

i) Introduction

The circular economy (CE) is the far-reaching sustainable development strategy adopted by the European Commission to set Europe's economy on the path to sustainability (European Commission 2015). By closing the loop of technical and biological materials that enter the economy, the CE advocates a paradigm shift in the way we produce, distribute and consume goods and services, while creating at the same time new opportunities for economic growth (Kalmykova et al. 2018).

Understanding how these systemic changes might occur and how regional economies could evolve towards circular trajectories is one of the main challenges that policy-makers and planners currently face. One of the key challenges undermining the analysis of this transition is the lack of data on CE indicators at sub-national levels, and particularly on material consumption and waste generation. Not only is the level of analysis highly aggregated (European Commission 2018), but the novelty of the CE concept also resulted in indicators for which historical data do not exist. Increasing the availability of regional data to monitor structural transitions towards a CE is thus a requirement for the development of effective place-based policies (Ten Brink et al. 2017).

We present an econometric method to regionalise the material and waste data currently available exclusively at national level.

ii) Data and methods

Data

To downscale the target variables we collected two sets of explanatory variables capturing the diverse socio-economic and territorial structure of regions, namely:

1. **Socio-economic variables:** population, gross domestic product (GDP), income, gross value added (GVA) by economic activity[38], gross fixed capital formation (GFCF) by economic activity, employment by economic activity and municipal waste.
2. **Territorial variables:** population density, total surface, land cover (specified for cropland, grassland, forestry and artificial area), location quotients for economic activities and land typology[39] and four dummy variables representing EU geographical subregions (northern, southern, eastern and western). These dummies account for territorial soft factors (e.g. governance, innovative performance, etc. (Capello et al. 2007)).

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38 The industrial activities considered, based on NACE Rev. 2, are Agriculture, Forestry and Fishing; Industry (excluding construction); Manufacturing; Construction.

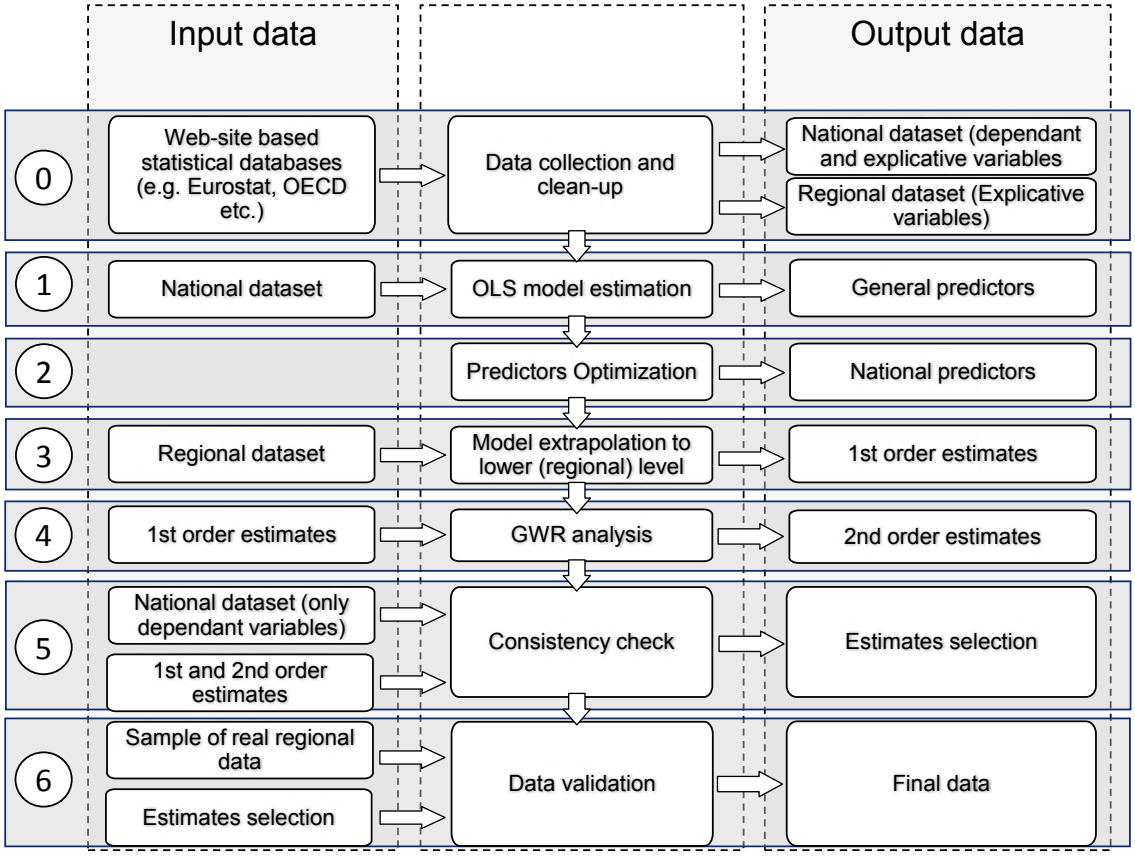
39 In this case location quotient measure the level of "concentration" of economic activities and typology of surface with respect to EU average.

Data were retrieved from Eurostat's "Regional statistics by NUTS classification" and "Environment" databases[40]. Data on European Free Trade Association (EFTA) countries not available from Eurostat were collected from the Organisation for Economic Co-operation and Development's (OECD's) Regions and Cities Database[41]. Data processing was done using R software for statistical analysis[42].

Regionalisation methodology

Figure 5.1.1 shows an overview of the stage-based downscaling method applied in this research. The figure highlights the reference data used and the output produced at each methodological step. A description of each stage is provided hereafter.

Figure 5.1.1.
Sequential flow of the downscaling method



1. Ordinary least squares (OLS) model estimation – we identify the best subset of explicative variables for each indicator according to statistical selection criteria (Ratner 2010). The goal of variable selection is to divide a set of predictors (our explicative variables) into active and inactive terms depending on a comparison of determined criteria, and consequently estimate regression models.

40 https://ec.europa.eu/eurostat/data/database. Specific datasets used for the analysis are: "env_ac_mfa" for material flow accounts; "env_was" for waste; "reg_area3" for regional surface area; "reg_dem" for regional demographic statistics; "reg_eco10" for regional economic accounts; "reg_sbs" for regional structural business statistics; "reg_lmk" for regional labour market statistics.

41 https://stats.oecd.org/

42 The library "Eurostat" (Lahti et al. 2017) was used to access and download data, while the library "Rsolnp" (Ghalanos and Theussl 2015) was used to optimise national parameters.

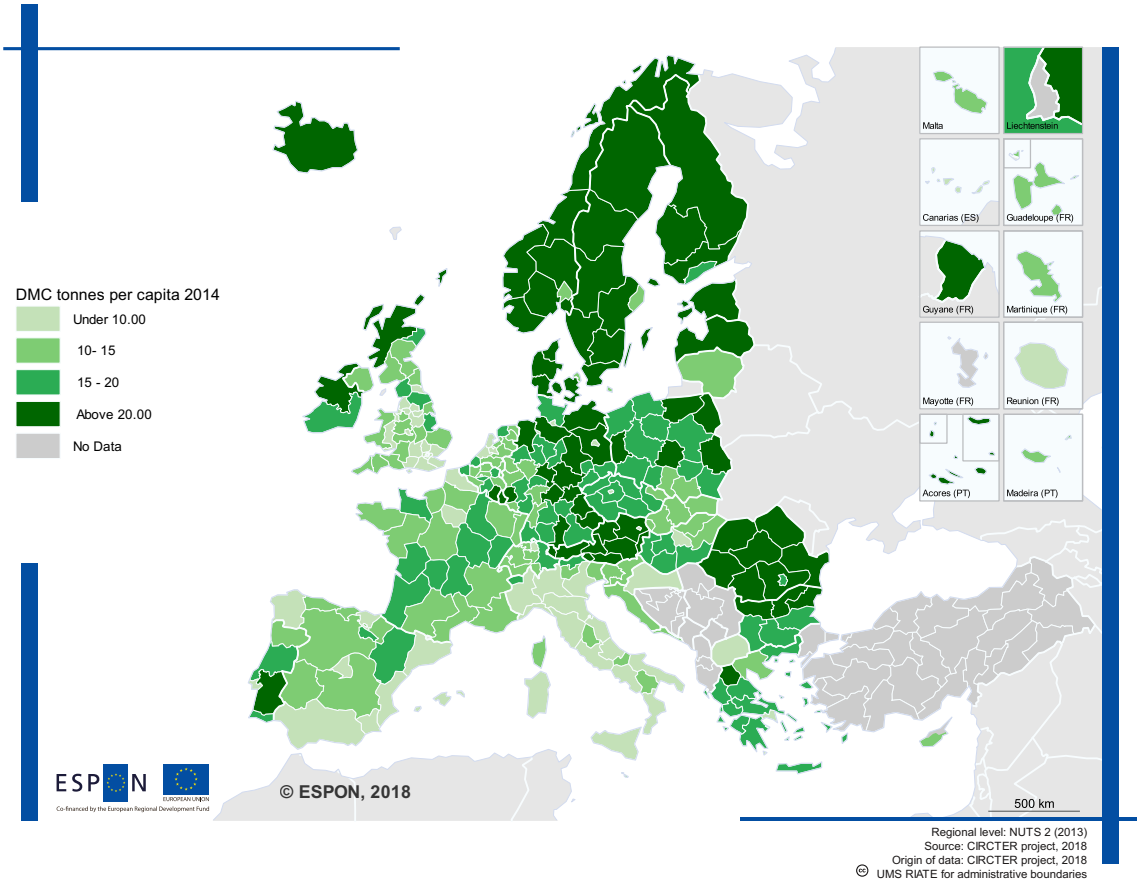
2. Predictor optimisation – the predictors estimated in the previous step apply to all countries, regardless of national specificities. We address spatial heterogeneity by optimising predictor values for each country. We allow the parameters to vary within their confidence interval such that the predicted national value matches the real known value. In this way, the national estimators are calibrated to each country on an individual basis.
3. Model extrapolation to a lower level – we compute first-order estimates by applying the country-specific regression models wherein we substitute the explanatory variables observed at national level with the same explanatory variables observed at lower territorial level (NUTS 2).
4. Geographically weighted regression (GWR) analysis – we test first-order regional estimates for spatial dependence by computing Moran's Index (Viton 2010). We check both error autocorrelation and dependent variable autocorrelation by applying a contiguity criterion. The theoretical purpose behind this approach is to add interregional interdependence to the measurement of material and waste flows (Capello et al. 2007). Hence, in those cases where spatial autocorrelation is detected, we compute second-order estimates by including such an interdependence effect.
5. Consistency check – we check consistency by comparing the real national values with the sum of respective regional estimates. If the sum of regional values is close to the real national value, we infer that differences between countries have been correctly accounted for. We test consistency for both first- and second-order estimates, and finally select the regional estimates – for each country – that have the smallest deviation.
6. Data validation – finally, we validate the approach by comparing our estimates with a small sample of real data retrieved from national statistical databases (e.g. domestic material consumption data for German Länder were available). This allows potential weaknesses in our estimation procedure to be identified and eased interpretation.

iii) Results and discussion

We downscaled nine indicators for two periods (2006 and 2014). Five indicators focus on material flows, namely: domestic material consumption (DMC), domestic extraction, biomass consumption, metal ore consumption and non-metallic mineral consumption. Four indicators provide information on waste generation: total waste generation excluding major mineral waste, waste generation by household, food waste, and electric and electronic equipment waste (WEEE). In this paper, we focus on the results for DMC and total waste in 2014.

Map 5.1.1 gives an overview of the regional DMC per capita in 2014. In general, regions with large urban agglomerations and strong tertiary economies are those characterised by lower material consumption on a per capita basis. The relatively low availability and high prices of vacant lands, coupled with a localised service/financial economy, clearly limit the expansion of the most material-intensive sectors such as agriculture, construction and manufacturing. There is strong evidence that the spatial structure of regions contributes to shaping their material consumption. Rural, sparsely populated regions are characterised by a greater availability of land for the cultivation of biotic resources. Usually these resources are processed locally to minimise transport costs (at least in the first stages of the production chain). In addition, the per capita consumption of mineral raw materials (a core driver of total DMC, together with biomass) is significantly higher in sparsely populated regions because of the lack of agglomeration economies.

Map 5.1.1.
Domestic material consumption per capita, regional estimates (2014)

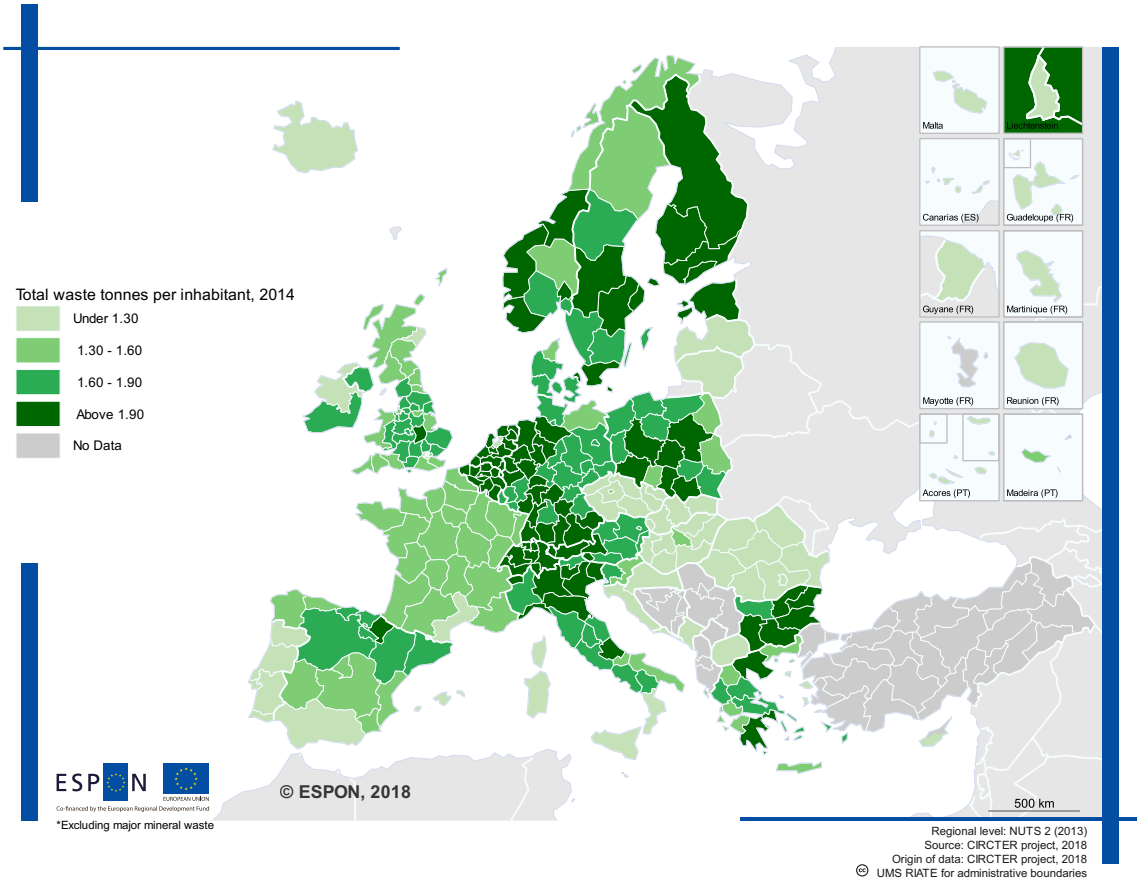


At the EU level, peripheral regions, particularly those in the Nordic countries, new Member States, southern Portugal and Scotland, show larger values for DMC per capita. These areas are mostly specialised in material-intensive sectors, such as forestry, agriculture and mining. Moreover, Romania's economy features among the most specialised in the construction sector, while Poland's is among the most specialised in the industrial and manufacturing sectors. Conversely, the most urbanised regions are characterised by more service-oriented economies and greater agglomeration factors, leading to a smaller DMC per capita.

