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tel. (42) 635 55 77

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PART I

MULTI-LEVEL ANALYSIS OF URBAN AND SPATIAL DEVELOPMENT IN TERMS OF POLICIES AND PROCESSES

Guest editors: Antonia MILBERT [*], André MUELLER [**]

FOREWORD: FRAMING THE VERTICAL OF THIS SPECIAL ISSUE

1. OPENING REMARKS

'Think globally, act locally' − this well-known phrase has become synonymous for the sustainability move launched by the Rio Declaration in 1992. The 2030 Agenda and the Sustainable Development Goals (SDGs) (UN 2015) and the New Urban Agenda (UN 2017) underline the crucial role of cities and communities, as

[*] Antonia MILBERT, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division People and Regions in Transition – Subjective and Objective Indicators, Thiemstraße 136, 03048 Cottbus, Germany; e-mail: antonia.milbert@bbr.bund.de, ORCID: https://orcid.org/0000-0002-3081-940X

[**] André MUELLER, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division European (and International) Spatial and Urban Development, Deichmanns Aue 31–37, 53179 Bonn, Germany / University of Bonn, Faculty of Mathematics and Natural Sciences, Department of Geography, Meckenheimer Allee 166, 53115 Bonn, Germany; e-mail: andre.mueller@bbr.bund.de

well as sub-national stakeholders in promoting the SDGs. Therefore, it seems indispensable that a common understanding across all levels of governance shall be achieved with regards to the necessary monitoring and implementation steps. This is what is to be understood as 'verticalisation:' pursuing the approach of the SDGs is a question of (i) applying appropriate research methods, data and indicators, and (ii) addressing policies in the same way as integrating stakeholders and thus following adequate processes and references (Wong *et al.*, 2021; Alibašić, 2017).

Against this background, it seems indispensable, however, to leave the familiar path of 'business as usual' – a singular, un-networked and incompatible action format and perspective – and team the knowledge of individual actors and empirically substantial on-site studies before launching or even establishing corresponding urban and spatial observation mechanisms and systems (Zhang, 2017; BBSR, 2022). The United Nations agreed upon guiding and framing political documents in order to install permanently such cross-hierarchical or verticalised networks and monitoring environments aiming at a broad impact. Pioneering initiatives of cross-vertical cooperation embracing all hierarchies thus exist. In addition, numerous single strategies, definitions, and measuring approaches for urban development are in place for cities and communities of all sizes and geographical locations.

This special issue gathers scholars and decision-makers from different countries and geographies in order to discuss specific place-sensitive, as well as people and institution-oriented ways of cross-vertical cooperation and verticalised multi-level monitoring systems. In that respect, the editors and authors of this special issue add to the verticalising approach the multi-level approach by asking the questions: which patterns and impacts on the micro, meso and macro levels may be analysed? Which benefits does a cross-vertical cooperation create? Which solutions may be transferred to another policy regime and/or geographies? All articles of this special issue address at least one of these methodological, empirical, and policy-relevant questions of multi-level analysis.

2. CONNECTING THE VOLUME PAPERS TO THE TOPIC OF THIS SPECIAL ISSUE

This framing article by Antonia Milbert and André Mueller aims at providing readers with some guidance in experiencing this special issue and connecting its papers to the topic of multi-level analysis of urban and spatial development.

Antonia Milbert, André Mueller, Debolina Kundu and Pragya Sharma on *Verticalising the multi-level analysis of urban and spatial development across geographies* open this special issue and explore the topic on the basis of analytical work, which was conducted between 2018 and 2023 in the framework of a re-

search cooperation between the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) within the Federal Office for Building and Regional Planning (BBR) in Bonn / Berlin and the National Institute of Urban Affairs (NIUA) in New Delhi. The joint analytical work aimed at taking a scientific perspective on data-based multi-level analysis of urban and spatial development and agreeing upon common indicators that are suitable for national and subnational alike, as well as regional and local levels within an international framework. Their article detects and reveals the pitfalls of verticalised monitoring of the SDGs for each geography – Germany, but also Europe, and India – and draws an overall conclusion for research and policy in terms of concrete data work.

Robert Ndugwa and Dennis Mwaniki on *A global perspective on the value of multi-level analysis as an enabler for achieving SDGs* take the second place in this volume in order to illustrate and discuss the analytical work of the Data and Analytics Session of UN HABITAT. Their daily analytical work focuses, amongst others, on the notion of 'leave no one behind' and measures, for example, the accessibility of Services of General Interest. In pursuing this aim, their Global Urban Observatory applies remote data transmission to measure in an exemplary mode this access for a population. Their call for respectively standardised indicators includes also the request of a common understanding of what a city, community or settlement is in terms of statistics and based, for example, on the built-up area. The SDG 11 on Sustainable Cities and Communities is thus key for their analytical work. Despite the challenges related to Big Data, they also stress the need for data that is collected on a voluntary basis. Citizens Sciences seems to be a notion familiar with the United Nations and their organisation services.

Oliver Peters and Henrik Scheller on the *Adding value by national reporting to sustainability approaches of the local-regional level* are the third in the row of articles. Their draw on their data-based experiences made in working with cities and communities of different sizes and geographical locations in Germany while developing in cooperation with the BBSR the first National Progress Report of Germany on the Implementation of the New Urban Agenda of the United Nations. This report is supposed to be a blueprint of integrating local perspectives on sustainability into national reporting mechanisms. Despite its 'success' the authors also indicate its limits. With regards to further research needed, they underline the necessity of combining quantitative and qualitative approaches in analysing and monitoring the development of cities, communities, and territories. An orientation towards data is thus to be accompanied by a guidance of local-regional development principles.

Marco Kellenberger on *Multi-level territorial monitoring in Switzerland as a case in federalism and multi-polarity* closes the series of articles attributed to analytical tools and monitoring systems in the broader context of a single nation, groups of nations or the globe. The author links the notion of territorial or spatial monitoring of sustainable development to the specific constitutional framework conditions of a federally organised country as Switzerland is and where cities and

communities are autonomous. The author illustrates the thereby defined roles of the institutions and their way of working in order to turn the notion of sustainable development into an endeavour of everybody. A multi-level analysis of urban and spatial development would thus become rather a multi-polar approach.

Philipp Gareis and Christian Diller on *Identifying exurbs: A multi-criteria approach for Germany* are the first ones in the second series of special issue articles dealing with the added value of multi-level analysis of urban and spatial development for the practice in research, planning, and policy. The English-American phenomenon of exurbs – areas which are neither urban nor suburban– may obviously also be identified in Germany in the sense of a multi-level analysis of urban and spatial development. If this migratory move, by applying the same multi-criteria set, is also be retraceable in Germany, what this would mean for policy and planning. The authors have thrown the first stone into the water of discussion and are looking forward to receiving feedback and resonance.

Andrea Jonas and André Mueller on the *Impact of learning city networks on multi-level urban development and transformation processes* finally draw on experiences having been made for more than a decade in hands-on urban laboratories across the Atlantic Ocean in this second series of articles and thus close the entire special issue. D4UC has become synonymous with a form of transatlantic cooperation of cities and communities that is unique. City pairs and city peers on both sides of the Atlantic Ocean, but also in other countries, support each other in the daily administrative and urban planning work. Which are these unique characteristics? Would they last for long or are they just 'à la mode'? Is the cooperation of cities and communities of different cultural backgrounds helpful in striving for multi-level analytical and implementation approaches to sustainable urban and spatial development and attaining respective goals?

The authors of the papers as well as the guest editors of this special issue would like to thank all reviewers for peer-reviewing the articles.

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INVITED ARTICLES

Antonia MILBERT[*], **André MUELLER**[**], **Debolina KUNDU**[***], **Pragya SHARMA**[****]

VERTICALISING THE MULTI-LEVEL ANALYSIS OF URBAN AND SPATIAL DEVELOPMENT ACROSS GEOGRAPHIES

Abstract. Making the analysis of urban and spatial development more acceptable by all levels of analysis and governance requires a multi-level – or in other words vertical – approach to indicators measuring development paths. The 2030 Agenda of the United Nations with its 17 Sustainable Development Goals offers a promising chance to establish, maintain, and further develop a monitoring system that is supported by all levels involved, as well as all stakeholder groups and individuals across all levels. First experiences gathered in a nation (Germany) and bilateral and supranational

[*] Antonia MILBERT, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division People and Regions in Transition – Subjective and Objective Indicators, Thiemstraße 136, 03048 Cottbus, Germany; e-mail: antonia.milbert@bbr.bund.de, ORCID: https://orcid.org/0000-0002-3081-940X

[**] André MUELLER, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division European (and International) Spatial and Urban Development, Deichmanns Aue 31–37, 53179 Bonn, Germany; University of Bonn, Faculty of Mathematics and Natural Sciences, Department of Geography, Meckenheimer Allee 166, 53115 Bonn, Germany; e-mail: andre.mueller@bbr.bund.de

[***] Debolina KUNDU, National Institute of Urban Affairs (NIUA), 1 & 2 Floor, Core 4B, India Habitat Centre, Lodhi Road, New Delhi 110003, India; e-mail: dkundu@niua.org, ORCID: https://orcid.org/0000-0002-7391-137X

[****] Pragya SHARMA, National Institute of Urban Affairs (NIUA), 1 & 2 Floor, Core 4B, India Habitat Centre, Lodhi Road, New Delhi 110003, India; e-mail: psharma@niua.org, ORCID: https://orcid.org/0009-0004-1290-9665

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context (Germany, Europe, and India) deliver recommendations for research and practice, and might thus show a possible way to attain successfully this goal.
Key words: sustainable development, 2023 Agenda, Sustainable Development Goals, multi-level analysis, verticalised indicators.

1. OPENING REMARKS

Increasing awareness amongst several indicates that implementing the 'global' Sustainable Development Goals (SDGs) of the United Nations should be handled in a 'localised' manner (Sterling *et al.*, 2020). The well-known phrase 'think globally, act locally,' invented at an even earlier stage in fact, became synonymous with the Rio Declaration of 1992 and raised thousands of local agenda groups (Biermann *et al.*, 2022). Amongst this awareness of manifold local political actions, as well as initiatives and a sensitivity for encompassing these processes with a data-based monitoring, a gap may still be identified. The paper thus discusses the need for and experiences made so far in localising – or to be more precise verticalising – indicators gathered or developed from scratch in order to monitor the implementation of the SDGs. In addition to this verticalising approach, a multi-level approach is also applied. The first part of the paper clarifies the concepts of verticalisation and multi-level analysis. The second part reveals experiences made in the multi-level analysis of urban and spatial development, conducted in the context of an exemplary comparison of spatial structures and trends in Germany (but also Europe) and India. The third part of the paper finally draws a conclusion for policy and science.

2. FRAMING THE VERTICAL ELEMENTS OF ANALYSIS

Multi-level analysis in statistical terms mostly handles the individual level in the context of group-related or regional conditions as a hierarchical challenge (Hox and Kreft, 1994; Hox *et al.*, 2017). The smallest level is not necessarily a synonym for individuals. In multi-level analyses in general, any hierarchical order of micro, meso, and macro units is applicable, as well as a hierarchy of administrative units. A multi-level analysis is thus the generic term for estimating models like random-coefficient models, Bayes models or hierarchical linear models (De Leeuw and Meijer, 2008; Hox *et al.*, 2017; Snijders and Bosker, 2011).

A multi-level analysis in the context of the SDGs discussed herewith means establishing consistent hierarchical orders of SDG indicators and analysing the

patterns and impacts on the micro, meso, and macro levels without modelling the statistical coefficients and effects. Verticalising indicators and measures across the local and the regional (as micro levels), up to sub-national and national (as meso levels) and the international or global (as macro levels) is a necessary condition for data-based monitoring of the progress (or regress) made in achieving the SDGs.