Map 5.1.2 shows the amount of total waste (excluding major mineral waste) generated by European regions, measured in tonnes per capita.

Clear national patterns emerge in some areas (see, for example, the cases of France, Portugal and Romania versus Germany or Bulgaria). These patterns indicate unharmonised data collection systems and methodologies across countries, particularly when it comes to municipal waste (European Commission 2011). That said, the overall amount of waste generated is largely related to the population size, economic size and structure of a given territory. The most urbanised regions, characterised by higher private consumption, as well as the highly industrialised regions, tend to produce greater volumes of waste per capita (Mazzanti and Zoboli 2008; Hoornweg and Bhada-Tata 2012). This is only partially confirmed by Map 5.1.2 as a result of the abovementioned data shortcomings.

Map 5.1.2.
Total waste generation (excluding major mineral waste) per capita, regional estimates (2014)



iv) Main limitations and possible ways to minimise shortcomings

Our downscaling method is based on an econometric approach that identifies and estimates the best predictive parameters for each selected indicator. The main drawback (and natural outcome) of this top-down approach is that it is not feasible to define a set of estimated parameters that soundly and simultaneously describes the economic structure of all 331 NUTS 2 regions considered. The regions presenting atypical values for the selected explanatory variables (i.e. far-from-average values) are those most likely to be outliers among the regional estimates. Regional estimates could be improved by: (1) exploring the use of time series instead of cross-section data and (2) the development of algorithms that ensure consistency between real national values and regional estimates (e.g. forcing the aggregated regional values to fit exactly with the corresponding national values).

The quality of the regional estimates depends not solely on the regionalisation approach itself but also (and above all) on the quality of the national datasets. Data collection approaches and methodological assumptions differ slightly between countries and/or periods (e.g. because of changes in terminology and definitions), especially for waste category indicators. Hence, the European Commission and Member States need to invest further resources in the development of a harmonised methodological accounting system.

v) Conclusion

The CE has recently gained momentum in discussions on economic development as a way to face rising environmental challenges and promote sustainable development. This new approach is expected to contribute to a fundamental de-linking of rising prosperity from the steady increase in resource depletion.

However, the existing CE monitoring tools available mainly provide aggregated data at European and national levels, offering almost no information on the diversity of conditions at sub-national levels. This lack of information hampers the understanding of material consumption and waste generation patterns at regional and local levels. Consequently, there is a growing need for finer resolution datasets of material and waste flows, not only for policy and infrastructure planning but also for general public awareness (Ten Brink et al. 2017). Given the impossibility of directly gathering or producing regional data – especially for past years – this article presents a stage-based downscaling method that makes use of generally available socio-economic and territorial information to disaggregate national material and waste data down to the regional level. By recognising the interaction between macroeconomic trends and local-based factors, our methodology provides regional estimates that go beyond simpler redistribution methods.

Our approach proved to be especially suitable for highly aggregated indicators (e.g. DMC and total waste generation), while its performance is less good for more focused indicators (e.g. metal ore consumption). Our method provides a pragmatic but reliable solution to deal with data scarcity at sub-national levels and can be efficiently used to build time series for past years where disaggregated data do not exist or cannot be collected. It provides sufficient data resolution for many applications and contributes to the identification of regional patterns of resource use that would otherwise remain unknown.

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5.2.
New territorial analyses enabled by emerging sources of geospatial data – use cases and challenges

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Key words: big data, geospatial data, points of interest, web data mining, territorial analysis

i) Introduction

Statistical and geographical data from official bodies were, for many decades, the prime inputs used for regional and urban analyses. Although such conventional data sources and associated data collection methods remain doubtlessly relevant, the paradigm evolved rapidly, as many information and communications technology (ICT-)based services started generating massive amounts of data as either final or by-products. Such data are often referred to as "**big data**" because of their volume, velocity and variety (Katal et al. 2013). Scientists and engineers from a wide range of fields soon started finding ways of obtaining and using data from these emerging sources, and the number of use cases is growing at a fast pace (Rodríguez-Mazahua et al. 2016). The terms "geospatial big data" and "big geodata" are used to refer to big data that are geotagged and/or georeferenced (Goodchild 2013). Although their use is growing, it does not come without challenges and compromises related to data access, storage and processing, quality and sustainability (Goodchild 2013; Liu et al. 2016), but also wider societal issues (Boyd and Crawford 2012).

Data generated by the operation of mobile phone applications and mobile phone networks, social media, web activity (content, traffic, searches, etc.) and financial transactions are typical examples of data generated as **by-products** of an ICT-based service. Other types of non-conventional geospatial data are intentionally generated as **core components** of a service. That is the case for OpenStreetMap (OSM)[45], a worldwide collaborative effort to map the world in detail. Companies like TomTom[46] also focus on producing reliable digital navigation and mapping products. Finally, a myriad of sensors can collect many sorts of georeferenced data, from meteorological variables[47] and counts of cars or pedestrians to highly detailed imagery of the Earth's surface. Although some of the latter products resonate with conventional cartography, the multiplication of data providers, distributed data generation and high spatial/temporal resolution are aspects that these products have in common with the big data paradigm.

The Knowledge Centre for Territorial Policies (KCTP) of the European Commission[48] aims to support territorial development policies by promoting better knowledge management and dissemination, and by releasing new spatial datasets, territorial indicators and tools for their interactive visualisation on the web. Over recent years, a number of research and policy-support activities carried out in the context of the KCTP have inevitably run into some of the abovementioned emerging types and sources of big geospatial data. The objectives of this paper are to review and discuss some of the main types and sources of geospatial data useful for territorial analysis (section ii), as well as examples of their application by the KCTP for improving the territorial knowledge base (section iii).

ii) New types and sources of geospatial data for territorial analysis

Points of interest (POIs) refer to physical structures on the Earth's surface that have a functionality relevant to human or societal activities and can be indicated as precise points on a map. In a geographical information system (GIS), a POI is an entity that includes a pair of latitude/longitude coordinates and one

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44 Disclaimer: The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission.

45 https://www.openstreetmap.org/

46 https://www.tomtom.com

47 For example, real-time, crowd-sourced meteorological data available at www.wunderground.com

48 https://ec.europa.eu/knowledge4policy/territorial_en

or more attributes, usually describing the type of physical structure and/or its functionality. A POI can refer to the location of a museum, hospital, shop, ATM, bus stop or gas station. Although its origin could be traced back to tourist city maps, the concept of POI consolidated and became popular with the development of global positioning system (GPS) navigation systems. Nowadays, POIs are also an important element of internet map services such as Google Maps, Bing Maps and the open-source equivalent OSM. POI data are generated by collaborative and volunteer efforts in the case of OSM but are also produced by private companies such as TomTom. For example, the TomTom MultiNet product includes tens of millions of single POIs for Europe alone, classified into dozens of categories. POIs can be used for territorial analysis in many ways, such as quantifying the supply, spatial configuration and accessibility of specific amenities or services in regions or cities (Kompil et al. 2019).

Web data mining consists of extracting useful information from websites. For example, the European Media Monitor of the European Commission[49] continuously monitors thousands of news sources in over 70 languages, providing information on what is being reported in the world at every moment. Statistical offices also use web data mining to obtain price information and to calculate inflation rates based on the price variations of different baskets of products (Polidoro et al. 2015). Other examples include the study of innovation (Gök et al. 2015) and the study of citizen and costumer sentiments (Liu 2012). However, websites can also be sources of georeferenced data if the extracted information can be linked to a geographical location through exact coordinates or the name of a place (e.g. region or city). For example, online booking platforms (e.g. Booking.com and TripAdvisor) include interactive maps with the location and characteristics of tourist accommodation establishments that can be inspected, fetched and brought into a GIS for subsequent detailed territorial analysis of tourism (Batista e Silva et al. 2018a).

Social media platforms are a widely investigated source of geographical data. User submissions, such as status updates, tweets, check-ins, photos or videos, are time-stamped and often carry a geotag (i.e. a spatial reference) with the high positional accuracy of GPS sensors commonly present in mobile devices. The thematic content of the data is more difficult to establish though. Social media data can be described as unintentional crowd-sourced data (Crooks et al. 2015). Since they were not intended to be bulk processed as a dataset, extracting useful information from the raw data (such as unstructured text and untagged photographs) is often quite challenging and relies on machine learning and artificial intelligence. The methods for deriving information from social media, where individuals serve as sensors, are also referred to as social sensing (Liu et al. 2015). A recent study found that socio-economic indicators such as personal income and electric power consumption are better proxied at fine spatial resolution by the sum of geotagged tweets than by night-time lights derived from satellite imagery (Zhao et al. 2018).

While the previous examples are strongly linked to the web as a source of data itself, or as a means for its production and dissemination, data from **mobile network operators** (MNO) are generated by the interaction between mobile phone terminals and the geolocated mobile network towers. MNO-generated data are another emerging data type that can be used to map and analyse the mobility patterns of mobile phone users (González et al. 2008) and characterise territories. In fact, numerous studies have shown the potential of MNO data to map multi-temporal population density (Deville et al. 2014), describe land use according to temporal profiles of locations (e.g. predominantly working, residential or commuting areas) (Ríos and Muñoz 2017) and assess the spatio-temporal visitation patterns of tourists (Raun et al. 2016). Statistical bodies are conducting pilot studies to test the use of MNO data in the production of tourism statistics (Dattilo and Sabato 2017; Demunter and Seynaeve 2017).

However, the use of this data source in a systematic fashion is still hurdled by data access constraints, as profit-driven MNOs are still reluctant to release their data, as proper business models are not yet well established (Debusschere et al. 2017). In addition, there are several methodological challenges associated with the use of MNO data. These include incomplete penetration rates and lack of data for “roaming” users (Dattilo and Sabato 2017), heterogeneous market shares of MNOs across regions and socio-economic groups, and issues with mobile phone usage patterns by different users, all leading to selection biases (Demunter and Seynaeve 2017). Technical proposals are being put forward to streamline access to MNO data in a harmonised manner across different operators (Ricciato et al. 2017).

49 http://emm.newsbrief.eu/

In Table 5.2.1 we propose a classification of the referred emerging geospatial data sources according to the nature of data production and access.

Table 5.2.1.
Examples of geospatial data sources according to the nature of production, ownership and access

	Proprietary		Open source
	Free or restricted access	Restricted access	
By-product	Web content, social media	MNO, transactions	
Core product	Sensor data	Cartographic and navigation data, specialised databases	Voluntary geographical information (VGI)

iii) Use cases of emerging geospatial data sources for new territorial analyses

Land use characterisation using point of interest data

Land use mapping requires local knowledge and, unlike land cover mapping, it cannot be readily and properly mapped using remote-sensing approaches alone. At best, products such as the Europe-wide CORINE Land Cover (CLC) inventory[50] include spatially and thematically coarse land use information derived from the visual interpretation of satellite imagery. Nevertheless, thorough land use mapping at continental scale poses considerable challenges and the EU still lacks a detailed and harmonised land use map.

A step towards better land use characterisation was taken within the ENhancing ACTivity and population mapping (ENACT) project[51]. A fusion of several remote-sensing-derived land cover datasets with multi-source POI-based information on economic activities enabled more detailed land use characterisation (Rosina et al. 2018). First, a spatially refined map was created by merging CLC, Urban Atlas and Copernicus high-resolution layers and other land cover data. Then, a machine-learning approach was used to breakdown the general industry/commerce class into three, more detailed, classes (production, commerce and services, and public facilities) based on the presence or absence of several categories of POIs. The resulting map covers the EU-28 and other European countries, contains 50 classes with a minimum mapping unit of 1 ha for artificial surfaces and 5 ha for all other land use/cover classes. It is currently used as a base map in the LUISA Territorial Modelling Platform[52] for the territorial impact assessment of European trends and policies.

Combining statistical and geospatial big data to map spatio-temporal population densities

Current knowledge of the spatial distribution of the population is still very incomplete. It is based upon place of residence statistics and does not account for the fact that people move between various locations in daily, weekly and annual cycles for reasons of shelter, work or leisure. The spatial mobility of people results in significant variation in local population densities, which is extremely relevant for a range of applications, from disaster risk assessment to urban and regional planning. Despite the advances in computational capacity and data availability, the spatio-temporal mapping of the population remained largely unaddressed until very recently.