Taking SDG 11.6 (By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management) might help to sketch the concept of verticalising indicators and multi-level analysis across the macro, meso, and micro levels. As more people are exposed to higher particulate matter pollution in cities than in rural or less densely populated areas, reducing the pollution is part of this sub-goal of SDG 11, referring to cities and communities in general. Above-average concentrations of particulate matter concentrations in the air may cause diseases of the respiratory and cardiovascular system of human beings and animals, increase the risk of developing other diseases, and are partly the reason of premature mortality (Destatis, 2021, p. 28). The Sustainability Strategy of Germany as central document related to the implementation of the 2030 Agenda in Germany lists the respective indicator under SDG 3 (Good Health and Well-Being). According to this strategy, the proportion of people who are exposed to concentrations of PM10 above 20 µg/cubic m – the WHO limit– should fall to zero by 2030 (Destatis, 2021, p. 28). The indicators unfortunately exclude those measurement stations where traffic constitutes the main source of emissions and thus probably underestimates the effective proportion of the population exposed (Destatis, 2021, p. 29).

The Länder in Germany as the meso level in the country equipped with competence in decision-making on and designing the implementation of the SDGs differ significantly in their settlement structure. North Rhine-Westphalia, as a heavily urbanised Land, covers the issue of fine dust pollution in its Sustainability Report but measures it as an average annual concentration (Landesregierung Nordrhein-Westfalen, 2021, p. 16). A rather rurally structured Land like Bavaria, for example, does not include the indicator in its Sustainability Strategy. The Bavarian State Office for the Environment regularly publishes figures on air quality at measurement stations, annual average PM10 values, and the number of days when the limit of 40 µg/cubic m as reference value provided by the European Environment Agency is exceeded (LfU, 2022). Interpolations between the monitoring stations across Germany and its total area covered illustrate a higher rate of particulate matter in cities but also the wind drift and larger concentrations of PM10 in rural areas and in the North German Plain (BBSR, 2022a, p. 122). The very diverse burdens in cities also become apparent. It therefore, seems indispensable for cities and communities, as the micro level, to know in which areas of a city or community the population is exposed the most to pollution and where respective actions are primarily needed. A consistent data and indicator system constitutes

a prerequisite for identifying air pollution hotspots, evaluating the urgency of an action, as well as its coordination with other actions across all levels of coordination. Air pollution with reference to PM10 (or even PM2.5) should thus be measured for all cities and communities on the same basis, aggregated to Länder levels, as well as to the national level in order to reach a consensus on coordinated actions to be taken and finally achieving the target set by the respective SDG.

On each level, the use of data is key for an evidence-based policy. Data, for instance, on the growth rate and patterns of urban settlements is elementary for governing urbanisation by properly providing public services (Mwaniki and Ndugwa, 2021, p. 34). Local and regional data mirrors the contribution of the micro levels in achieving a goal (Lange *et al.*, 2020). Furthermore, not only regionally varying situations need different strategies in achieving the goals, but also regionally different political landscapes and subnational constitutions thrive the SDGs on different pathways and at varying speed (Alaimo and Maggino, 2020). Paragraph 45 of the United Nations 2030 Agenda Declaration highlights the important role of municipalities and regions in implementing the SDGs and a need for a close collaboration of national governments and regional and local authorities, as well as subregional institutions (United Nations, 2015). In addition, the New Urban Agenda of the United Nations constitutes a particular roadmap for sustainable urban development in accordance with the SDGs via an integrated and coordinated manner amongst all relevant actors at all corresponding levels (United Nations, 2017, paragraph 9).

Nevertheless, this cross-vertical collaboration remains underdeveloped (Lohse, 2017). Issues of verticalising data and indicators are seldom underpinned (Milbert *et al*., 2021). The main reason is that much more experience exists in horizontal harmonisation. The United Nations Statistic Division (UNSD) and other large international statistical offices like Eurostat or the respective organisational units of the Organisation for Economic Co-operation and Development (OECD) work on harmonised international statistics on the macro and to some extend also on the meso level. The starting point of this work are the databases, established decades ago, not necessarily meeting the data needs of the SDGs in general and the SDGs on the micro level (Milbert *et al.*, 2021). Since the release of the SDG Indicator Framework by the United Nations, there have been several attempts to compare and integrate all indicators into one measurement system and detecting the hierarchical relationships of all 17 SDGs (Kumar *et al.*, 2017).

However, when local agenda groups started their work in the 1990s, indicators mainly had to support local activities. Therefore, local data and indicators rarely fit into national or global indicator frameworks and are even not comparable to other cities or communities (Milbert *et al*., 2021). In consequence, the reasoning and language between the global institutions as top-down-oriented process drivers and local actors as bottom-up-oriented process drivers hinder in most cases a common understanding of indicators.

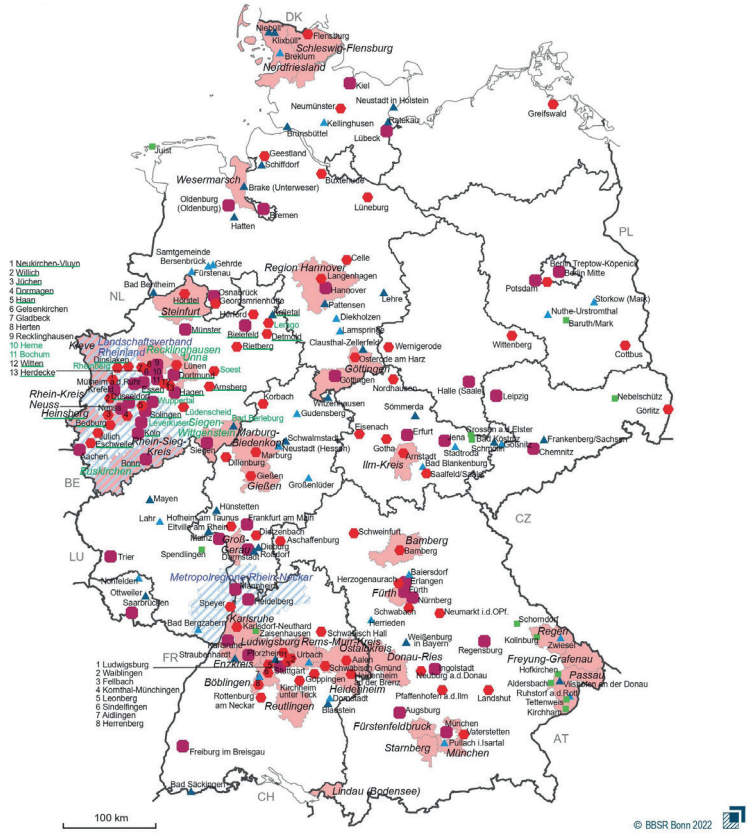
Overall, there is a lack of comparability between the levels in terms of clearly defining goals and applying respective data for monitoring purposes in order to be able to prove (or disprove) a progress (or regress) in achieving a target. Autonomy and responsibility of the various levels for designing strategies and measurement tools has led for decades to developing in parallel varying sustainability targets and respective indicators systems. This also applies to the data question. Despite the commitment(s) of everybody to involve the local level (better) in a successful implementation process of the SDGs, national and global reports still refer mainly to national (and global) statistics. However, the informative value of various indicators referring to the local level is often different from the one of functional regions or nations, due to inter-communal and intra-regional exchange formats and interrelations as such. Apart and in addition to the challenges of data availability, a mutual understanding of a 'common indicator language' needs to be developed and applied continuously. Chapter 3 offers some respective examples.

Some positive examples of overcoming these obstacles exist: one is a joint endeavour of the scientific community, consultancies and administrative umbrella institutions, which started in 2017 in order to determine sub-goals of all 17 SDGs relevant for municipalities in Germany. This joint exercise aimed at transferring existing SDG indicators to a reliable and valid set of indicators for which data is publicly available (Bertelsmann Stiftung *et al.*, 2020). This set also constitutes the monitoring basis of the first National Progress Report on the implementation of the New Urban Agenda to which nine communities of different sizes and geographical positions in Germany contributed with own compatible analyses (BBSR, 2021). This approach has been taken further by an ongoing applied research project aiming at scientifically accompanying communities in developing the so-called Voluntary Local Reviews compatible with higher levels of monitoring and reporting (see Fig. 1; BBSR, 2022b). In addition, this set of indicators is the guiding framework for conducting a comparative analysis of spatial patterns of sustainable urban and regional development in Germany (but also Europe) and India, as aforementioned and to be discussed in the following.

3. TAKING A SPATIAL PERSPECTIVE AT SOME SDGS AS VERTICAL REFERENCE POINTS

This paper mainly refers to analytical work conducted in the framework of a research cooperation that was signed in 2018 between the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) in Bonn, and the National Institute of Urban Affairs (NIUA) in New Delhi. This cooperation has aimed at analysing local, regional and subnational structures and patterns of sustainable development. So far, indicators have been examined with regard to

SDG 3 on Good Health and Well-Being (Binot *et al.*, 2020b), SDG 4 on Quality Education (Binot *et al.*, 2020c), SDG 5 on Gender Equality (Binot *et al.*, 2022b), SDG 7 on Clean and Affordable Energy (Binot *et al.*, 2023), SDG 8 on Decent Work and Economic Growth (Binot *et al.*, 2022c) and SDG 11 on Sustainable Cities and Communities (Binot *et al.*, 2020d) in the same way as awareness has been raised for spatial structures and urban typologies (Binot *et al.*, 2020a).



Municipal signatories of the specimen resolution „The 2030 Agenda for Sustainable Development: Building Sustainability at the Local Level" of the Association of German Cities and the German Association of the Council of European Municipalities and Regions as of December 2022

according to BBSR types of municipalities

	number Munic. signa.	number GNK NRW
large cities (100,000 inhab. and more)	49	13
medium-sized towns (20,000 up to below 100,000 inhab.)	69	18
smaller-sized towns (10,000 up to below 20,000 inhab.)	30	2
small towns (5,000 up to below 10,000 inhab.)	26	-
rural municipalities	13	-

	number Munic. sign.	number GNK NRW
counties	32	6
associations	2	

Ansberg Municipal signatories
Soest Globally Sustainable Community in NRW (GNK NRW)
Düsseldorf Municipal signatories and GNK NRW

Böblingen Municipal signatories
Euskirchen Globally Sustainable Community in NRW (GNK NRW)
Steinfurt Municipal signatories and GNK NRW

*Nibüll and Klixbüll are communities in Südtondern, which is classified as a small town.

Source: Engagement Global gGmbH - Service Agency Communities in One World (SKEW), Spatial Monitoring System of the BBSR
Geometry: municipalities and counties (generalised borders), 31/12/2020 © GeoBasis-DE/BKG, Author: A. Milbert

Fig. 1. Municipal signatories of the specimen resolution on the 2030 Agenda
Source: BBSR, 2022b.

This empirical work was meant to work with and – from a scientific point of view – agree upon joint indicators suitable alike for subnational, regional, and local levels within the given international framework. The indicator set considers the different development statuses of Germany (but also Europe) and India and, therefore, includes additionally specific indicators of particular interest for one country, although the respective sub-goal might have already been achieved in another country. Examples in that respect are SDG 5.3.1.1 on Child Marriage and SDG 7.1.1 on Access to Electricity. The main findings considering the methodological approach taken are discussed in the following section. In that respect, it is to be underlined that the research cooperation was not meant to conduct a direct comparison of all indicators at respectively comparable spatial levels – an approach that is extremely difficult or even impossible to exercise, given different national constitutions. On the contrary, it aimed at identifying existing subnational indicators related to the SDGs by applying a common data language, as well as interpreting their significance in the respective geographical framework conditions.

3.1. Suitability of cross-international local and regional indicators

Some of the identified indicators are difficult to compare in an international perspective. This is mainly the case where systems and requirements or basic needs are varying. A prominent example are the education systems of the countries (related to SDG 4). This is the same with some sub-goals of SDG 11, because they often address different needs: while authorities and stakeholder groups in India have to deal with slums as well as informal settlements and ways to organise them and provide essential services of public interest, the goal in Germany is to make housing affordable for everyone and reduce the land consumption for settlement purposes (Binot *et al.*, 2020d). Nevertheless, the spatially disaggregated data has revealed fruitful insights in spatial patterns for a targeted spatial and urban planning in each country.

Another aspect is that national accounts are sometimes based on different statistical units. As in many other countries, the economic performance is measured in Germany by the Gross Domestic Product (GDP) and the Gross Value Added (GVA). In India, it is the State Domestic Product (SDP). Respective numerical values are not directly comparable, because GDP and SDP reflect different methods in a common accounting system. It is to be questioned whether an increase in prosperity measured by GDP or SDP (see Fig. 2a and 2b) might actually, in the sense of sustainability, have a positive impact on everybody – with reference to the United Nations (2015) asking for a 'people-centred set of universal and transformative goals and targets' – and the suggested indicator on annual GDP growth would be appropriate to measure SDG 8 (Binot *et al.*, 2022b).

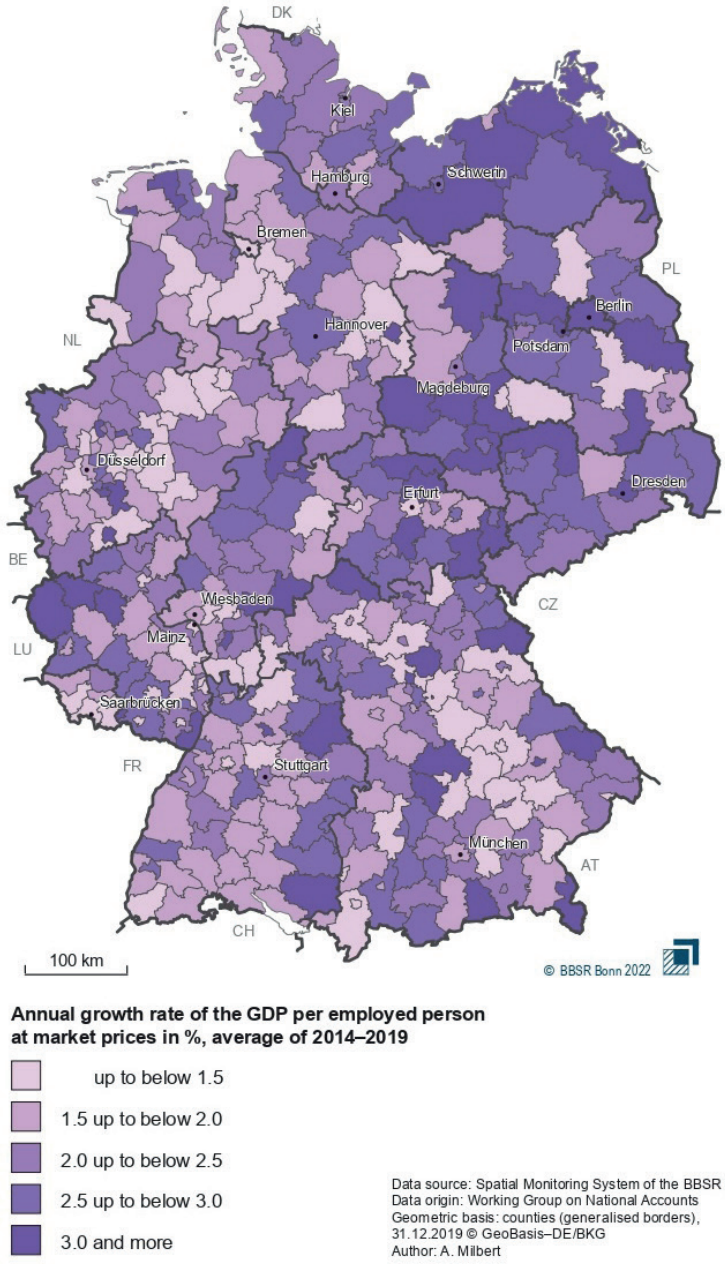


Fig. 2a. Annual growth rate of the Gross Domestic Product per employed person in Germany
Source: Binot *et al.*, 2022c.

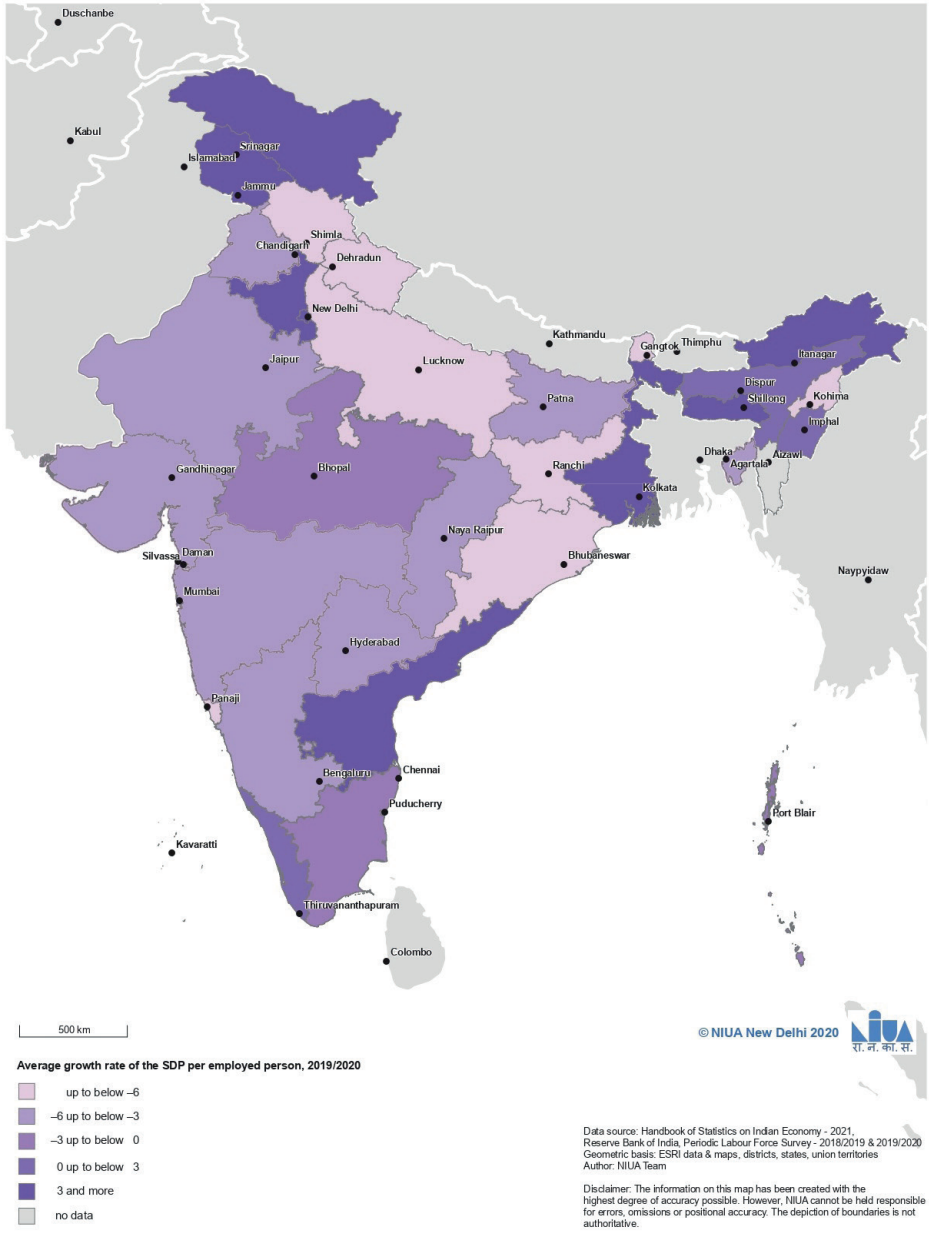


Fig. 2b. Annual growth rate of the State Domestic Product per employed person in India
Source: Binot *et al.*, 2022c.

3.2. Data availability on highly disaggregated levels

The available data on the micro level seldom fulfils the requirements of highly disaggregated level information with regard to age, gender, skill or social status. A policy demanding to 'leave no one behind' would need such fine granular data information. However, core statistics on the local and regional levels, as well as personal data protection mechanisms prohibit the use of numerical values beyond the aggregated total sum of inhabitants or employees. Therefore, the people-centred goal of leaving no one behind cannot be measured on the local level of communities and cities. The spatial picture of disaggregated level information thus delivers only a rough idea on SDG 8.5 of where all women, men, young people, and persons with disabilities might find decent working places (Binot *et al.*, 2022b).

Another important aspect to consider is that socio-economic factors influence the health status of a person, as well as the health care situation of an authority, institution or territory – independently from the development status of the related country. Maps on Germany and India both reveal this correlation (see Fig. 3a and 3b): the higher the economic level and the average income of a region is, the higher the life expectancy there is. Better skilled workers generally move to regions with higher economic outputs and are able to pay for better healthcare there.

Sometimes, data is collected via web search or it is estimated, as no reliable surveys of official statistics exist in a local and regional context. This approach is remarkable, particularly in countries where a respective national legislation exists. An example herewith are women's quota in bodies of political representation (see Fig. 4a and 4b). Quota exist in India with regard to their Panchayati Raj Institutions. In Germany, too, a respective (voluntary) quota for women exist, yet there is no obligation to publish the results of elections or the representation per gender of women and men in parliaments.

3.3. Suitability of the local level

Pre-selecting respective indicators incorporates a certain responsibility of (and affordability for) cities and communities to (voluntarily) contribute, although the local level might not always be the appropriate level of observation. Especially in the field of services of general interest, local authorities also provide services to surrounding municipalities. An example might refer to the provision of medical (family) doctors. The higher the value of this service is, the more it is concentrated in larger cities as service locations for larger catchment areas, which cannot necessarily be defined by administrative boundaries. Appropriate spatial boundaries would thus have to be defined for monitoring purposes on a case by case basis. Very small-scale grid-based data is suitable herewith, because it may be applied very flexibly in order to generate varying spatial references. It goes without saying that data of this fine granular grid

cells is not available for most topics. The most advanced progress has been made on the monitoring of land use and urbanisation by applying the Global Human Settlement Layer (GHSL) (Evers *et al.*, 2020; Milbert *et al.*, 2021).

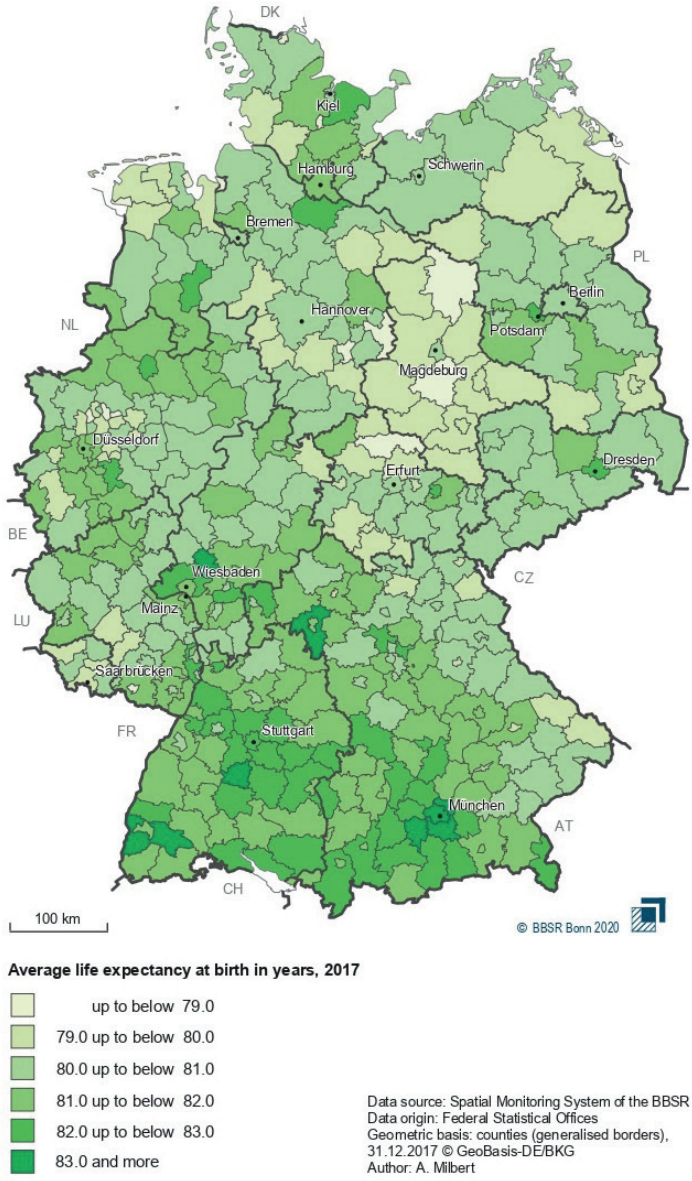


Fig. 3a. Life expectancy at birth in Germany
Source: Binot *et al.*, 2020b.