The abovementioned ENACT project also produced the first EU-wide, consistent and validated population density grids taking into account daily (night- and day-time) and monthly population variations (i.e. 24 time frames), at a working resolution of 1 ha. The methodology used was structured into 4 phases: (1) the estimation of regional and monthly stocks for 16 population subgroups (residents, employees in 11 sec-

50 https://land.copernicus.eu/pan-european/corine-land-cover

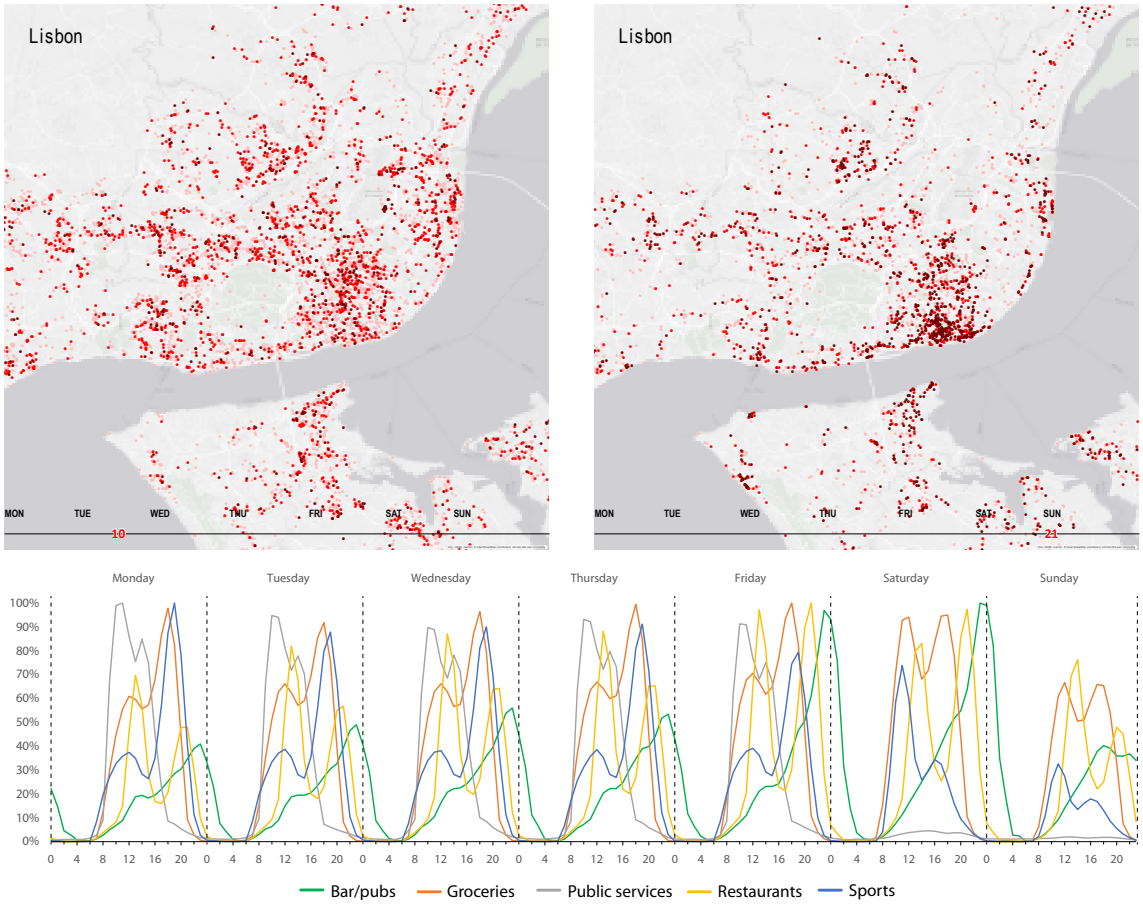
51 https://ghsl.jrc.ec.europa.eu/enact.php

52 https://ec.europa.eu/jrc/en/luisa

tors, students in 2 levels, tourists and day-time residents), based on a combination of official statistics at NUTS 3 level; (2) detailed mapping of socio-economic activities; (3) the disaggregation of regional and monthly population stocks to grid level using the location of socio-economic activities as spatial covariates; and (4) cross-comparison with independent sources (including MNO-derived population densities) (Batista e Silva et al. 2018b).

Future developments should focus on increasing the temporal resolution. For this purpose, temporal profiles or signatures of socio-economic activities and land uses will be required. One promising source of information is the "Popular Times" feature from Google Maps, characterising POIs from Google Maps according to the level of human activity per hour and weekday. Figure 5.2.1 shows the level of activity for the POIs available in the city of Lisbon for two distinct hours and weekdays, as well as the temporal signature for a selection of POI categories.

Figure 5.2.1.
Level of activity of POIs for two distinct hours and days of the week in Lisbon, Portugal (top), and temporal signatures of a selection of POI categories (bottom); the darker the points the busier they are at the indicated time



Source: Google Maps; authors' own elaboration

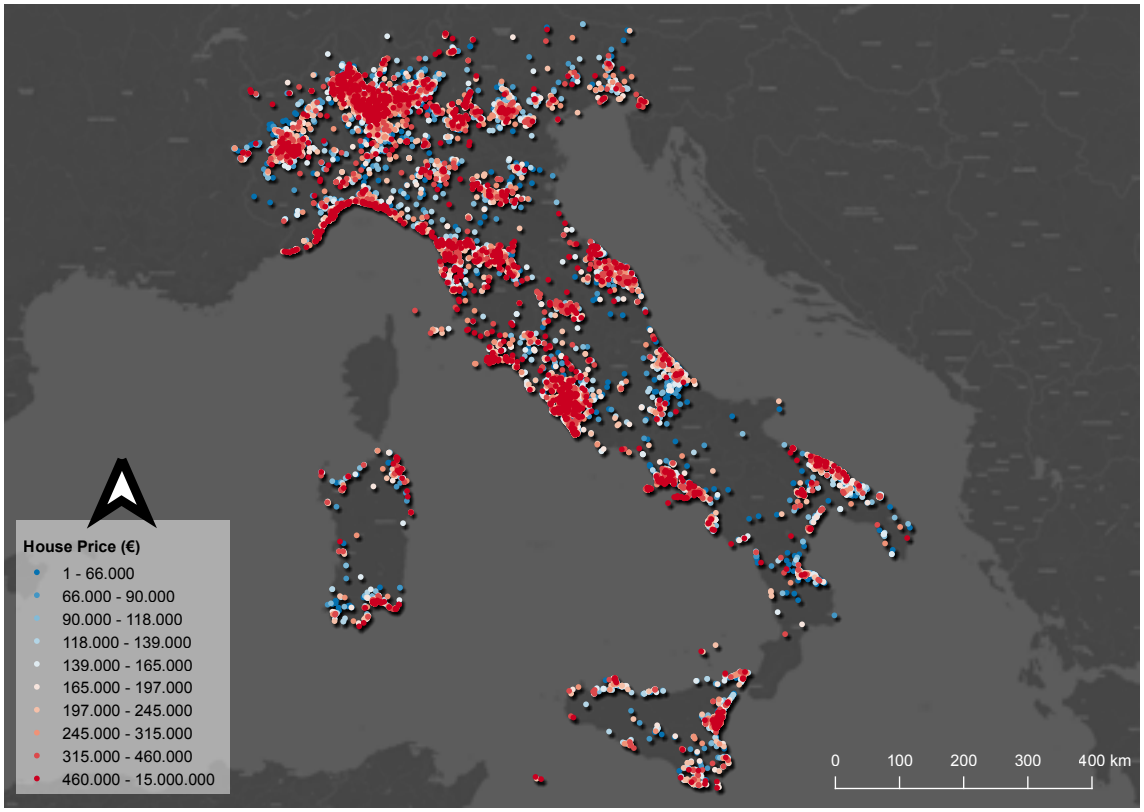
Web mining housing market prices

Housing market prices can be fetched from real estate web portals. The data extraction, or web scraping, needs to be set up specifically for each particular website depending on its structure. Because Remax[53] operates worldwide, this real estate agency was an interesting test case. For Italy, we were able to extract

53 https://www.remax.com

more than 20 000 records, each corresponding to a particular property on the market at the time of the search (see Map 5.2.1). For each property, in addition to its location and asking price, it was possible to obtain a set of descriptors such as year of construction, floor area, energy efficiency class and presence of particular features such as garage, balcony, garden, etc. Such information is very valuable for hedonic price analysis (Law 2017).

Map 5.2.1.
Location and price class of properties for sale in 2017 through a real estate agency in Italy



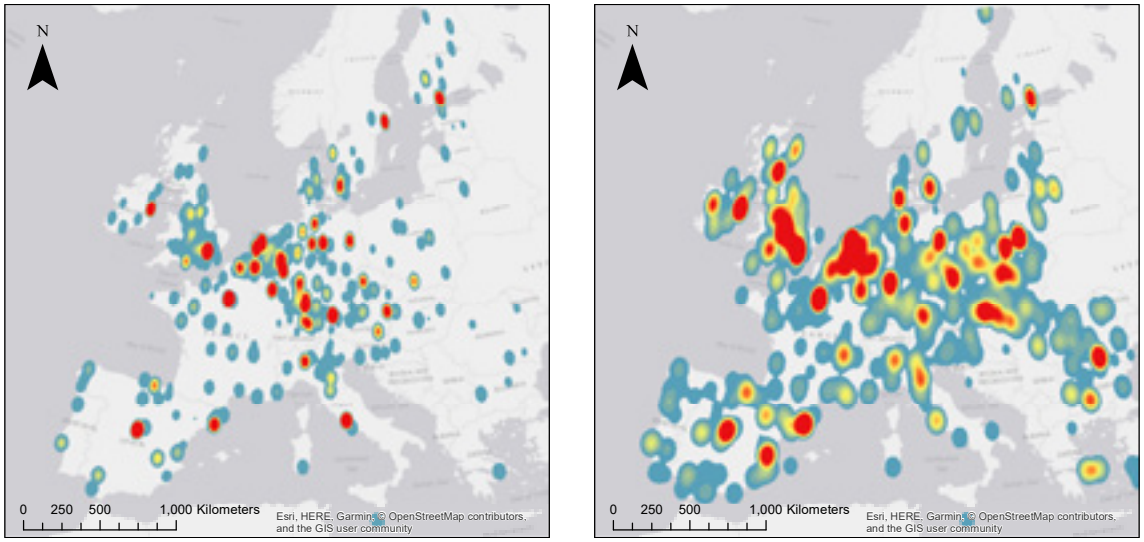
Source: Remax; authors' own elaboration

Mapping foreign direct investment based on a proprietary database

Foreign direct investment (FDI) Markets[54] is a proprietary service and database that monitors cross-border investments covering all sectors worldwide. The information is collected from company announcements and verified against various sources of information, including media and industry agencies or market research companies, and, finally, made available to the public through a subscription. Each FDI project in the database contains information related to the origin and destination of the investments (country and city), as well as the date, company, sector, motivation, capital committed and jobs created. The origin/destination city names have been geocoded into actual geographical coordinates allowing us to make the heat maps shown in Map 5.2.2 and visualise spatial concentrations of outbound and inbound capital investments. Furthermore, this information can be used to determine, for instance, which cities and sectors are connected through FDIs or reveal the determinants of FDI using network and statistical analysis.

54 https://www.fdimarkets.com

Map 5.2.2.
Heat maps of FDI per origin (left) and destination (right) in Europe in 2017



Source: www.fdimarkets.com; authors' own elaboration

iv) Discussion and conclusions

In this paper, we reviewed, in brief, emerging sources of geospatial data and examples of how they can be employed to improve the regional and urban knowledge base and research. Despite the promising potential, important challenges related to the use of the sources of geospatial data discussed must not be ignored. For example, POI data should be used with caution. The quality of POI data in terms of completeness and spatial and thematic accuracy varies significantly across data sources and are difficult or costly to assess systematically because of a lack of benchmarks. The quality of the data from the same data source can also vary significantly across countries and regions. The combination of POI data from various sources is a possible strategy to increase completeness, but then the problem of how to address overlapping information or reconcile different nomenclatures must be solved. In applications that make use of POI data to assess accessibility to public services, for example, key information is often missing. For example, in the case of hospitals, is it meaningful to assess how many people are close to a hospital if we lack information about what influences the actual accessibility of the population to that hospital, such as the type of hospital (large, small, public, private) or the diversity, price and quality of the services offered?

Temporal inconsistency is another issue that affects many emerging sources of geospatial data. Differences in information obtained at different moments from the same source may not necessarily be related to actual differences in the underlying phenomena, but rather related to changes in data quality and coverage. Because of space constraints in this paper, the last aspect we discuss concerns the sustainability of emerging sources of geospatial data as accessible, reliable and frequent data providers. While official statistical bodies have the mission and, usually, a sustained flow of public resources to produce statistics with sound standards in terms of quality and frequency, many emerging sources rely on the activity of private entities whose main goal is – legitimately – profit, not the production of reliable statistics that are consistent over time and space. As such, these data sources are closely tied to the profitability of the underlying activity. Moreover, legal aspects may arise when fetching data particularly from the web. While it may be appealing to scrape web contents, such activity may be regarded as abusive (or even illegal) by the owner/publisher of the content, thus undermining the wider usability of certain sources.

For all the above, "big data" must not be seen as a panacea for the future of territorial and geographical analysis. Instead, non-conventional data sources are best used to complement conventional sources, or to make informed, but cautious, guesses in relation to topics not covered by official sources. In fact, the abovementioned ENACT project illustrates how the combination of emerging sources of geospatial data and official statistics can yield a product with significant added value for applications requiring detailed land use and population mapping. These results can be exploited to characterise regions and cities,

assess the impact of investments and infrastructures, or assess human exposure to pollution and hazardous events, among other applications.

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5.3.
Institutional data versus big data: why analysing data on housing dynamics in cities matters

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Key words: inequalities, cities, housing, property prices, market, affordability, housing conditions

i) Introduction

Housing is a major policy issue related to urban well-being, cohesion and sustainability in Europe: “in 2014, approximately 7 % of the EU-28 population faced the situation where housing costs accounted for more than half of their disposable income” (Eurostat 2016). Housing prices have increased faster than the income of residents and buyers in major post-industrial city regions, and real estate has become an important driver of socio-economic inequalities.

However, harmonised sources of data on this phenomenon in Europe are scarce and incomplete. We propose mapping the spatial dynamics of unequal local affordability to analyse the spatial impact of pro-homeownership policies[56]. We deem it relevant to measure the financial effort and its spatial structure, elaborating on methods of spatial analysis of property price (Boulay 2012; Le Goix et al. 2018).

First, we cover some background, to elaborate on the case of the Paris western suburbs as an ideal case study because of the diverse situations in terms of housing inequalities. The main goal is to analyse how to use conventional data (e.g. income, census) and unconventional data together, either from institutional sources (transactions) or harvested online (real estate websites). We suggest a methodology for the spatial analysis of unequal local affordability. Finally, we discuss the potential use of disaggregated local urban data and real estate data harvested online for the analysis of housing well-being. The conclusion section discusses the relevance of this analysis for policy-making.

ii) Background and policy relevance: affordability and spatial inequalities

This study was carried out in the context of the Territorial Agenda of the European Union 2020 to investigate the impacts of housing on territorial cohesion and how to tackle the risks of exclusion. The Organisation for Economic Co-operation and Development (OECD) database on affordable housing shows that increased price and income inequalities exacerbate unequal access to affordable housing

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56 This paper summarises a methodological report draft prepared as part of the ESPON Big Data for Territorial Analysis of Housing Dynamics 2018–19 project.

(OECD 2018), a situation that has spread across property markets (Kemeny 2001; André and Chalaux 2018). A continuous increase in property prices and a steady increase in homeownership were found to relate to a new price regime (Tutin 2013). This situation is linked with financial and macroeconomic parameters such as monetary policies and credit affordability (national policies), and the shift among advanced economies towards an asset-based welfare model, yielding a regime with an ideology of ownership, credit affordability and house prices often subsidised by the state and local governments (Ronald 2008; Rolnik 2013).

Therefore, real estate has become an important driver of inequalities, for at least two reasons. First, increased property prices sort out buyers by making access to housing even more dependent on assets and access to credit. Second, the flows of household real estate investments are instrumental to the dynamics of asset capitalisation (Piketty 2013). Therefore, both assets and access to credit directly affect social inequalities and the spatial segregation patterns of residents and buyers. The dimensions of these socio-spatial inequalities derive from a decrease in housing affordability, i.e. a widening gap between property prices and household incomes (Friggit 2017).

ESPON's interest in this methodology is also policy oriented: it could help determine to "what degree new 'big data' collection approaches can be used to enrich existing territorial policies and provide up-to-date evidence" (ESPON EGTC, 2017). Our proposal seeks to provide new insights into how to use unconventional data to gather valuable information, to provide a cost-effective and harmonised means of data collection, and to contribute to the analysis of socio-economic cohesion.

Therefore, by the means of bringing together conventional and unconventional data, the policy relevance of the case study is threefold:

1. to monitor the spatial effects of pro-ownership policies on socio-economic inequalities, and the attendant risks of market-based exclusion;
2. to analyse the spatial patterns of inequalities stemming from unequal capitalisation of housing wealth in some areas versus the vulnerability of households in others;
3. to better inform and map the increasing affordability gap, a critical issue for social cohesion sustainability in metropolitan areas in Europe.

iii) Using institutional data to analyse the dynamics of property markets

The case of the western suburbs of Paris allows us to discuss implementation. We consider a variety of datasets:

- **Institutional unconventional data:** property-level data from the Paris Chamber of Notaries (1996–2012). This sample contains transactions for the region and its suburbs, within the administrative limits of Île-de-France (1 million rows). All records contain information on property amenities and pricing, and a series of understudied interesting variables on sellers and buyers, such as age, sex, socio-economic status, national origin, place of residence and some credit history related to the transaction. This preliminary analysis is conducted on single-family homes in the Yvelines department (west of Paris), which consists of a transect of the many residential-type strata found in Île-de-France, from the denser mixed fabric of the inner suburbs.
- **Public conventional data:** grid-based income census data (INSEE 2016). Institut national de la statistique et des études économiques (INSEE) gridded local data are made available with many constraints in terms of statistical secrecy. Income refers to income by household consumption units, in cells of more than 11 inhabitants. Values are estimated by INSEE in a 200 m grid. To harmonise our maps, we interpolated income into the 1 km grid[57].

The focus is to analyse the geography of homeownership inequalities in relation to transactions. Therefore, several issues have to be considered regarding the spatial level of aggregation:

- A grid allowed us to integrate datasets with various spatial definitions for spatial analysis purposes.

57 https://www.data.gouv.fr/fr/datasets/donnees-carroyees-a-200-m-sur-la-population/#resource-bcdc7244-cda9-4342-9770-7382b0b89dee

- Data secrecy, privacy control and legal and/or ethic requirements regarding the confidentiality of individual transactions have to be considered.
- The MAUP (modifiable areal unit problem), related to the spatial distribution of transactions and aggregation (Openshaw 1983), has to be considered.
- The weakness of the sample and missing data issues have to be considered. Grid interpolation allowed us to estimate the potential prices in adjacent cells, with assumptions regarding the spatial interactions between transactions (Le Goix et al. 2018).

To offset these limitations, we use a combination of a 1 km grid and techniques of interpolation, following the assumptions of Stewart potentials, using the SpatialPosition R package (Commenges and Giraud 2016), as shown in Map 5.3.1 . For examples and a detailed discussion of methodology regarding data processing, gridding, interpolation and mapping, see Le Goix et al. 2018.

iv) Harmonised variables

To better understand inequalities in housing markets, we start with nominal price (Map 5.3.1 a) and then produce harmonised variables, based on ratios, such as the price-to-income ratio, to analyse affordability, and the debt-to-value ratio, a proxy for inequalities stemming from the equity capital availability of households. The ultimate goal of using harmonised variables is to be able to compare between cities and between countries *ceteris paribus.* This section provides examples of how to match data contained in transaction data files (i.e. debt) with external sources (e.g. income from 2011 census data).

An example of a harmonised variable produced with the transaction dataset only is the debt-to-value ratio (Map 5.3.1 b). It is computed, for each grid cell, as the total amount of debt contracted and the total value of transactions. Two regimes can be highlighted on this kind of map that show a very unequal spatial distribution of wealth and household vulnerability:

1. asset accumulation, especially in the more affluent south-east side of the district;
2. a detrimental effect for households purchasing a property in lower bracket submarkets, especially along the Seine river and the north-west part of the map; because of their lack of assets, they are more likely to rely on a higher debt-to-value ratio when contracting a mortgage[58].

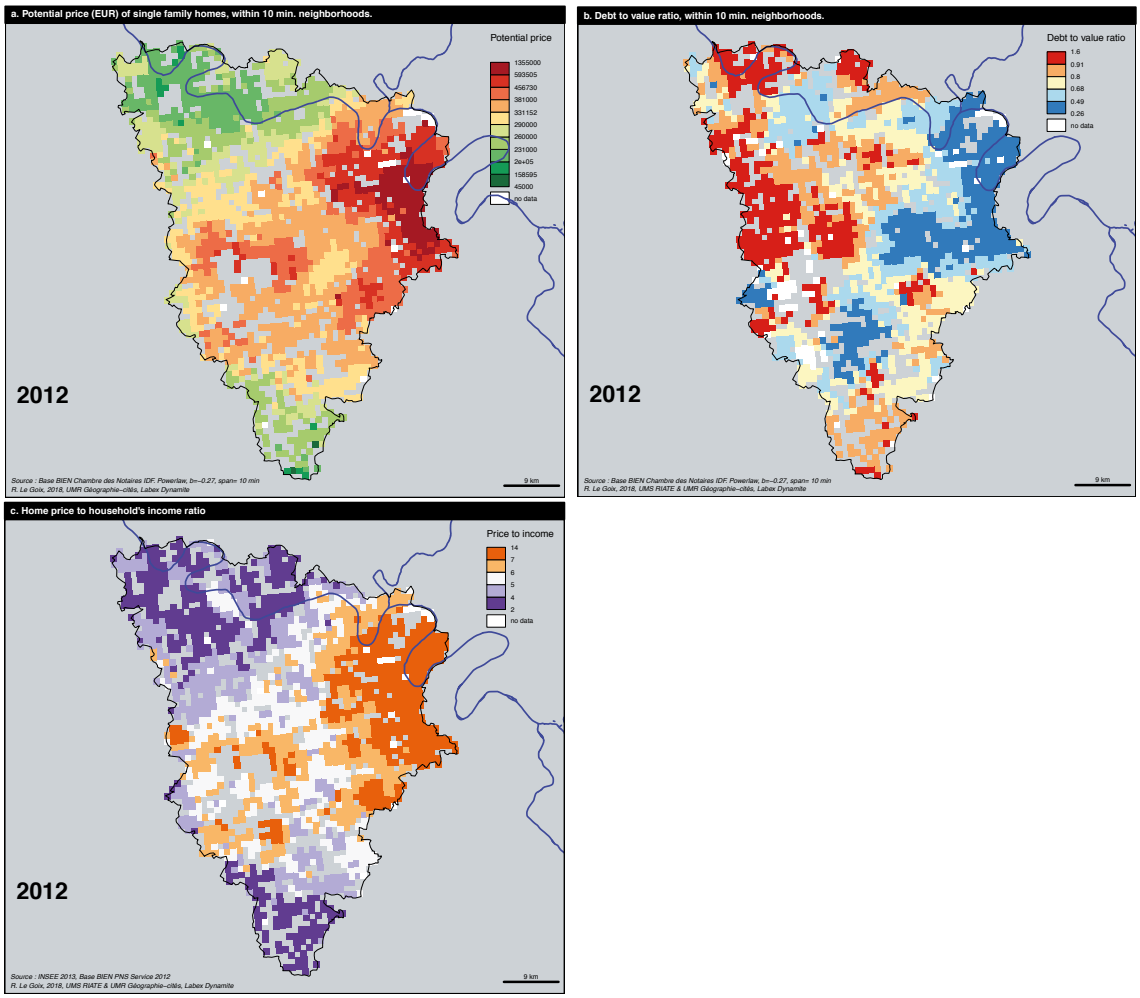
Another example consists of matching transaction data and income census data. Map 5.3.1 c shows the integration of such heterogeneous datasets, so as to produce a harmonised indicator describing the unequal affordability of homeownership: the price-to-income ratio. Data show a very high price-to-income ratio in the eastern part of the district, where prices are higher, and an apparent higher level of affordability in the western part. Two contrasting regimes coexist:

1. Where prices are higher, transfers of assets (for instance from a previously owned property) allow households to better offset the effects of higher prices on income. Mortgages represent a lower proportion of the price paid.
2. On the western side of the outer suburbs, a lower price-to-income ratio spatially correlates with a higher debt-to-value ratio. Where prices are lower, households tend to rely mostly on mortgage to access ownership.

Such maps clearly depict the effects of property price, income, debt and assets on unequal access to homeownership.

58 The information is incomplete, the dataset contains more information on mortgages. Data may be missing for other conventional forms of loans, securitised by insurance mutual companies.

Map 5.3.1.
Price and other harmonised variables



v) Unconventional ("big data") versus institutional data sources

This section discusses how to compare and benchmark institutional and unconventional data sources. Institutional data can be compared to possible sources of harvested big data (e.g. real estate websites, open-source data resources and warehouses, and Airbnb). To do so, we explored how to harvest property listings from a real estate sales website: leboncoin.fr. This is one of the leading platforms for real estate advertisements in France, used by individuals as well as real estate agents and companies to advertise residential properties for sale and to let.

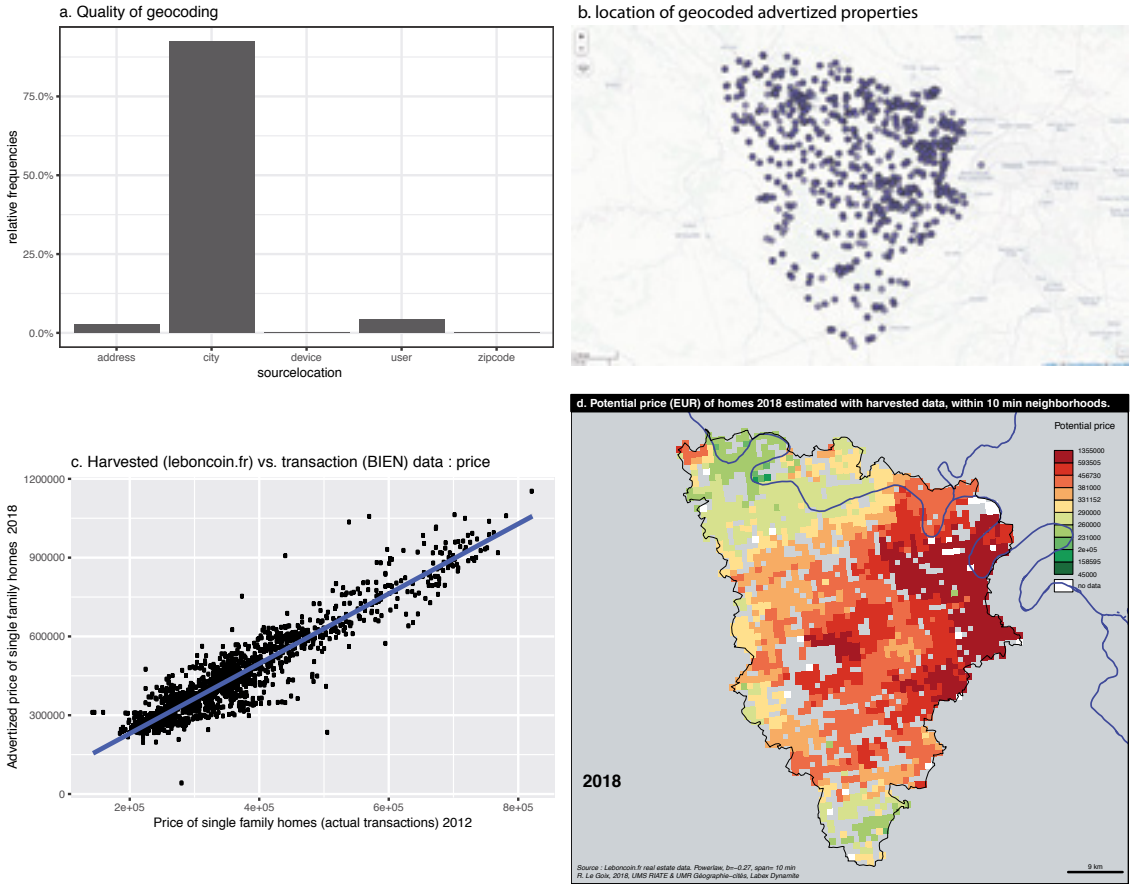
Unconventional data are often viewed as interesting proxies to measure and better understand spatial behaviours and territorial dynamics (Kitchin 2013; Gallotti et al. 2016), and also as means of providing higher spatio-temporal resolution data than institutional data sources (EUNOIA, 2015).

Before relying on unconventional data sources, it is important to assess their reliability and whether or not they provide accurate information when compared with the long-established, statistically robust conventional data. Studies address the representativeness of IDS (internet data sources) compared with conventional data sources (Le Goix and Vesselinov 2013; Beresewicz 2015).

A total of 9 934 observations of houses to sell had been collected online by the end of October 2018. We used standard methodologies with rvest R language libraries and applied them to the Yvelines depart-

ment to demonstrate the usefulness of the method[59]. Data collected included the advertised price, the main characteristics of the property and its location. Location generally describes that of the property, but not systematically. As in Figure 5.3.1a, location data are provided by the website as either the city or the municipality (78 %), and only a few advertisements are geocoded down to the address. In some other cases, location appears to be the location of the seller's agency and does not provide any location information usable in the scope of our study.

Figure 5.3.1.
Summary of harvested data



The map of extracted results (Figure 5.3.1b) shows good coverage of the study area, with a wide range of municipalities (LAU 2) covered. But data also show that alternative methods for geocoding and clean-up will be necessary if we intend to remove all outliers. For the case study, the 9 934 observations collected resulted in 7 460 unique and accurate records, as shown in Figure 5.3.1b. For the purpose of comparison, two subsets are produced, houses and apartments. We create a spatial data frame from latitude and longitude. Since the coordinate reference system (CRS) for harvested data is WGS84, for harmonisation with institutional datasets the coordinates must be converted into a Lambert-93 RFG83 CRS.