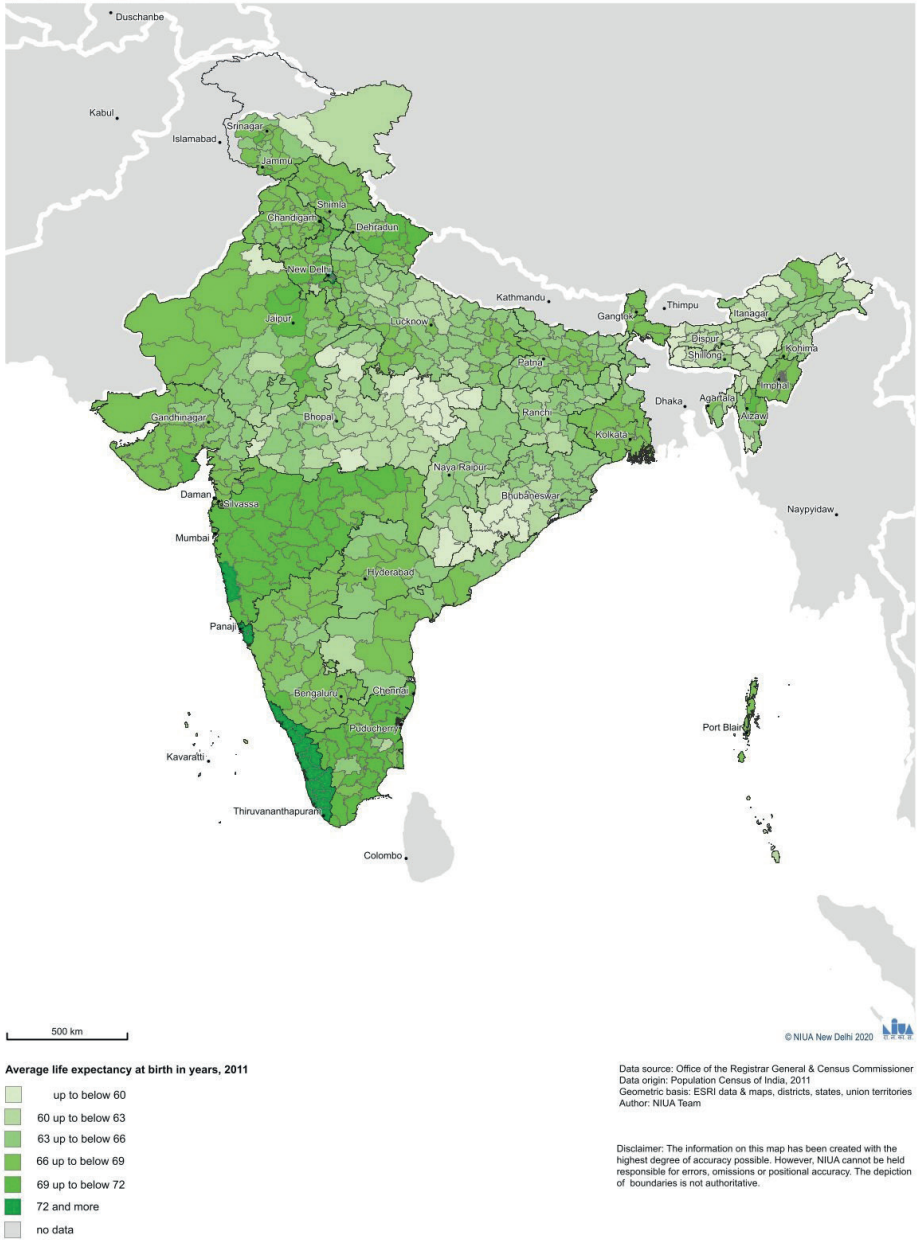
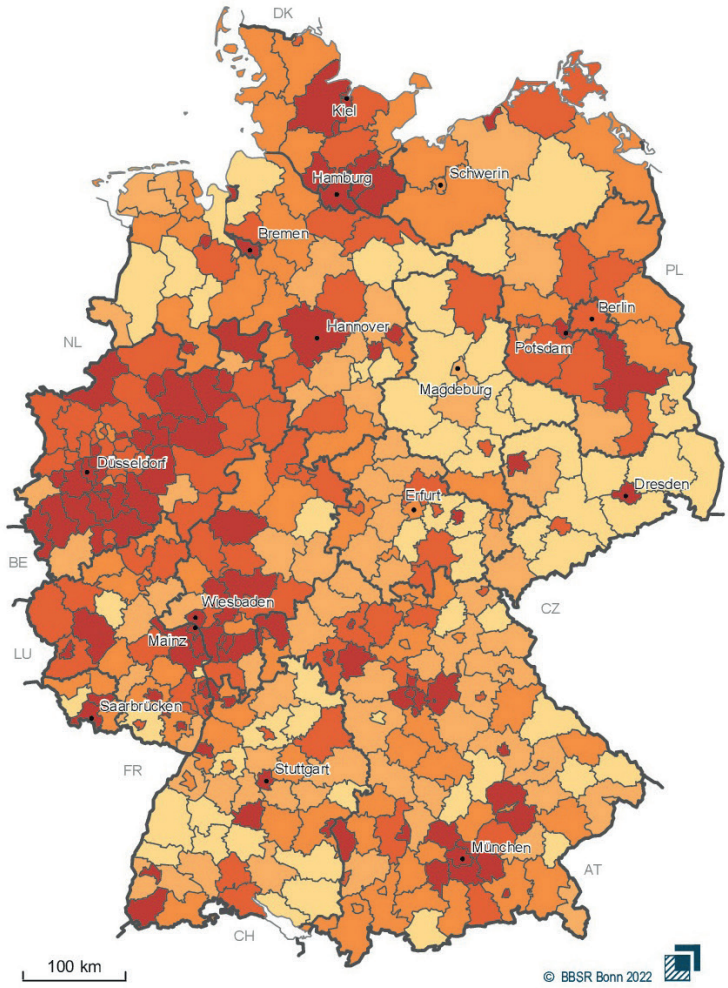


Fig. 3b. Life expectancy at birth in India
Source: Binot *et al.*, 2020b.



Share of elected women in Stadt- und Landkreistage (local parliaments), 2019/2020

- up to below 20
- 20 up to below 25
- 25 up to below 30
- 30 up to below 35
- 35 and more

Data source: Spatial Monitoring System of the BBSR
Data origin: Federal Statistical Offices
Geometric basis: counties (generalised borders), 31.12.2019 © GeoBasis–DE/BKG
Author: A. Milbert

Fig. 4a. Elected women in Kreistage in Germany

Source: Binot *et al.*, 2022b.

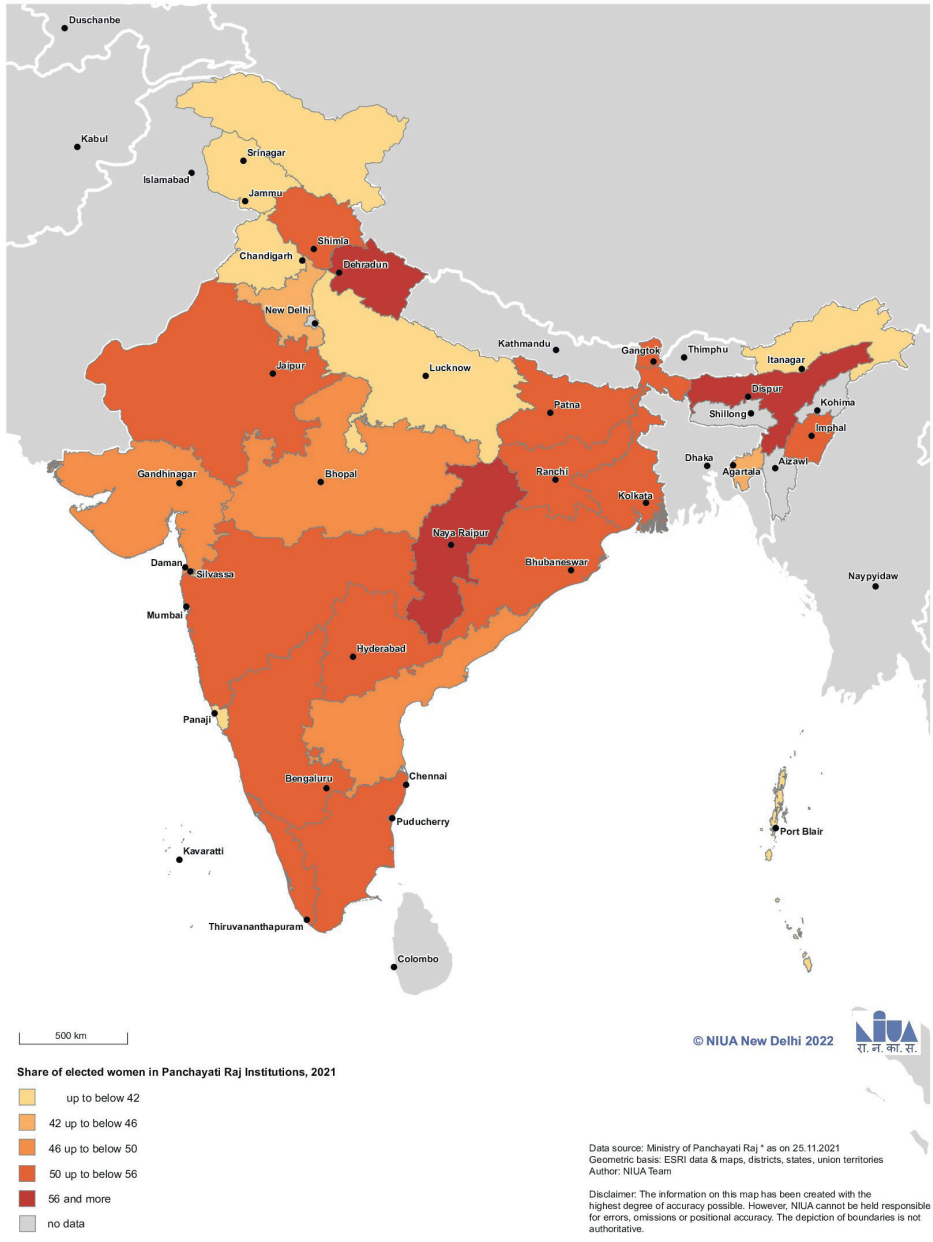


Fig. 4b. Elected women in Panchayati Raj Institutions in India
Source: Binot *et al.*, 2022b.

The example of institutions of higher education also reveals the spatial differences between larger cities. As some universities are specialised to a certain degree in their field of expertise, they attract either more male or female students (see Fig. 5a and 5b). The respective indicators on gender equality refer to these specialisations, yet analysing specific spatial pictures requires a lot of local knowledge about these specialisations in order to correctly interpret the situation and thus derive target-oriented policy recommendations.

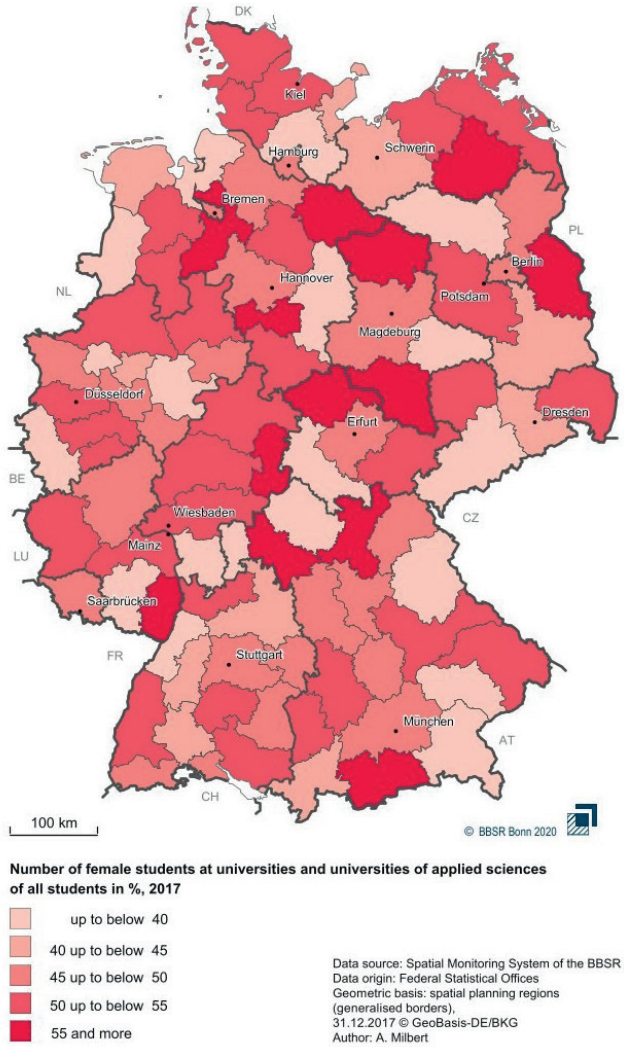


Fig. 5a. Female students in Germany

Source: Binot *et al.*, 2020c.

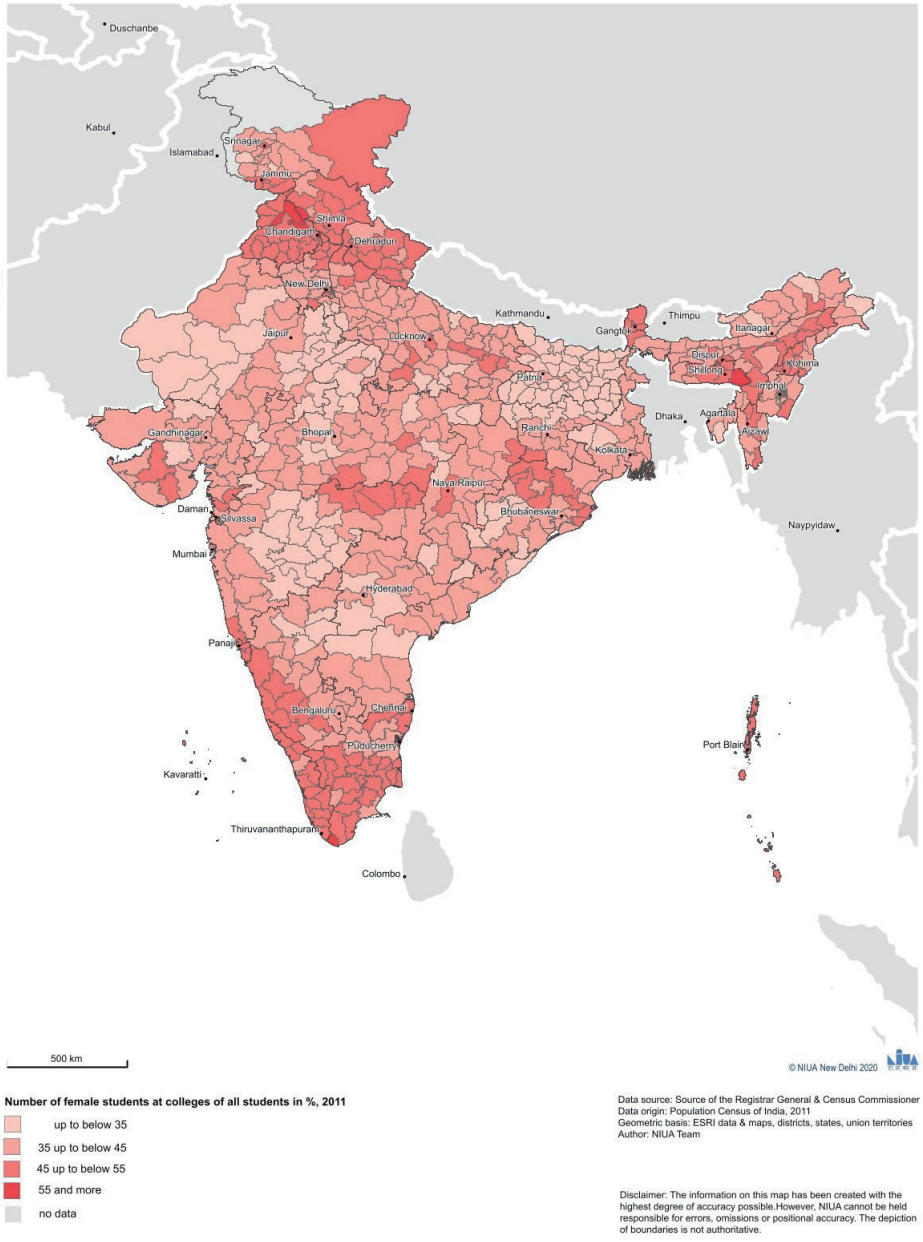


Fig. 5b. Female students in India
Source: Binot *et al.*, 2020c.

3.4. Timelines for measuring development in concrete terms

SDG 8.1 proposes an annual GDP growth rate as an indicator for measuring the development of an economy. This rate should be at least 7% in developing countries. Unfortunately, the COVID-19 pandemic had a global impact on various economies – in many countries with regional and local differentiations. Due to this kind of external shocks, an annual growth rate seems less favourable and suitable. On the contrary, a multi-annual average of such development rates should be recommended. As shown by Fig. 2a and 2b, the increase of the GVA in Germany refers to a five-year observation period and in India to the development in 2020 compared to the one in 2019. A weakened economy, in that respect due to the COVID-19 pandemic and its related contact restrictions, become falsely evident.

Very vague ideas are also provided by other sub-goals of the SDGs. The local and regional comparison in an international perspective thus requires more clarity – at best the concrete indication of multi-year time intervals.

4. EXAMINING THEORY AND PRACTICE AT A VERTICALISING FUTURE

Before drawing a joint conclusion, it seems appropriate to look at each geography and cultural context, as well as their specificities in science and policy.

4.1. Interim conclusion with regards to Germany (but also Europe)

A future targeted design of a consolidated and verticalised reporting on the progress (or regress) of implementing the SDGs and the New Urban Agenda was already drafted by Milbert, Mueller, Schmidt-Seiwert and Schoen in 2017. Reviewing this design and its elements reveals that the various existing expert networks still need to be interlinked in more depth in Germany. They consist of Statistical Offices of the Federal Government and the Länder, diverse regional expert groups and individuals of sectoral policies and bodies, nationwide networks of local authorities, as well as the national experience in urban development policies and, last but not least, BBSR as a possible anchor point in this web of knowledge. In that respect, the vertical dialogue of the National Urban Development Policy as a joint initiative of the Federal Government, the Länder and all cities and communities in Germany could be enlarged by a joint monitoring system of the development of cities and communities. The National Urban Development Report, which has to be published at least once per legislative period, could be linked, for

example, with the Voluntary Local Reviews of the local level (cf. above), as well as possible subsequent national progress reports on the implementation of the New Urban Agenda. Their indicator orientation could be based on the respective data technique applied by the Federal Sustainability Strategy.

A large amount of knowledge has been gathered so far. Considering data and indicators, the Working Group on SDG Indicators for Communities (Bertelsmann Stiftung *et al.*, 2020) is to be named in the same way as the aforementioned first National Report on the implementation of the New Urban Agenda (BBSR, 2021) and the analytical work in Germany (but also Europe) and India (Binot *et al.*, 2020a–d, 2022, 2023), conducted by the research cooperation of BBSR and NIUA. This knowledge is being applied in concrete terms and actions as described above with regard to Voluntary Local Reviews (BBSR, 2022).

The analytical and indicator-related work seems to be fruitful and rewarding. It also seems as if in Germany the Committee of State Secretaries on Sustainable Development (in German: Staatssekretärsaussschuss für nachhaltige Entwicklung) as central body of the Federal Sustainability Strategy acknowledged in mid 2023 this work across levels by adopting concrete measures to be taken in the future in order to emphasise that local and regional levels are of crucial importance for implementing the SDGs. A vertical as well as multi-level data approach might thus serve as an appropriate way forward. Nevertheless, it has to be stressed repeatedly: such an approach is only sustainable and of relevance for the daily practices in local and regional authorities if communities of all sizes and geographical positions take part in and co-carry on this joint work.

4.2. Interim conclusion with regards to India

India has adopted an SDG Framework and aligned its development programmes with the global targets of the SDGs. Several initiatives have been taken so far by the Government of India to implement the SDG Framework and monitor the progress (or regress) at the national, state, district and local levels. SDG India Index Reports are published at the national as well as the state levels, based on an interactive online dashboard developed by NITI Aayog. All states of India have to develop their own monitoring dashboards with which their respective progress (or regress) may be monitored and visualised. All dashboards at the state level will be integrated in the one of NITI Aayog. However, a couple of challenges exist in monitoring the implementation of the SDGs in India: granular data is still absent on the city or ward level for most critical indicators. Furthermore, official agencies do not supply data beyond the ward level. Unlike some developed countries, the statistical system of India has yet to collect and monitor data on the neighbourhood level. In that respect, it needs to be strengthened. A robust statistical system is thus required.

India has adopted so far a top-down approach in designing and monitoring the implementation of the SDGs by involving national and state governments. This effort has not yet percolated through to the city level, particularly small and medium-sized cities and communities as they often lack the administrative, financial, and technical resources to undertake this task (Khan, 2014). A SDG Cell is thus required in every local authority to collect and compile SDG-related data and link the data sets to the SDG Portal created by NITI Aayog. Cities and communities need a specific budget and human resources in order to perform accordingly and meet the targets set by the SDGs. A meaningful GIS-approach seems favourable. Capacity building and advocacy in localising the SDGs thus constitute most urgent needs in India.

A general data-related issue prevails though: municipal data, being the most important data source for assessing, for instance, the economic performance of cities and communities, have been disconnected in India from its Census since 2001. Additionally, the release of crucial data has been delayed for years – tables on inner migration, for example, gathered by the Census of 2011 were published in 2018.

4.3. Joint conclusion by valorising respective research cooperations

Two aspects crystallise in a joint inferential view on verticalising the multi-level analysis of urban and spatial development across geographies: it is first about data and second about a constant conversation culture.

Statistical data is usually hardly available on the ground – at least not in the granular structure most wanted. That is the reason why often Big Data, crowd data-mining, remote sensing, and other forms of decentralised data-gathering are applied in order to fil the gap. Generating this kind of information is resource-consuming, though, and requires strategic decision-taking in order to make the best use of the resources available.

A conversation culture, which is worth its name, in order to arrive at the point in multi-level analysis of urban and spatial development and conduct straightforward talks about elements missing or to be adjusted, is a mammoth task. It would only be successful if there were constant feedback and resonance loops with all institutions, stakeholders, as well as groups and individuals involved.

The primary added value of research cooperations in that respect would be to test respective approaches across geographies and cultures and become aware of the pitfalls usually buried under daily life conditions. Last but not least, taking the expert perspective from two larger geographical contexts might boost the visibility and assertiveness of a joint endeavour and respective expert recommendations for practice in research and policy.