To benchmark the results of the harvested data, we also apply an interpolation to the harvested data points and map it with the 1 km grid (Figure 5.3.1c). The interpolation methods used, which produce estimates of, for example, price or density of transactions in 1 km neighbourhoods, allow us to compare, visualise and benchmark the harvested dataset versus the institutional transaction datasets. The harvested data versus institutional transaction data plot (Figure 5.3.1c) compares values collected with both methods.

59 Part of the code used to harvest data from the leboncoin.fr website was initially prepared by L. Vaudor, S. Rey-Coyrehourcq and F. Pfaender for the PIA Labex Dynamite Summer School 2018 in Florence, Italy, and was modified with the authorisation of the authors, which has to be acknowledged.

vi) Discussion and conclusion

Several directions for policy-oriented analysis derive from this work that delineates a methodological proposal for the collection, comparison and harmonisation of conventional and unconventional data, to characterise housing inequalities and well-being. First, such a methodology, conducted in several cities in Europe, will allow us to monitor the spatial effects of pro-ownership policies on socio-economic inequalities, and the attendant risks of market-based exclusion.

Second, with this methodological proposal, we aim to analyse the spatial patterns of inequalities stemming from the unequal capitalisation of housing wealth in some areas versus the vulnerability of households in others. As shown in Map 5.3.1 , data demonstrate that the price-to-income ratio, i.e. the pressure on income linked to the cost of housing, is an interesting variable to use in the spatial analysis of inequalities in access to ownership, even though public policies see it as a superior form of tenure. Furthermore, we describe a variable, the debt-to-value ratio, that denotes the asset accumulation and vulnerability of households, compared with the debt contracted.

Finally, a critical issue for social cohesion sustainability in metropolitan areas in Europe is how to better inform and map the increasing affordability gap. This is why we are committed to exploring unconventional web-based data (IDS), so we can compare their use and relevance with institutional data, such as transaction data.

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5.4.
Discovering the potential of big data for integrated territorial policy development in the European growth corridors – a review of new data sources

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Key words: big data, new data source, European growth corridors, integrated territorial policy

i) Introduction

Many policy-makers operating at a municipal, regional, national or transnational level are seeking new ways to use data as evidence for policies aimed at fostering the development and governance of European growth corridors. Growth corridors as strategic frameworks for spatial development follow major European transportation routes and often build on the ideas of functional regions, although extending the scale of development to the interurban and transnational contexts (e.g. Zonneveld and Trip 2003; Drewello and Scholl 2015).

At the same time, new data analysis products and services such as artificial intelligence, machine learning and deep learning are becoming increasingly available for public and private actors, opening up the potential for actors to use new capacities for territorial development based on improved understanding of the spatial organisation of societies. Traditionally, the development of growth corridors has mostly leaned on conventional data sources such as statistical data based on administrative boundaries and data describing physical transportation flows along corridors. A more comprehensive understanding of the interrelations between actors and regions along corridors is lacking.

This paper introduces a comprehensive framework for corridor governance to support big data utilisation and hence evidence-based development in European growth corridors. The purpose of the framework is to broaden the perspective of corridor governance by directing attention to the different – physical, social and digital – dimensions of corridor development. The framework is then tested through three case studies that focus on exploring the possibilities of passive mobile positioning data for transport infrastructure analysis; social network analysis of project connectivities; and explaining fluctuations in national transport and commuting levels.

The paper begins by presenting the proposed framework and its aims and then describes practical examples from three case studies. After that, it discusses how this framework could be used in evidence-based policy-making for European growth corridors. In the conclusions, some key findings are emphasised regarding both possibilities and challenges related to new data sources.

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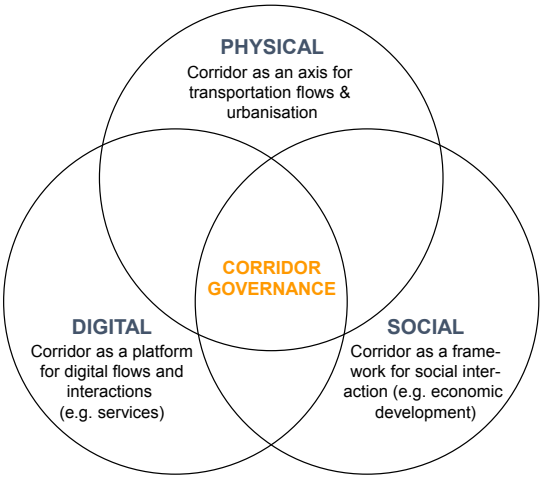
ii) Framework for identifying big data sources relevant to policy-making

The approach to identifying data sources is built on a conceptualisation of corridors as metagovernance frameworks of spatial development (see, for example, Zonneveld and Trip 2003; Jauhiainen and Moilanen 2011; Kalliomäki 2012; Moilanen 2012). Within this conceptualisation there are different, overlapping spatial dimensions in corridor development, which are characterised by numerous interactions and flows between the actors and places along the corridor. A conceptual framework is developed to support the identification of datasets with potential for describing diverse development practices and phenomena by sector, spatially and between the multiple actors involved in the spatial development of corridors.

The conceptual framework builds on the geographical conceptualisation of space as absolute, relative and relational (Harvey 1973), which in this context describes physical, social and digital aspects of corridor development (e.g. transportation flows, social and intellectual networks, and services). The framework presents a way to operationalise the theoretical conceptualisation of space as these three aspects of corridor development, which are often interrelated and overlapping (Figure 5.4.1).

Figure 5.4.1.
Conceptual framework describing the three overlapping spatial dimensions of corridor development that should be taken into account in comprehensive corridor governance



Traditionally, territorial policy-making in growth corridors has mostly utilised data describing the physical flows in space (e.g. transportation and commuting data), whereas the digital and social aspects of corridor functionalities have relied more on assumptions without a detailed knowledge base. Each dimension of corridor development might benefit from new big data sources. This, however, may require different strategies for data collection and utilisation. For example, the results of mobile positioning research have various implications for developing the corridor as a physical space (e.g. infrastructure planning), as a social space (e.g. balanced development, economic development) and as a digital space (e.g. service development) that are all present in comprehensive corridor governance.

iii) Practical examples

For the ESPON Targeted Analysis – "Potentials of big data for integrated territorial policy development in the European growth corridors"[64] – the approach described above was used to analyse three types of datasets in more detail to answer policy questions concerning territorial development within growth corridors. The geographical area of the analysis covers "the Northern Growth Zone" (NGZ) that stretches from Oslo via Örebro to St Petersburg. Southwards is the North Sea–Baltic corridor that connects the area of the Estonian case study to the NGZ. In addition, potential datasets have been mapped to widen the understanding of data utilisation possibilities on diverse scales relevant for corridor development.

64 See: https://www.espon.eu/programme/projects/espon-2020/targeted-analyses/big-data-potentials-big-data-integrated-territorial

CASE STUDY 1

E18 route traffic analysis

The goal of the first case study was to provide a view of growth corridor activity through traffic behaviour and provide a basis for developing a model of the relationship between the road traffic and economic data of municipalities by using machine learning technologies. The new data source used in this case study is the automated traffic intensity measurement (ATM) data that were recently made publicly available by the Finnish Transport and Communications Agency (Trafi). The aim was to explore the potential of these ATM data in corridor development and prepare for the combined usage of traffic data and diverse economic indicators of municipal development.

The visualisations of the origin–destination analysis take advantage of a predictive model. Methodologically, this has been produced by using a novel two-step approach: (1) detecting jamitons (self-standing traffic concentration waves (Flynn et.al. 2009)) and transforming traffic data to minimise the noise component created by the jamitons; and (2) approximating the transformed traffic flow by using a predictive model, which includes an origin–destination structure. There are two methods for creating such a predictive model: a least-square regression method using a set of traffic intensity rectangles (RRM) and a minimum description length (MDL) approach. The model is geographically generic, meaning that it is applicable anywhere the corresponding traffic data and similar economic indicators are available. Because of the constrained schedule, no road network analyses (Omatu and Seinfeld 1989) are covered and only the E18 road is included. Each measurement point has been associated with a small set of nearby municipal or postal areas to assign the economic descriptors properly in future studies. Currently, the model suits unsupervised learning, enabling the clustering of different municipalities and time periods. Supervised learning will commence when economic indicators have been organised and are available.

CASE STUDY 2

Network analysis of project partnerships

The goal of case study 2 was to analyse the open-source data on EU-funded regional development projects to create an understanding of collaborative relationships and their characteristics across regional and national boundaries. EU-funded regional development programmes have a joint and openly available depository for data on the projects and their partners, funding, themes and location. The project data acquired from the programming period 2014–20 correspond to 2 353 projects. A new dataset was generated that compares projects and NUTS areas, forming pairings for all the projects and their respective NUTS 3 areas. This approach enabled the development of a network of vectors connecting two areas that have a project connecting them.

Collaboration in the projects can act as an important catalyst for regional development and innovation, for example through joint knowledge creation and improved project management capacities (Astrov et al. 2018). Yet knowledge about project partnerships and connectivities is seldom used to support regional development strategies and practices in corridor development. Many project leaders welcome clearer quantitative evaluation criteria and indicators that would take into account the nature of the project and its geographical properties more coherently (Mavrič and Bobek 2015). The network analysis conducted enables the quantitative and qualitative evaluation of interactions between partners and interlinkages to be modelled (Bramoullé et al. 2016). Regional economic factors are analysed in relation to project partnerships, thus providing a fresh angle on the extant network analysis literature (cf. Huggins and Thompson 2017).

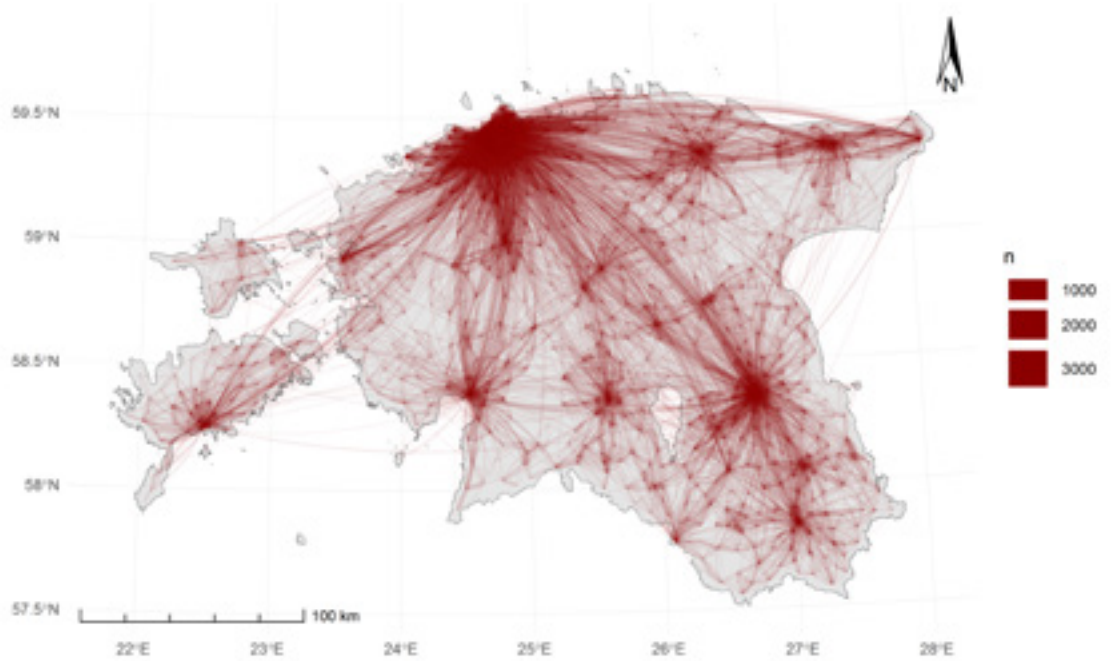
CASE STUDY 3

Mobile positioning data

The main purpose of the third case study was to develop a nationwide mobility database that contains data on the regular movement patterns of Estonian residents. The database was developed in collaboration with the University of Tartu and the Estonian Ministry of Economic Affairs and Communications. The main data input came from passive mobile positioning data. Passive mobile positioning data are automatically stored in mobile operators' memory files and contain information about the calling activities of mobile phone holders (anonymous user ID, time and location). This kind of data is widely recognised today as a good alternative in mobility studies (Chen et al. 2018). Every step of data collection, storing and processing followed EU data protection regulations.

Based on an anchor point model (Ahas et al. 2010), meaningful locations (home, work, leisure, household, etc.) were calculated from the mobile positioning data. These anchor points allow, for example, the investigation of regular mobility patterns (e.g. commuting) as well as more permanent moves such as changes of residence. Mobile positioning data have been successfully applied to study central places and functional urban regions (Novak et al. 2013). The spatial granularity of the database is planned to remain at the level of territorial communities. Everyday mobility is described as a movement between regularly visited places (home, work, leisure) (Map 5.4.1). The innovative aspect of the study is the usage of mobile positioning data in the production of a nationwide (official) mobility database for the first time. Thus, it is a good example how data from information and communications technology (ICT) applications can be used cost effectively to provide new information about the spatio-temporal behaviour of society (e.g. transport demand, commuting).

Map 5.4.1.
Example of OD-matrix for February 2017 based on mobile positioning data



iv) Potential of big data in relation to European growth corridors

Nowadays the arguments about functional corridors are often based on assumptions and strategic objectives without an adequate evidence base[65]. Infrastructure projects are used as measures in both competition and cohesion policies without adequate understanding of the suitability of these approaches to actual place-based needs (see, for example, Rodriquez-Pose 2018). There are currently very few detailed analyses of the functionality of growth corridors (See Nordregio 2005; Spiekermann and Wegener 2007; Spiekermann et al. 2015), highlighting the potential of big data in increasing the understanding of connectivities along corridors, e.g. between urban and rural areas.

Understanding both micro- and macro-level dynamics and mobilities becomes increasingly important in transnational corridor development that in the end aims to affect the behavioural patterns of, for example, individual citizens and companies and to develop more environmentally, socially and economically sustainable practices. For this reason, understanding the motivations and drivers of physical mobility highlights the significance of more a comprehensive examination of spatial connectivities, for example in different collaborative networks. At best, utilising big and open data can help create new businesses, enhance resource use efficiency and increase participation in and the transparency of decision-making. For example, smart mobility initiatives (e.g. mobility as a service) require vast amounts of data that can boost the functionality of a growth corridor. Furthermore, the potential of big data in corridor development is related in particular to an improved understanding of cross-border functionalities.

v) Conclusions

Portraying European growth corridors as frameworks for metagoverning spatial development highlights the role of evidence – and data – in planning processes to strengthen the legitimacy of corridor-based policies. Big data plays a central role in understanding the complex, often place-based development challenges and spatial connectivities that cannot be captured using traditional statistical datasets. The existing knowledge base could be significantly complemented by utilising big and open data sources and methods of analysis. Data utilisation in spatial development should not be restricted by the traditional territorially bounded understanding of how contemporary democratic societies should be organised (cf. Faludi 2018).

From the perspective of different datasets, understanding the various spatial dimensions of corridors, related to physical, social and digital spaces, is important for the appropriate design of policies and the efficient utilisation of research results. The factors causing movement along growth corridors should be at the very core of corridor development, since these issues cannot be affected by the individual actors at the lower levels of territorial development. Overall, the comprehensive approach to spatial development and the manifold questions related to the utilisation of big data in territorial policy development in the European growth corridors highlight the importance of policy integration in corridor-based development processes. Good territorial governance in new comprehensive development frameworks that surpass the traditional administrative territories is still hindered by the territorial realities of diverse administrative units and their functions, highlighting not only the need for a more versatile evidence base but also the need for common institutional capacity building in relation to answering data-related questions.

The conceptual approach presented could be utilised to widen the horizon of big data utilisation in corridor development. Furthermore, the framework is relevant for territorial development in general, as it can be applied to various scalar and sectoral contexts in an attempt to promote more sustainable practices based on new data sources. Yet, there are also several challenges in utilising big data in corridor development that need to be taken into account, such as the spatial dimension missing from big data components. In addition, new ways have to be developed to combine and harmonise the insights arising from new, unconventional data sources with the knowledge base used in existing decision-making processes. In general, most institutions are well aware of the importance and usefulness of big data, and it is mentioned in most agendas and strategic plans. In reality, however, the level of access to big data is still very low and poorly regulated, and hindered by fears related to, for example, the violation of privacy.

65 A study about the evidence base of corridor-based development was conducted in Finland in 2015–16: Kotilainen et al. 2016.

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5.5.
Profiling urban populations through mobile phone data: an application in the Milan urban region

Fabio Manfredini and Paola Pucci[66]

Key words: mobile phone data, Milan urban region, mobile populations

i) Introduction

This paper aims to explore the potential of mobile phone data for identifying and interpreting mobility practices and their space–time variability in contemporary cities to identify different mobile populations, in a specific setting: the Milan urban region (Northern Italy). These profiles of mobile populations can be relevant for defining their main needs in terms of mobility supply and for addressing interventions in relation to transport systems aimed at selectively enhancing accessibility to relevant urban functions located in a wide urban region that goes far beyond administrative boundaries. The research contributes to the definition of an integrated research protocol for monitoring mobility practices that can offer useful support to decision-making processes.

The paper is divided into three different sections. The first section (section ii) discusses the role of mobile phone data in urban studies with reference to the current scientific literature on this topic. In the next section (section iii), we present an application of mobile phone data analysis and mapping, for the classification of urban spaces and populations in the Milan urban region. Finally (section iv), we highlight the challenges faced by policy-makers, official statistical institutions and researchers when trying to integrate mobile phone data into their activities

ii) Mobile phone data as a "consolidated" data source for urban studies

Conventional data, mainly based on official statistics, appear to be increasingly inadequate for describing city dynamics and territorial development trends. One issue relates to the identification of the most relevant geographical scale on which to analyse urban processes that are not recognisable confined by administrative boundaries. An understanding of urban and territorial transformations requires more flexible data and tools. A second issue is related to the temporal dimension, which is almost completely absent from conventional surveys despite being one of the main elements that characterise contemporary cities.

In this general context, the use of new data sources, generated by users, can contribute to a better understanding of urban behaviours and to the definition of more user-centred policies. After a decade of study (Ratti et al. 2006; Kwan et al. 2007; Reades et al. 2007; Blondel et al. 2015), it is possible to state that mobile phone data have improved the understanding of urban and mobility practices. These data can simultaneously overcome the limitations of the detection latency time typical of traditional data sources and take advantage of the pervasive diffusion of mobile devices (Ahas and Mark 2005; Ratti et al. 2006; Reades et al. 2007).

Because of their characteristics (fine spatial and temporal resolution and ease of obtaining with minimum costs for providers), these data represent one of the most promising sources for the analysis, visualisation and interpretation of people's presence and movements in urban spaces and, in doing so, for informing policy-making processes (Ahas et al. 2010). In the field of urban and mobility policy, the applications of such data offer relevant contributions to:

- supporting the efficiency of urban policies and transport services with more detailed knowledge of the intensity of use of the city;

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- managing large and special events, also estimating the mobility demand and the spatio-temporal variation in population density, to offer guidance on future decisions on the provision of new urban services;
- updating origin–destination transport matrices, dealing with the behavioural mechanisms of the modal diversion process and operationalising travel behaviour studies;
- realising a land use classification based on mobile phone uses;
- managing environmental and industrial risks with information deduced from mobile phone data used as a "proxy" of the population exposed to specific risks.

iii) An application of mobile phone data in the analysis of urban spaces and populations in the Milan urban region

Our research on mobile phone data (Pucci et al. 2015) shows the significance of this data source for at least the following applications:

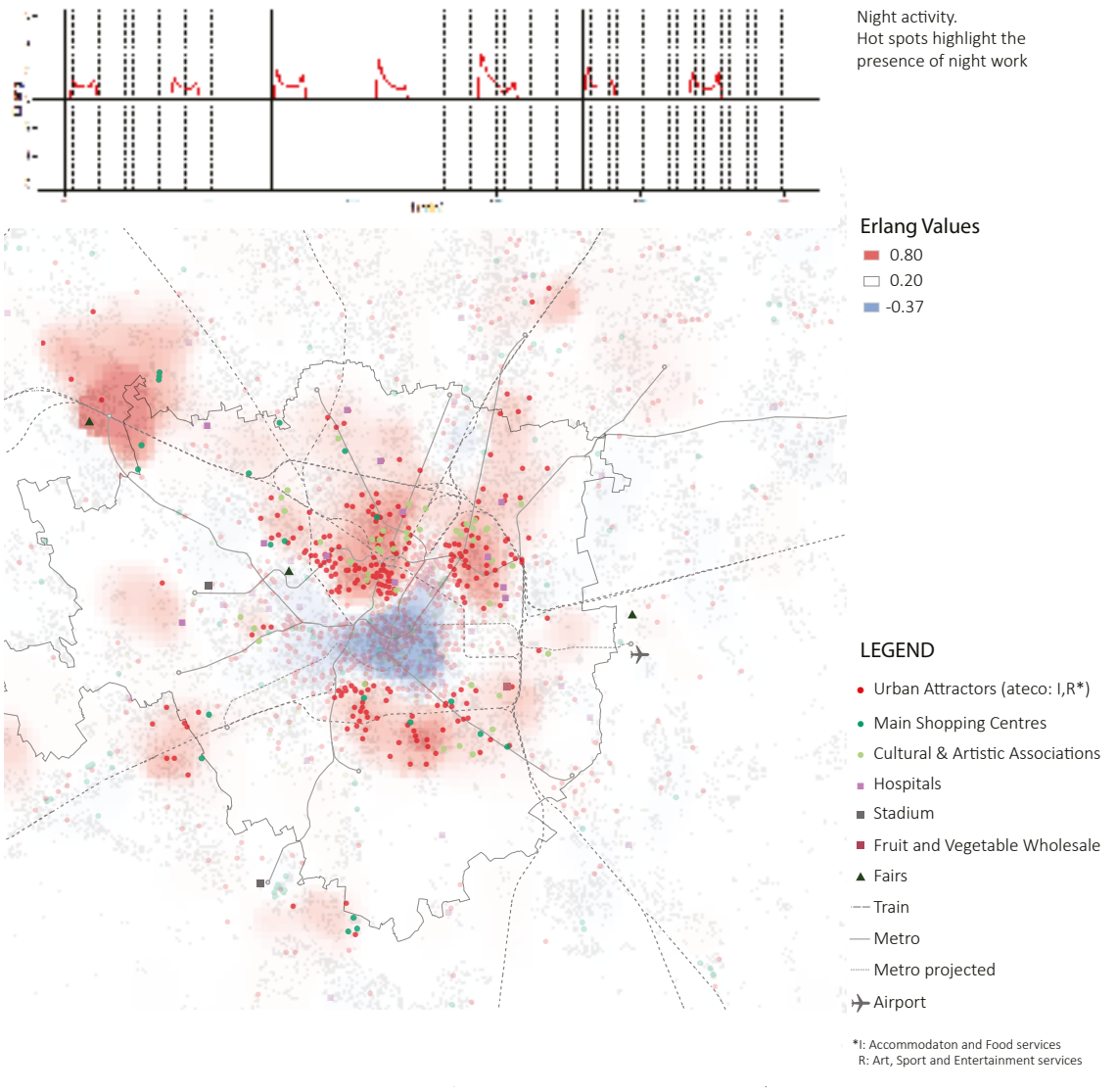
- monitoring in real time the density of people during a large event, such as the International Design Week in Milan;
- detecting the space–time variabilities of urban practices, providing information on temporary populations and city usage patterns;
- detecting prevalent flows and their intensity and variability to distinguish systematic from non-systematic mobility, as well as the recurrence of mobility practices;
- searching for relevant boundaries to deal with the variability of social and spatial relationships and with the multi-scalar dimension of urban practices.

The data concern mobile phone traffic registered by the network across the entire region of Lombardy in 2010. Data are expressed in Erlang, namely the average number of concurrent contacts in a time unit. The fine spatial resolution of this new data source can allow statistical aggregations able to overcome the limits of the spatial definition of traditional sources related to administrative boundaries.

The methodology is based on the integration of mobile phone data with conventional spatial data (land cover, infrastructure, distribution of activities, socio-demographic and economic data) and allows different profiles of mobile populations to be recognised and classified. These profiles could be relevant for defining main needs in terms of mobility supply and for addressing interventions related to transport systems, aimed at selectively enhancing accessibility to relevant urban functions. By applying a methodology named Treelet decomposition (Lee et al. 2008; Manfredini et al. 2012a; Vantini et al. 2012), we obtained a set of maps explaining patterns of both mobility and city usages (commuting, nightly activities, residential districts).

The maps show a basic temporal profile in the top panel, where the x-axis represents time, spanning seven days – from Wednesday to Tuesday at an hourly rate – and the mobile phone intensity, where the colours highlight the extent to which the profile explains overall mobile phone patterns.

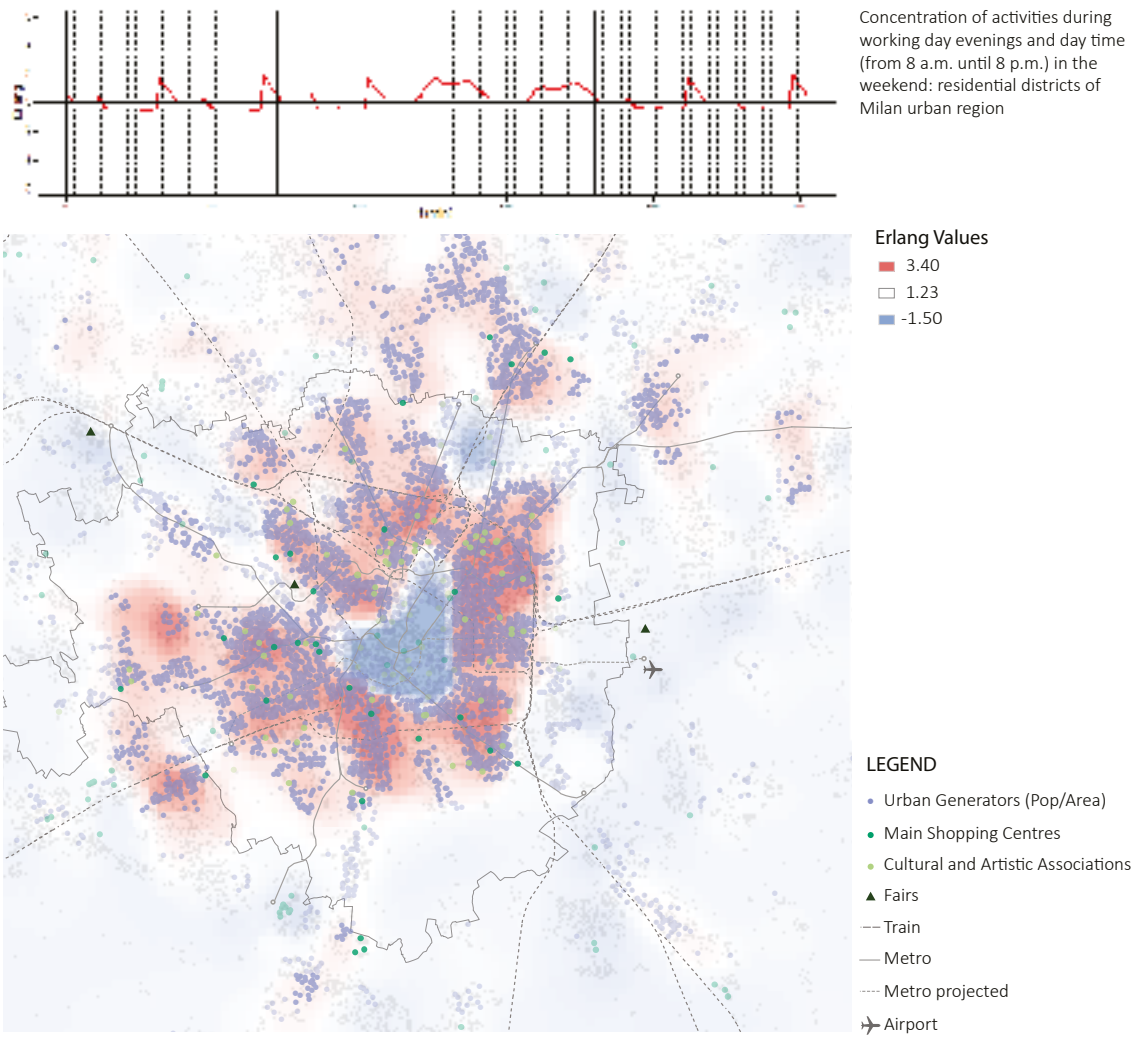
Map 5.5.1.
Night-time activity derived from mobile phone data



Map 5.5.1 shows, in red, the geographical distribution of night-time work activities within the Milan area. It is possible to detect some hot spots related to the exhibition districts in the north-western part and the fruit and vegetable wholesale market in the south-eastern part of the city together with a distribution of activity corresponding with the presence of urban attractors in the sector of accommodation, food and entertainment services derived from the 2011 census.