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Robert NDUGWA*, Dennis MWANIKI*

A GLOBAL PERSPECTIVE ON THE VALUE OF MULTI-LEVEL ANALYSIS AS AN ENABLER FOR ACHIEVING SDGS

Abstract. With more than 50 percent of the global population living in urban areas, Sustainable Development Goal 11 on Sustainable Cities and Communities provides a critical lever for us to realise all other SDG goals. This calls for tracking urban spatial development at various levels to facilitate a better understanding of the role, amongst others, of remote sensing data in the field of sustainable urban development and services of general interest to be provided by authorities. Urbanisation patterns may thus be retraced, but also modelled in order to provide evidence for decision makers. Without proper planning, the spatial impacts of urbanisation and subsequent spatial inequalities are more likely to affect disadvantaged groups most. In the last decade of the SDGs, the use of data to inform policies is very critical, and such evidence needs to be anchored in multi-level analysis and ensure vertical and horizontal applications at all governance levels.

Key words: sustainable development, 2030 Agenda, Sustainable Development Goals (SDGs), sustainable cities and communities, land-use, built-up area, services of general interest, remote sensing data.

1. INTRODUCTION

With a majority share of the global population increasingly living in urban areas, meeting the parameters of SDG 11 should be viewed as critical for achieving the 2030 Agenda's vision of global development. Cities and human settlements are the locus of opportunity to accelerate progress achievement of all the Sustainable

* Robert NDUGWA, Dennis MWANIKI, UN-HABITAT, Data and Analytics Section, P.O. Box 30030, GPO, Nairobi 00100, Kenya; e-mails: robert.ndugwa@un.org, dennis.mwaniki@un.org, ORCIDs: https://orcid.org/0000-0003-3286-9061, https://orcid.org/0000-0002-3675-7940

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Development Goals and climate change aspirations. Delivering on each of these areas will increasingly be determined by how well we plan and manage our cities and human settlements, the effectiveness of local action, and responses to emerging challenges and opportunities.

The 2030 agenda for Sustainable Development which was unanimously adopted by all member states in 2015 is a commitment by all countries and stakeholders to work towards implementing actions that ensure that no place and no one is left behind (United Nations, 2015). While all the goals within the Sustainable Development Goals (SDGs) framework envision actions around the 5 main areas of people, prosperity, planet, peace, and partnerships where interventions are needed to attain sustainability, each of the actions target a unit of implementation, both in the geographic and the man-made environment. The agenda, and its monitoring framework also recognises that actions in one area affects outcomes in other areas, both in scale and focus of operation, and thus call for balanced territorial development that must consider the social, economic, and environmental elements of sustainability (United Nations, 2015).

In addition, approximately one-third of the SDG indicators require monitoring at the local level (United Nations, 2018), which also includes indicators that form the 'urban' goal – SDG 11: Sustainable Cities and Human Settlements. SDG 11 presents a very specific scenario where the unit of analysis for most targets is – the city/urban area, with aggregation of results done to the national, regional, and global levels. Specifically, Goal 11 does require city/urban specific analyses, while also integrating key aspects of spatial analysis – from the overall relation of all targets and indicators to a spatial unit, to demands for use of earth observation and geospatial data for the individual cities/localities. In addition, SDG 11 focuses on the urban domain of sustainable development, and acknowledges the interlinkages between the natural and living environments and the fact that sustainability requires a more holistic analysis of trends and implementation of actions – which must encompass the urban, rural, and other types of settlements, as well as other areas of the living and geographic/natural environments.

Empirical data shows that small cities cover almost half of city land (about 45 percent) in low-income countries, a trend that will persist over the coming decades (UN-HABITAT, 2022b). Fast-paced urban growth in lower income contexts coupled with limited public response capacities, especially in smaller urban areas, risks an outcome of unplanned urbanisation rather than producing sustainable cities and human settlements at the global scale. Therefore, unless we invest more in understanding urbanisation trends at all levels and scales, greater divergence in the quality of urbanisation between cities in developed and less developed regions and within countries may emerge, with a higher potential of expounding broader global inequality.

As prescribed in the SDG framework's targets, and later reinforced by the New Urban Agenda, the attainment of the globally agreed vision is only possible if actions are implemented at multiple scales – from micro to meso and macro levels.

To attain the principle of leaving no one behind, we require a series of activities, ranging from ensuring a consistent way of measuring and understanding inequalities that can be applied uniformly by all countries (such as those proposed through SDG monitoring framework), to implementing specific actions at the meso (national/regional) and micro (city, settlement, and neighbourhood) levels.

The New Urban Agenda and the 2030 agenda for sustainable development spell out different levels of action and engagement, the most visible ones being the global, regional, national, and local levels. Paragraphs 3 to 5 of the United Nations General Assembly Resolution 70/1 which established the 2030 Agenda highlights (United Nations 2015: 3/35) "the sub-national, national, regional and global levels where interventions are needed to ensure we achieve our shared future." Specifically member states committed to:

> "3. We resolve, between now and 2030, to end poverty and hunger everywhere; to combat inequalities **within and among countries**; (…) We resolve also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work **for all**, taking into account different levels of national development and capacities.
>
> 4. As we embark on this great collective journey, we pledge that no one will be left behind. Recognizing that the dignity of the human person is fundamental, we wish to see the Goals and targets met **for all nations and peoples and for all segments of society**. And we will endeavour to reach the furthest behind first.
>
> 5. This is an Agenda of unprecedented scope and significance. **It is accepted by all countries and is applicable to all**, taking into account different national realities, capacities and levels of development and respecting national policies and priorities. **These are universal goals and targets which involve the entire world**, developed and developing countries alike. They are integrated and indivisible and balance the three dimensions of sustainable development."

While projecting the commitment by member states and the global community at large, the targets outlined in each of the SDGs are to be achieved at a more localised level, such as cities, neighbourhoods, villages, certain ecosystems, or other units. For example, to achieve sustainable cities and human settlements (SDG 11), a series of actions are required at the urban level, such as those aimed at ensuring every urban resident lives in a decent house and has access to all basic services. To realise this ambition, specific interventions are needed in all the neighbourhoods within the city. The SDG framework also highlights very localised intervention areas, such as in target 16.1 (reduce violence and related deaths everywhere) where safety should be enhanced at the neighbourhood level. Target 9.1 requires specific actions aimed at enhancing rural connectivity and access to opportunities and services among rural populations by ensuring everyone is within 2 kilometres of an all-weather road. Tracking access to services or opportunities in such rural communities requires analysis that covers individual villages and aggregating such analysis to the national level.

The local, sub-national, national, regional and global level analysis is further emphasised in the SDG monitoring framework (United Nations, 2017), which provides that "Sustainable Development Goal indicators should be disaggregated, where relevant, by income, sex, age, race, ethnicity, migratory status, disability and geographic location, or other characteristics, in accordance with the Fundamental Principles of Official Statistics." The city/urban area is one of the major 'geographic locations' for which SDG indicators should be disaggregated.

The case for multi-level analysis of urban and spatial development is thus deeply entrenched in the 2030 Agenda for sustainable development and more so for SDG 11 targets. Recognising the role that cities and urban areas play in the attainment of sustainable development is a great starting point, and this is further emphasized by the New Urban Agenda (United Nations, 2017b) which complements the need for analysis of urban and spatial development across different scales and specifically for all the five pillars of the New Urban Agenda outlined as National urban policies, rules and regulations, urban planning and design, financing urbanisation, and local implementation.

In this article, we highlight the relevance of multi-level analysis in shaping policies and actions towards sustainable development, with a specific focus on interventions that target urban areas. We acknowledge that the attainment of sustainable development is not limited to interventions only in the urban areas which this article focuses on, but rather multi-level actions must be undertaken in all types of settlements (urban, peri-urban, and rural), as well as for other geographies/natural environments as prescribed by the SDG framework.

2. REGIONAL AND GLOBAL ANALYSIS HELPING TO SHAPE THE GLOBAL AGENDA AS WELL AS CONTRIBUTING TO COUNTRY – COUNTRY LEARNING AND GOOD PRACTICES SHARING

Our rapidly urbanising world requires continuous monitoring of urban transformations both, in time and space, and constantly ensuring that we use the resulting knowledge to inform new policies and actions to advance progress towards sustainable urbanisation at the regional and global levels. Urbanisation manifests itself both spatially and demographically, and at multi-level scales ranging from the neighbourhood to the city, national, and global. The rate at which the demographic and spatial trends change at the different scales requires continuous monitoring through well-established monitoring systems that start at the local level (UN-HABITAT, 2018). For example, many datasets that showcase global urbanisation trends – such as the world urbanisation prospects and Glob-

al Human Settlements Layer (GHSL) – are based on data/estimates produced at the individual city level, which then gets aggregated to national, regional and global levels (Florczyk *et al.*, 2019). Production of data at the individual city level is often costly, especially in cases where surveys have to be implemented. Equally, the availability of comparable data relies on methodological alignments, both in terms of defining the spatial 'city/urban' unit and also the method used to produce the data. Due to recent developments in technology, alongside availability of open and free data, and methodological alignments, traditional challenges that hindered the understanding of our urban and spatial shifts through data are increasingly an issue of the past, making it possible to continuously produce and update policy-relevant data from the local to global scales (UN-HABITAT, 2023).

A major achievement over the last few decades that has enhanced availability of multi-level data across countries has been enhancements in space applications and related analytics, which today make it possible to analyse urbanisation trends at an ever growing spatial and temporal resolution. For example, the availability of free and open-source satellite imagery from the Landsat and Sentinel missions, coupled with openly accessible processing technologies such as Google Earth Engine, has made it possible to assess urban changes for the whole globe at sub-annual scales (UN-HABITAT, 2023). From assessing growth of cities to exposures and impacts from disasters, these resources offer accessible, affordable, reliable, and consistent ways to understand urban changes at unprecedented spatial and temporal scales, which are key to informing policies and actions at all governance levels. For countries with limited capacities to process this data, the diversity of global datasets produced from these resources is available, which range from multi-temporal built-up layers to gridded population data (e.g., GHSL). These global datasets are critical for assessing the global urbanisation trends, and their ever growing and improving resolutions are contributing to enhanced tracking of changes at the city and neighbourhood levels – all with positive impacts on multi-level policy and governance processes.

Likewise, the recent endorsement by the United Nations Statistical Commission of a globally harmonised global definition of cities and rural areas, i.e., the degree of urbanisation, makes it easier to globally compare urban trends/performances based on a standard and uniform unit of analysis (European Union, FAO, UN-HABITAT, OECD, The World Bank, 2021). This, coupled with a commitment by countries to adopt and localise the SDG monitoring framework, has created new opportunities to better understand global urbanisation trends, as well as facilitate the transfer of policies across countries with similar urban characteristics and challenges. At the national level, using the same method to identify settlement types and the continuum of human settlements also portents unique opportunities for the development of national urban policies, sub-national, and urban development plans.

3. SUB-NATIONAL, CITY, AND SUB-CITY ANALYSIS INFORMING POLICIES AND ACTIONS ARE KEY FOR ATTAINING SUSTAINABILITY

In most countries, cities are an essential unit of analysis for which policies, decisions, and actions are implemented. It is also at the local or city levels where the opportunities and ills associated with the urbanisation process manifest themselves. As cities transform, they have a different impact on their surroundings, but also their internal configurations. Often times, the outward expansion of cities observed in most countries throughout the world displace other land-uses, and can pose significant impacts to the overall living and natural environments (Mudau *et al.*, 2020; UN-HABITAT, 2018b). For example, where cities expand into fertile agricultural land in their vicinity, they can have adverse impacts on food production of the surrounding regions; while disruptions in ecosystems can happen where such expansion occurs into natural environments. Such uncontrolled expansions can have detrimental impacts on the local environments, but also on the overall attainment of sustainability for entire areas or the country.

Equally, cities experience internal growth or changes, which mostly manifest themselves through densification and intensification (UN-HABITAT, 2018b). Such developments happen within individual neighbourhoods, and can have diverse impacts on the urban populations and the living environment. Neighbourhoods that experience rapid densification or intensification, without commensurate expansion of services can negatively impact their residents' quality of life, e.g., through reduced availability of open spaces, and increased crowding, but also reduced access to basic services (UN-HABITAT, 2016; UN-HABITAT, 2018b).