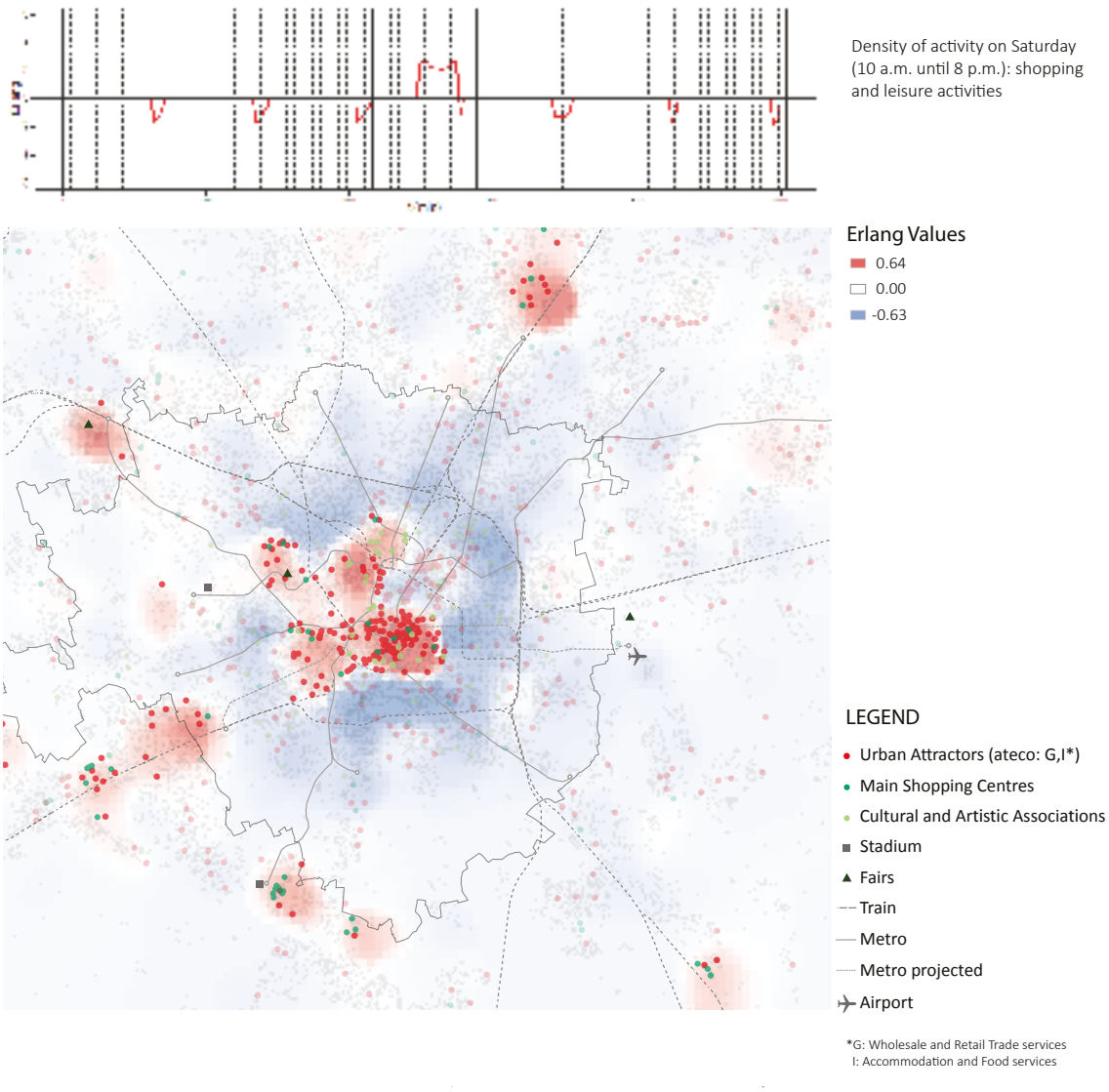
Because night-time populations refer not only to the inhabitants, but also to night-time workers and temporary populations, this methodology allows their spatial patterns to be mapped and the identification of situations located in a wide territory, where a high concentration of night-time activities denounces the dimension of this phenomenon.

Map 5.5.2.
Residential districts derived from mobile phone data analysis



Map 5.5.2 highlights the main residential districts along the second circular ring road where the inhabitant density reaches the highest value in Milan as well in some municipalities with large-scale social housing and residential neighbourhoods. The city centre is characterised by a low value of activity because of the progressive replacement of dwellings with offices, services and retail spaces that has occurred in the last decades. We added to the map the spatial distribution of high population density census blocks derived from the 2011 census to verify the patterns derived from mobile phone data. Even in this case, the integration of the conventional data with the new data source allowed the spatial variability of residential presence during specific hours of the day to be visualised. These areas can also be interpreted as urban mobility generators and therefore can be associated with the urban populations of commuter students and workers.

Map 5.5.3.
Shopping and leisure activities derived from mobile phone data analysis



Map 5.5.3 shows the density of mobile phone activity on Saturday during daytime and therefore related to shopping and leisure, an issue that is difficult to capture through conventional data sources. This phenomenon is once again completely different from those identified in previous maps of night-time activities and of residential districts in terms of both intensity and spatial distribution.

The geographical patterns of shopping and leisure activities point out the importance of not only the city centre but also the western urban sector, as well as the fairground area and several other dispersed centralities. The catchment areas of these centres, attracting a large number of mobile city users, cover a vast territory, which cannot be identified through conventional data based on fixed and static boundaries.

Despite the fact that the data analysed are from 2010, the research questions and methodology remain valid today because mobility in contemporary cities is more and more complex and new tools and methods are necessary to measure and describe it. Moreover, despite the fact that the real availability of mobile phone data is an open issue, the pixel-based aggregated format can easily be provided by mobile phone data providers. We therefore believe that the methodology could be replicated with minor changes to other spatial contexts.

iv) Challenges for mobility policy and official statistical institutions

This research contributes to improving the understanding of complex practices related to mobility and the temporary uses of urban spaces that occur in contemporary European cities by integrating different typologies of spatial data. Its outcomes could support decision-making processes in terms of the identification of different issues related to the spatial distribution of mobility patterns, and their spatial implications in terms of supporting equal access to urban opportunities. The interpretation of mobility trends derived from mobile phone data permits the definition of new needs in relation to a growing, dispersed and intermittent mobility demand, not clearly identified with traditional data.

Recent years have seen a growing debate on the potential contribution of new sources of data, based on information collected anonymously by users, to official statistics. The main issue relates to defining methods that are able to integrate new data sources with conventional data sources to overcome the limitations of conventional data in describing and measuring the phenomena that occur in urban spaces.

On the other hand, the real availability of mobile phone data at a European level is a relevant issue because of the huge fragmentation of providers in European countries and their lack of willingness to cooperate for public interest purposes such as an improved understanding of territorial development. The identification of conditions for the acquisition of private data by public institutions is a topic that needs to be fully addressed to define how this data source can contribute to a near real-time understanding of European spatial processes.

The original raw data are acquired by the network, processed directly by the company and provided to the scientific community in different formats, at different spatial and temporal resolutions and without an established standard for privacy issues, which is a dimension regulated by national laws.

Another point to stress is that mobile phone data must be interpreted, even with the help of conventional data sources (e.g. mobility data, land use/land cover data, socio-demographic data, census data) and other sources that have become available in recent years (open mapping websites, social media data and user-generated data in general).

This is important because integration among different data sources generates added value for the interpretation of complex territorial processes and provides a sense of concentrations and hot spots of mobile phone activity or anomalies at specific hours of the day, on specific days of the week and in specific seasons.

In this context, official statistical institutions, both at national and European levels, can play a relevant role in incorporating some of the methodologies and some of these new sources of data into their own tasks. First, they can act as public interlocutors of telephone companies to define formats and conditions to obtain mobile phone data for general interest. In this framework, the definition of public interest use of mobile phone data and the identification of a public agency (i.e. an official statistics institution) may lead companies to share some data for specific purposes.

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5.6.
Producing a simplified and harmonised map of European local administrative units (LAUs): when "less" offers "more"

Jacques Michelet, Frédéric Giraut[67], Erik Gloersen[68] and Ronan Ysebaert[69]

Key words: thematic cartography, innovation, Voronoï polygons, mapping layer, LAU

i) Voronoï polygons: from origins to ESPON context

The use of Voronoï diagrams is not new in cartography. British physician John Snow for example famously applied a similar method in 1854. He used it to illustrate how the majority of people who died in the Broad Street cholera outbreak in London lived closer to the infected Broad Street pump than to any other water pump. Voronoï diagrams have also been used in climatology, as a way of improving precipitation estimates by interpolating punctual measures over large areas (Thiessen 1919). They are also called "Thiessen polygons" as in this work. However, their use in cartography remained limited until the 1970s, when computer algorithms made it possible to automatise their elaboration.

Nowadays, most geographical information systems (GISs) offer automatic functions that make it possible to transform a set of points into tiles that are delineated using Voronoï operators. As a result, a variety of applications emerged with regard to geographical issues. For example, Voronoï operators can be used for:

- **assessing imbalances** between institutional subdivisions and functional socio-economic spaces, an approach that was developed in the early 2000s in South Africa (Geyer et al. 2000);
- **creating maps of fine-grained** spatial information (e.g. municipalities) on a large scale: to compare long-term demographic trends in 17 European countries on the basis of municipal data, Hubert and Moriconi-Ebrard (1999) developed a mapping layer with Voronoï cells, at a time when seamless, pan-European maps of municipalities were not available for researchers.

Within the ESPON programme, the initial impetus in 2012 for elaborating a Voronoï local administrative unit (LAU) layer came from a practical concern: at that time, LAU mapping layers were protected by copyright. To continue capitalising on the results of the GEOSPECS project after its completion (Gloersen et al. 2013), the University of Geneva came up with an innovative way to circumvent copyright maps, producing its own LAU map built on Voronoï polygons and overlaying these with copyright-free delineations of the European coastline. Thus, generalisation and its related advantages were not the goals per se, but collateral consequences of the method.

When ESPON launched the MapKits 2020 project with the aim of providing the programme with a coherent set of mapping layers and a coherent layout, preliminary reflections highlighted that mapping layers are used for two distinct purposes: analysis and mapping. When assessing whether or not individual

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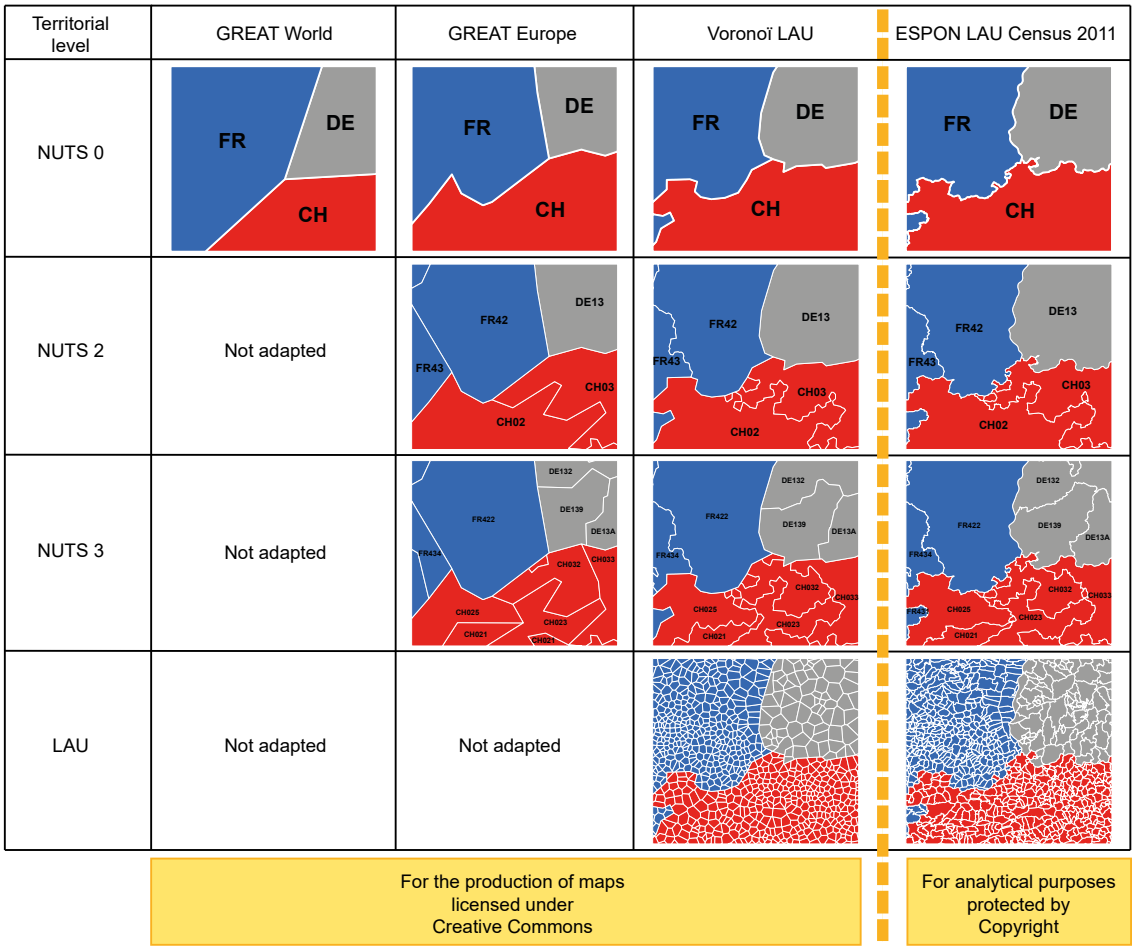
geographical layers may be suited to these purposes, a number of criteria need to be considered (Zanin and Ysebaert 2018), as follows:

- **For analyses,** the key criterion is precision. The ESPON LAU Census 2011 Map, based on a collection of various versions of the EuroBoundaryMap[70] to fit the 2011 census nomenclature with a resolution corresponding to a scale of 1:100 000, is perfect for that purpose.
- **For mapping,** the key criterion is informational value. The objective is to convey the cartographic message in an efficient way. This implies that "noise" (i.e. unnecessarily detailed boundaries) must be eliminated. A coherent set of generalised mapping layers has been produced, including the Generalised Representation for European Areas and Territories (GREAT) and a Voronoï "twin" of the ESPON LAU Census 2011 Map. The appropriate degree of generalisation depends on the scales on which the mapping layer will be used. The Voronoï layer is primarily planned to represent local data at transnational level. However, the production of pan-European maps showing local data is also possible.

Altogether, these layers provide the ESPON community with structured and coherent sets of geographical layers for analytical use and thematic mapping on various scales, designed to support the multi-level approach supported by the ESPON programme (Figure 5.6.1).

Figure 5.6.1.
Voronoï within the multi-level layers supply strategy of the ESPON 2020 MapKitx



70 https://eurogeographics.org/products-and-services/ebm/

ii) Production of ESPON Voronoï LAU layer

A Voronoï cell, also sometimes referred to as a Thiessen polygon, is the basic unit of a Voronoï diagram. A Voronoï diagram divides – tessellates – a two-dimensional set of points into areas, so that the borders of the resulting areas are equidistant from the nearest points. It means that, within a Voronoï cell, every location is closer to the point around which the cell is drawn than to the centre point of any other cell.