Analysing how cities grow in space is thus critical, to both understanding their impacts on the surroundings, and their internal setups. Such analysis requires multiple levels of measurement, and it ranges from sub-national analysis to examining urbanisation trends beyond individual urban boundaries, to settlement level analysis to tracking localised trends. These levels of analysis have different policy implications, which can vary from city and neighbourhood level planning and interventions to sub-national level development strategies. Figure 1 and Figure 2 present two typical scenarios in urban growth for a hypothetical area.

In Fig. 1, city x grows both internally, but also expands to surrounding areas – with additional (new) developments recorded outside the municipal boundaries and into sub-national unit q. In Fig. 2, cities y and z, which are also located within sub-national unit q, are also growing both internally, but also beyond their municipal boundaries. For a mayor of any of these cities, their most urgent interest might be to ensure that services are expanded to cover the densifying areas within their municipalities and ensuring that the new developments are in accordance with the zoning regulations and planning guidelines. A closer look, however, would help them understand that a significant share of their population who rely on the city

services live just outside its boundaries in the rapidly urbanising areas. Such residents would, for example, travel in and out of the city every day, and if the public transport system is not expanded beyond the municipal boundaries, an increase in traffic congestion may be recorded as the people opt for private means of transport for ease of movement.

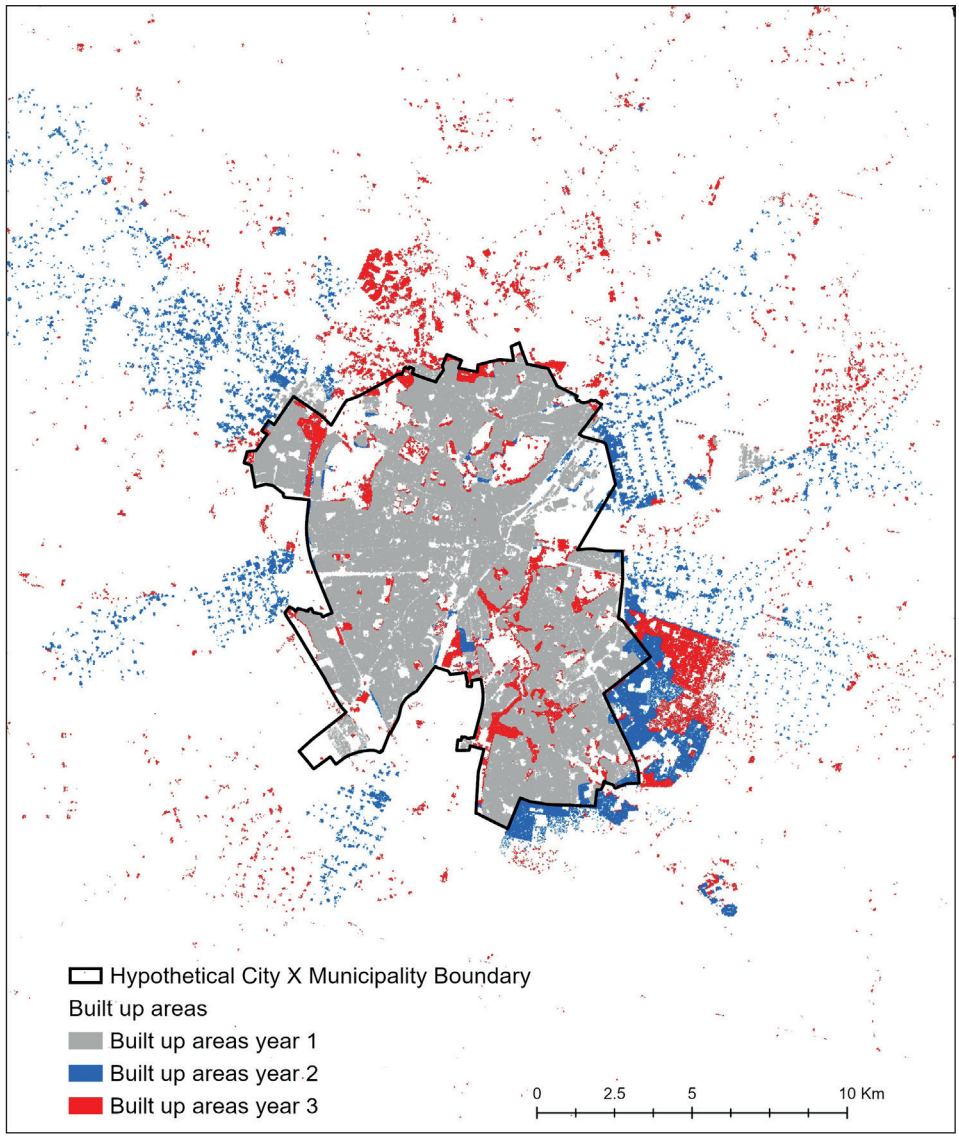

Fig. 1. Built-up area change in city x

Source: own work.

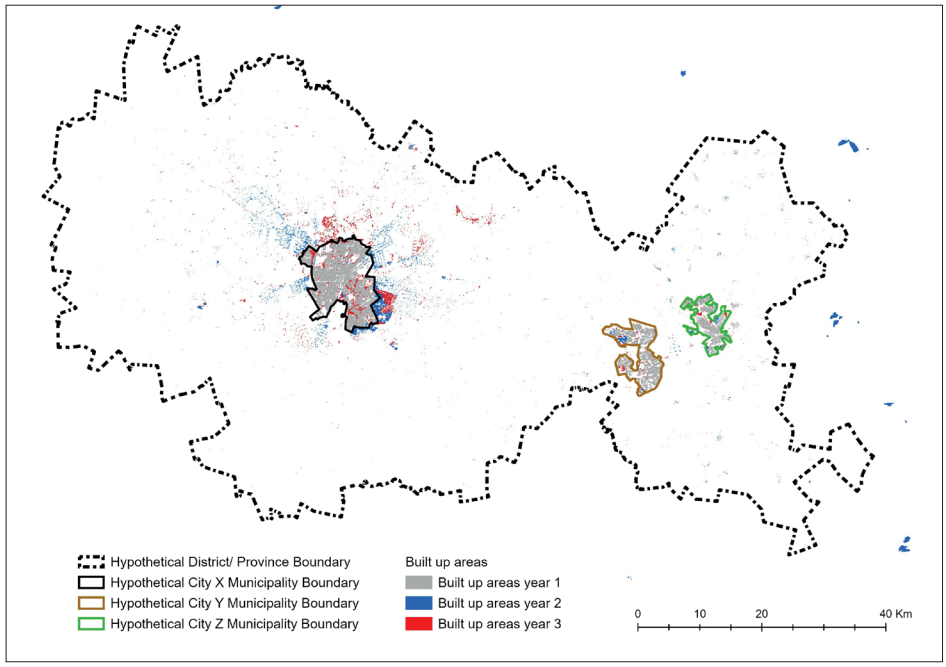

Fig. 2. Built-up area change in cities with region q

Source: own work.

Conversely, the governance structure for the sub-national unit where expansions of the different municipalities are occurring may face uncontrolled urban-threshold developments, displacing fertile agricultural areas. Without looking at the two levels of analysis (city and sub-national), the municipality mayors and policy makers in the larger region would be faced with a dilemma of finding the most suitable solutions to their unfolding challenges. Examining the two levels of analysis jointly would immediately create a basis for the leaders to work together and formulate collective solutions which might include agreements to expand the municipality boundaries and implement strategies on planned city extensions. In foresight, they might also agree to create a regional development strategy, which would make the necessary provisions for the co-existence of the urban and non-urbanised land uses, with overall positive impacts to the region's sustainability. Within the individual municipalities, the mayors would be able to see the types of developments happening at the neighbourhood level, and put in place relevant strategies to ensure that the quality of life of their citizens is not compromised, but instead ensure coherence and planning that maintains the city's urban sustainability form.

The above scenarios are typical of what we see in many regions and countries and this demonstrates the relevance of multi-level analysis at the sub-national,

city, and neighbourhood levels, and how this can directly contribute to joint policy formulation and decision making. They also highlight the relevance of examining sustainability with a system-wide lens, which helps understand how different elements of the living/built environment interact with the natural environments, and the needed actions to ensure harmonious development. Today, such analysis can be easily implemented from freely and openly available satellite imagery and processing resources, but also using global datasets such as Global Human Settlement Layer (GHSL). Similar analysis requirements are embedded within the SDG 11 monitoring framework (indicator 11.3.1), as well as in the New Urban Agenda. Both frameworks establish that, to become sustainable, cities require orderly development which can be fulfilled through effective planning, formulation, and implementation of relevant urban policies, sound environmental protection, and strategic investment actions intended to meet the needs of the current and future generations. Such interventions should be informed by a multi-level analysis of the spatial trends of urban areas.

The need for multi-level analysis also crosses other aspects of urbanization. Over time, the multi-level analysis has helped the global community to better understand the effects of spatial location which sometime can also be gendered. For example, women in cities tend to be more constrained than men in accessing some services and benefits of the city. In cities of both the developing and developed countries, there are numerous recorded incidences showing women are more vulnerable to the risk of harassment and violence in public spaces and also while accessing public transport (UN Women, 2020). In addition, urban crime and violence rates tend to be concentrated where low income communities are also spatially concentrated. Crime has a detrimental impact on development by increasing costs and by eroding the value of household assets or properties. In US metropolitan areas, for example, households from poor neighbourhood are around one-third more likely to be the victims of crime than those from rich suburbs; and in such neighbourhoods, property crime rates are two to three times higher and murder rates are five times higher than elsewhere (Valdez *et al.*, 2007).

In many cities, the spatial distribution of welfare indicators is caused not only by spatial inequalities in income; it is entrenched by regressive spatial distributions of public investment (Kilroy, 2007). One of the most influential causes of spatial inequalities is increased lobbying (group competition) for public expenditure on services and amenities, with higher-income groups having a higher bargaining power compared to poorer neighbourhoods. These discrepancies in public expenditures on communities are augmented further by the fact that among high-income areas there is a larger propensity to provide their own physical and social infrastructure privately.

More broadly, there is also a lack of intra-urban information and limited capacity among urban institutions which impedes policies to mitigate the effects of spatial inequalities. Many cities in the developing countries are handicapped from

effectively developing informed urban policies and analysing their implication due to a lack of capacity and frameworks for monitoring the data to study the margins of differences. Without better information, city administrations and national governments cannot systematically appraise urban problems, and if they engage in remedial policies, they cannot effectively measure their outcomes. Indeed, data measuring the internal spatial structure of the city, its economy and the distribution of opportunities is not even collected in many parts of the world today.

Addressing urbanisation and leveraging its opportunities requires a clear understanding of city level trends, and urban-suburban-rural areas (urban continuum) interactions. This also requires working across a variety of actors to ensure that data is transformed into knowledge that supports local actions and policies. UN-HABITAT's work in supporting continuous urban monitoring against the sustainable development goals (SDGs), and the New Urban Agenda is a good example where a harmonised urban monitoring framework that integrates space-science-based measurements, particularly those which rely on satellite imagery for land cover/ land-use classification and built-up areas extraction has been developed. The framework is applicable at the neighbourhood, sub-national, national, and global levels (United Nations, 2022a). Where the framework has been applied, the information extracted from the analyses has been used for indicator specific applications, such as understanding urban trends, population distributions and their proximities to urban spaces and services, understanding of spatial inequalities and climate risks, among others; all of which directly contribute to the agenda of leaving no one and no place behind.

In summary, a multi-level analysis that is designed to facilitate transformative policy shifts entails significant and fundamental changes in the approach or direction to embrace innovative and bold measures to bring about substantial change. It involves adopting new strategies, principles, or frameworks that can profoundly alter the way in which policies are designed, implemented, and financed. The scale, complexity, and multi-dimensional drivers of urbanisation certainly call for transformative shifts that depart from the status quo/business responses. The fulfilment of transformative shifts requires collecting the most relevant data at scale alongside dedicated political will, policy continuity, and policy agility to bring about the desired changes.