Details on steps leading to a pan-European LAU Voronoï mapping layer can be accessed in the MapKits creation process and data report (Gloersen et al. 2017). They can be synthesised as follows:

1. **produce a set of NUTS 0 polygons** covering all ESPON countries;
2. **generate centroids** out of the ESPON LAU census 2011 layer to ensure one-to-one compatibility between the two layers;
3. **adjust national borders:** some of the centroids appear on the "wrong side" of the terrestrial border (in black in Figure 5.6.2a); the adjusted border is shown in white;
4. **generate the Voronoï diagram** via an appropriate GIS command;
5. **make manual adjustments to preserve significant contiguities** such as coast, national border or lake (Figure 5.6.2b);
6. **make manual adjustments to preserve geographical coherence** for very large LAUs, e.g. in Sweden or French Guyana (Figure 5.6.2b);
7. **make manual adjustments for remaining errors** such as sliver polygons resulting from the clipping of the Voronoï polygons with the coastline;
8. **assemble the countries into a single shapefile:** the ESPON LAU Voronoï layer (Figure 5.6.2c);
9. **clean topological errors:** essential for further processing, such as aggregation, R automatised treatments and running cartogram software.

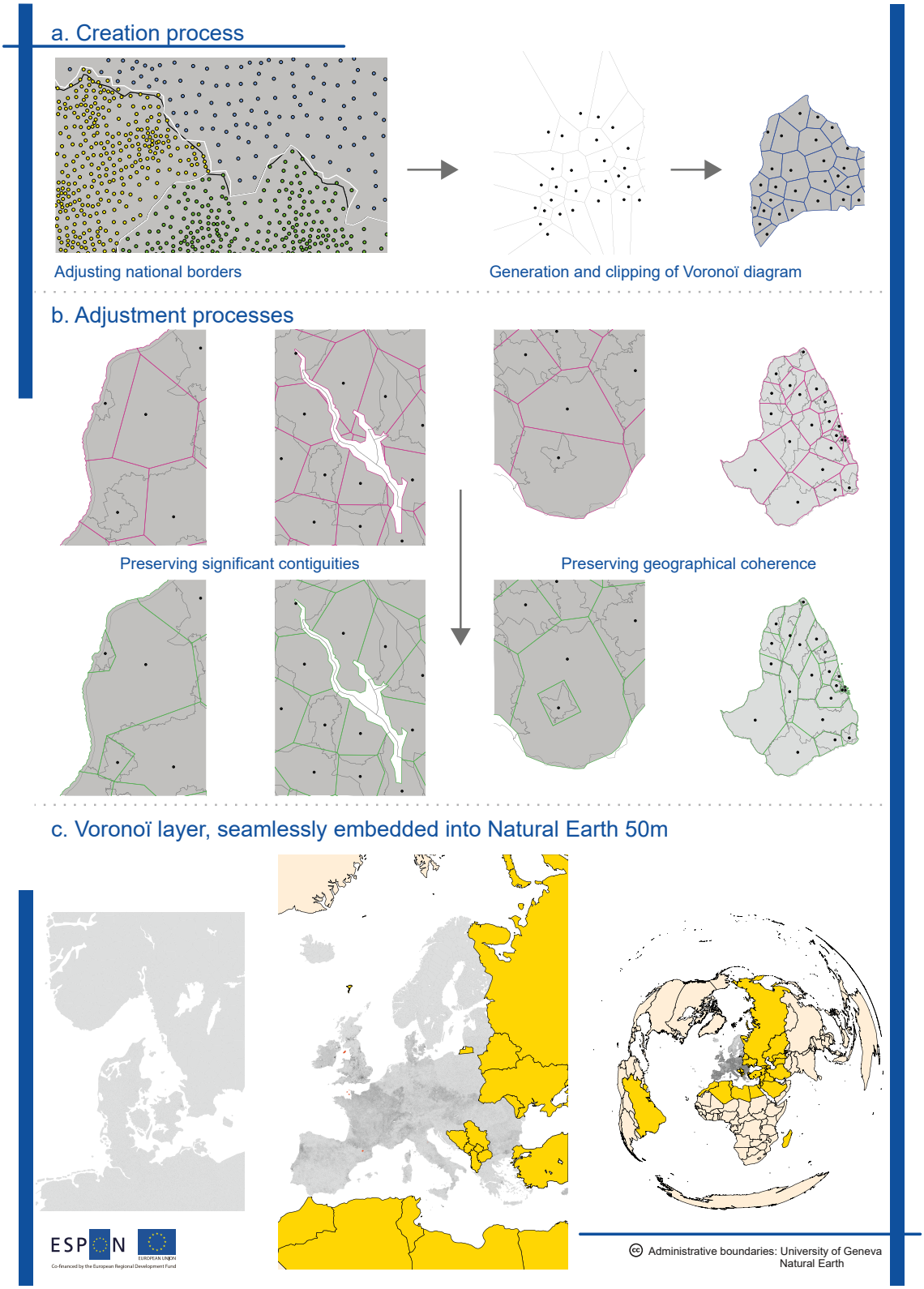
An exciting alternative would be to automatise parts – or the whole – of the creation and adjustment processes, e.g. using R or Python scripts. Given that all methodological steps have now been extensively described, their translation into computerised routines seems achievable. This does rise a series of methodological and technical issues, as some of the manual steps described above require geographical expertise. However, automatisation remains an option to be explored, e.g. within the framework of the updates of the EU LAU reference layer.

iii) "Less": specifications of the Voronoï mapping layer

The Voronoï mapping layer possesses a number of advantages related to the methodological choices made for its construction. The ESPON LAU Voronoï layer distinguishes itself in terms of the following:

- File size: while the size of the ESPON LAU census 2011 map layer, which is based on the EuroBoundaryMap, is 311 071 KB, the size of the Voronoï layer is only 796 KB. This makes its ".shp" file 800-times smaller than its detailed equivalent.
- The method offers an easy solution to producing a seamless map without the particular efforts required by the harmonisation of precise national layers. These layers are however necessary input material for generating centroids.
- Using exclusively open-source material, it is possible to customise it to meet the specific needs of the ESPON MapKit in terms of generalisation.
- It provides a very simplified pattern that offers real complementarity to the EuroBoundaryMap when mapping LAU statistics, or geographical objects based on LAU aggregation (e.g. urban objects, mountain massifs).

Figure 5.6.2.
Creation and adjustments, and the resulting mapping layer



iv) "More": innovative perspectives as the result

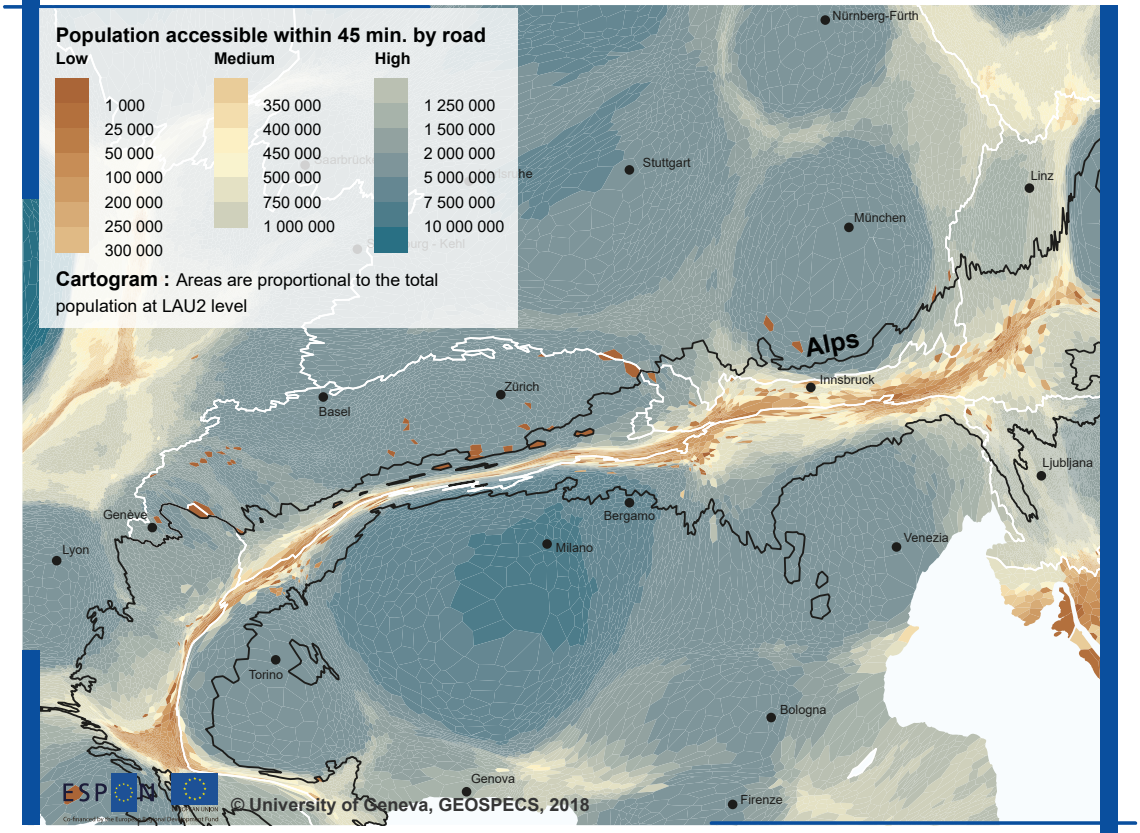
The Voronoï layer offers several advantages, in terms of both mapping (i.e. effectively and efficiently conveying cartographic messages) and processing (i.e. computer processing of spatial data). These advantages are linked to the small file size of the mapping layer file and to the high level of the generalisation of its boundaries:

- The Voronoï mapping layer is not only internally seamless. It also seamlessly integrates with boundaries of countries outside the ESPON space, as represented in the Natural Earth 50 m layer[71]. This makes the Voronoï layer particularly well suited to elaborating and running spatial models. Furthermore, this particular feature would allow the easy creation of LAU layers for countries that may join the ESPON space in the case of EU enlargement.
- Far from adding accuracy, an excessive level of detail generates visually counterproductive "noise" to maps above a certain level. For example, on maps covering all of Europe, a full surface of the colour of unit outlines appears on the west coast of Norway, while the colours of small German NUTS 3 units become illegible. In that sense, the Voronoï diagram is appropriate for conveying cartographic messages.
- Because of its high level of generalisation, only a small amount of computing power is required when processing these files in GISs or in editing programs such as Adobe Illustrator. This makes the production of maps faster and easier.
- The aggregation of LAU seamless units to produce maps of functional urban areas (FUAs) and all types of geographical objects is relatively easy. NUTS, FUA and core city delineations are already embedded in the Voronoï ".dbf" file of the ESPON 2020 MapKit, allowing the aggregation of LAU units into higher level territorial subdivisions. Similarly, users can incorporate their own territorial objects according to their needs (Map 5.6.1: LAU delineation of Alpine perimeter).
- In turn, simplified units that require less computing power facilitate the creation of innovative maps from classical GISs, for example the generation of cartograms or smoothing maps with tools such as ScapeToad and Magrit (Map 5.6.1).
- The small file size, in association with Creative Commons[72] licensing, makes the "on the fly" production of maps using interactive mapping portals feasible, even for pan-European maps. Meeting this specification is particularly relevant, as interactive cartography via web-based tools is becoming increasingly the norm for the dissemination of maps and data.
- Based on the Creative Commons license, the mapping layer can be widely disseminated, and used and updated by users such as European institutions, students and academics. In that sense, a seamless geographical layer, adapted to cartographic needs and matching EU statistics, fills a recurring need.

71 https://www.naturalearthdata.com/

72 https://creativecommons.org/

Map 5.6.1.
Cartograms at LAU level produced using Voronoï polygonss



Regional level: LAU2 (version 2011)
Source: Geospecs, 2012
Origin of data: Geospecs, 2012
© University of Geneva for administrative boundaries

v) Synthesis in view of ESPON 2020 objectives

With regard to the specific ESPON 2020 objectives – to (1) improve territorial observation and provide new tools for territorial analyses and (2) support researchers and policy-makers with innovative perspectives on the EU territorial structure – the Voronoï LAU mapping layer clearly meets the need for alternative spatial observations, which in turn support related policy discussions:

The opportunity to map LAU statistics at the transnational and European levels without having to handle mapping layers with a large file size and the possibility of drawing cartograms or smoothing maps should stimulate researchers to produce innovative territorial evidence on a local scale. As a result, a better understanding of specific territorial patterns and associated development issues is likely to support policy-making in terms of a place-based approach and integrated territorial investments.

- The possibility to aggregate LAU units so as to represent a variety of larger territorial objects provides a real alternative to traditional NUTS analyses. As demonstrated by the ESPON GEOSPECS[73] project and by the ESPON European Territorial Monitoring System (ETMS)[74] tool, it is, for example, possible to explore social, economic and environmental patterns and trends in a variety of functional areas, in mountain ranges, islands, sparsely populated areas and coastal zones. This makes it possible to produce evidence to support, for example, metropolitan strategies, community-led local development (CLLD) and integrated territorial investments (ITIs).

73 https://www.espon.eu/programme/projects/espon-2013/applied-research/geospecs-geographic-specificities-and-development

74 https://www.espon.eu/tools-maps/etms-tool-european-territorial-monitoring-system

The production of the Voronoï mapping layer echoes wider debates on how institutional actors, researchers and analysts may relate to some key challenges:

- Facilitating access to geographical data, and their use, may help to promote territorial approaches to addressing social, economic and environmental issues.
- The storage of data at the local level, and of information on corresponding nomenclatures, is a key challenge.
- By producing "open data", and making their availability known to relevant organisations, institutions such as ESPON may trigger major changes in policy-making practices.
- As discussed at the ESPON conference held in London on 14 November 2018, these highly simplified maps can be disconcerting for some users, who are used to traditional detailed representations of boundaries. Such simplified representations of spatial patterns must therefore be accompanied by explanatory statements.

The decision to opt for the Creative Commons licensing of the GREAT and Voronoï layers relates to the objective of the ESPON programme to realise a wider outreach and uptake of territorial evidence. Indeed, the idea is that, if more users access mapping layers and related datasets, the ESPON 2020 programme will have a greater impact on policy practices across Europe.

These fascinating perspectives are novel; therefore, there is a need to publicise the findings and for the ESPON programme to have a diffusion strategy to disseminate the tool to wider communities of users, outside the actual network of researchers and policy-makers. To draw all possible benefits from open-source mapping layers, relevant actors need to be made aware of their existence.

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