4. **CONCLUSION**

The inclusion of Sustainable Development Goal (SDG) 11 and various other urban-related SDGs targets in the 2030 Agenda for sustainable development and the strong connections with the New Urban Agenda is a recognition of the intrinsic value that cities hold today in the achievement of global goals (United Nations,

no date). The multi-layered level of recognition embedded in the SDGs and the New Urban Agenda where actions need to cascade from local-national to global is a key lesson drawn from some of the strategies that followed the transition from the Millennium Development Goals. Whilst cities are incredible generators of economic growth and well-being for many countries, often they are also centres with neighbourhoods where poverty and inequality are manifested in greater magnitudes. Yet, if cities are properly planned and well-managed, urbanisation processes can reduce poverty and inequality – for example, by creating employment opportunities, as well as ensuring access to infrastructure and basic urban services, especially for the most vulnerable. However, in many cities, progress towards equality is constrained predominantly by shortcomings in urban planning and design, and the consistent lack of data to understand the nature and distribution of the problem, as well as the prevalence of land-use policies that fail to address spatial inequality (UN-HABITAT, 2018).

The lack of spatial data is a major bottleneck for designing and setting evidence-based policies and priorities for cities. However, based on the available data one can conclude that the nature and impacts of urban poverty and inequality in cities is not homogenous. Trends differ significantly between cities of developed and developing countries, which reflects the reality of a highly unequal urban world (United Nations, 2022b). However, even with cities from the same countries or neighbourhoods from the same cities we see many spatial inequalities around access to adequate housing, transport, water, sanitation, and other urban-related opportunities.

A multi-level analysis and governance arrangements are today well recognised instruments for creating synergies, reducing overlapping and critical gaps between institutions, and promoting trust and accountability that enhance policy coherence. The establishment and operation of effective and efficient multi-level analysis and governance at the local level requires clear divisions of labour, powers, responsibilities, and resources among national and sub-national government entities. It also requires multi-stakeholder collaboration among government institutions, private firms, civil society and other NGOs, higher education institutions, and other innovative partnerships at all levels. Since 65 percent of the SDG agenda may not be fully achieved without the involvement of urban and local actors, delivering all SDGs rests on the actions of local governments and the existing multi-level connections and governance structures of support from the national governments.

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Oliver PETERS[*], **Henrik SCHELLER**[**]

ADDING VALUE BY NATIONAL REPORTING TO SUSTAINABILITY APPROACHES OF THE LOCAL-REGIONAL LEVEL: THE CASE OF GERMANY

Abstract. Global socio-environmental challenges and local impacts, global agendas, and local implementation: multi-level governance has never been more important – or more complex. To keep track of progress and the challenges in sustainable urban development, monitoring systems at all levels are at different stages of development and in need of harmonisation. In this context, national reporting can link the global level with the local one by identifying and reviewing framework conditions, and setting indicator and data standards for cities, counties, and municipalities. This raises questions about the awareness of different issues, resource imbalances and, not least, the effectiveness of standardised monitoring. This paper provides valuable insights into the lessons learned from the preparation of the first national progress report on the implementation of the New Urban Agenda. The reflections could support further governance and monitoring efforts not only at the national level but also across all levels.

Key words: urban studies, urban development, sustainable development, Sustainable Development Goals, New Urban Agenda, Germany.

[*] Oliver PETERS, German Institute of Urban Affairs (Difu), Zimmerstraße 13–15, 10969 Berlin, Germany; Brandenburg University of Technology Cottbus-Senftenberg, Institute of Urban Planning, Konrad-Wachsmann-Allee 4, 03046 Cottbus, Germany; e-mail: opeters@difu.de, ORCID: https://orcid.org/0000-0002-0051-4357

[**] Henrik SCHELLER, German Institute of Urban Affairs, Zimmerstraße 13, 10969 Berlin, Germany; Freie Universität Berlin, Otto Suhr Institute of Political Science, Ihnestraße 22, 14195 Berlin, Germany; e-mail: scheller@difu.de, ORCID: https://orcid.org/0000-0002-8669-5063

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1. INTRODUCTION

Although sustainable development has a history dating back at least 300 years, during which the concept has been described, defined and enriched with diverse experiences in various phases (Shi *et al.*, 2019), the past decade has marked another transition phase from the development to the implementation phase. In less than two years, the global community under the umbrella of the United Nations has adopted important agreements that are shaping our lives today and will shape in the future. The 2030 Agenda for Sustainable Development, which includes the 17 Sustainable Development Goals (SDGs), the Paris Agreement on climate change, the Sendai Framework for Disaster Risk Reduction, the Addis Ababa Agreement on Financing for Development and the New Urban Agenda (NUA), have come into force to counterbalance the 'Great Acceleration'[1] with unprecedented environmental change and social inequalities.

These agendas were negotiated at the global level and address primarily the signatory states, however, what is quite obvious for the New Urban Agenda is also true for the other agendas: regional and local governments play important roles or even determine whether the objectives of the agendas can be achieved at all (see, e.g., Rudd *et al.*, 2018; Simon *et al.*, 2018). For instance, in regards to the SDGs, it is estimated that at least 105 out of the 169 targets (65 percent) will not be reached without proper engagement of and coordination with regional and local governments (OECD, 2020). Other studies, such as the project SDG-Indicators for Municipalities from Germany, have come to similar conclusions: Jossin *et al.* (2020) have identified 74 percent or 163 out of 220 targets and 'sub-targets' – SDG targets with multiple statements that were divided into several single targets – that are of problem and task relevance for German municipalities.

This raises several questions on effective multi-level collaborative governance between national, regional and local government institutions, e.g., how we can overcome the widespread mismatch between statutory responsibilities on the one hand and powers, resources and capacity on the other (Perry *et al.*, 2021). Besides these vertical relationships, further questions appear when considering horizontal collaboration between entities at the same level, as well as collaboration among different types of actors such as the public and private sector, the civil society, and academia (Valencia *et al.*, 2019). The variety of perspectives and questions seems to overload the debate, however, sustainable development requires exactly these considerations, as one actor or process alone hardly generates any impact.

[1] The model known as the "Great Acceleration" by Steffen *et al.* (2015) identifies twelve socio-economic megatrends and twelve ecological (Earth system) megatrends that in many respects have shown a dramatic unprecedented increase in human activity since 1950. This highlights the impact of human activity on the life-giving ecosystems of our planet.

The same applies to measuring the impacts in terms of multi and cross-level monitoring of sustainable urban development. Irrespective of the level, the benefits of indicator-based governance have always been a core topic. Monitoring success and enabling local governments to steer the transition require data-based indicators of sustainable development. This paper will shed light on the opportunities and challenges of national reporting that add value to sustainability approaches of the local-regional level.

Integrated governance, documentation, and measurement of an effective sustainability policy that considers all jurisdictional levels and actors of a country and the various sustainability dimensions in their diverse interactions are, therefore, the actual political and administrative challenge. Federations are a specific type of states here, since the different layers of government have a special level of autonomy. However, it can also be observed for unitarian states that sustainability reports are often only available for specific levels or local authorities, e.g., for the national or regional level or individual municipalities. There are already existing reporting approaches that aim at comprehensive and comparative integration. For example, the OECD has developed a 'Toolkit for a Territorial Approach to the SDGs', which is designed as a user-friendly checklist to guide policy makers at all levels of government to implement a territorial approach to achieving the Sustainable Development Goals (SDGs)" (OECD, 2022). This form of 'territorialisation' of the 2030 Agenda and its SDGs, on the one hand, takes off on the special features of the individual state levels, but also wants to create a uniform standard for all sub-units. Finland also presented a Voluntary National Review Report in 2020, which relies on a 'Whole of Government' and 'Society Approach'. In this context, reference is also made to the special importance of municipalities: "There is room for improvement in the coordination between the national level and the local level on the specific role of the municipalities in implementing the SDGs. For example, national indicators seldom serve the purposes of the monitoring of local sustainability work and there are locally developed indicators and monitoring systems. However, there are initiatives that create interactions between these governance levels. The Ministry of the Environment is running the Sustainable City Programme (2019–2023) that promotes the sustainable development of cities and municipalities through practical urban development and strategic management." All of these examples – whether integrated voluntary or local review reports or cross-states comparative analyses of sustainability efforts – refer to challenges that shall be discussed in the following analysis. These include the globally binding and uniform definition of sustainability indicators including their data gathering methods, the territorial gradation of sustainability goals, an improvement in official data bases, as well as the determination and calculation of the sustainability contributions of the individual administrative state levels.

2. BACKGROUND AND METHODOLOGY

Like most of the above-mentioned international agendas, which are based on a voluntary commitment by the signatory states, the New Urban Agenda also relies on periodic and voluntary monitoring and benchmarking of the development progress. Sustainable urban development in signatory countries of the New Urban Agenda is to be reviewed every four years, according to a recommendation in paragraph 166. Against this background, the first German progress report on the New Urban Agenda at the national level was prepared in 2020 and 2021 (BBSR, 2021). The project was commissioned by the Federal Ministry of the Interior, for Home Affairs and Construction, which was responsible for the national and international urban development policy, and the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). Since the New Urban Agenda does not contain its own monitoring mechanism but does have diverse links to the Sustainable Development Goals (SDGs), SDG 11 (Sustainable Cities and Communities) in particular, an SDG monitoring method adapted to the requirements of the New Urban Agenda was applied and tested together with selected partner municipalities. The focus of the investigations was on climate protection and adaptation, as well as mobility in the urban-rural context, each supplemented by digitalisation approaches.

This article focuses on selected challenges that national reporting on sustainable urban development faces, especially in a federation like Germany. The real tension is between international requirements and the desire for comparability on the one hand, and the shared federal responsibilities and structural heterogeneity of the monitoring object – the municipalities – on the other.

3. VERTICAL INTEGRATION OF SUSTAINABLE URBAN DEVELOPMENT IN GERMANY

The implementation of urban sustainability agendas is influenced to a large extent by the framework conditions of the federal government. According to the German Basic Law (constitution), cities, counties (Landkreise) and municipalities are not an independent level of government, but an administrative division of the 16 federal states (*Länder*). Article 28 of the Basic Law states that German cities, counties and municipalities are based on the principle of local self-government and that municipalities must be guaranteed the right to regulate all local affairs within the limits set by the law. Due to Germany's federal structure, urban development policy affects the responsibilities of several jurisdictional levels. Relevant in this regard is, among other things, the Federal Building Code

(*BauGB*) – and Chapter 2 Special Urban Development Law in particular, which was last amended in 2017. The legislative competence for the Building Code is incumbent on the federal government pursuant to Article 74 (1) of the Basic Law. According to this, the federal government is responsible for "urban land use, land law (excluding the law on development contributions) and housing subsidy law, old debt assistance law, housing subsidy law, miners' housing law and miners' settlement law." Other sources of law of relevance to urban development policy include the Regional Planning Act (*ROG*), which also falls within the scope of concurrent federal legislation, the Act on Protection against Harmful Effects on the Environment Caused by Air Pollution, Noise, Vibrations and Similar Processes (Federal Immission Control Act, or *BImSchG*) and the Ordinance on the Use of Land for Building Purposes (Federal Land Utilisation Ordinance, or *BauNVO*). At the level of the federal states, the 16 state planning laws, the state spatial planning and development programmes, and the building codes, which are based on the Model Building Code of the Working Group of the Building Ministries (*ARGEBAU*), are of particular relevance (BBR, 2000). The federal government supports urban development measures of the states and municipalities with various subsidy programmes. Relevant here is the Administrative Agreement on Urban Development Promotion (*Verwaltungsvereinbarung Städtebauförderung*) to be concluded annually between the federal government and the states.

Most of the federal states also already have adopted their own sustainability strategies with predominant reference to the SDGs and implemented a wide range of programmes and measures (see Federal Statistical Office of Germany, 2023). Some of them focus specifically on supporting their municipalities in developing and implementing their own sustainability strategies. However, sustainable development is also a voluntary task at this level, and the options available to German municipalities, (not only) in terms of budgetary and human resources, vary widely within and between the federal states. Similarly, the degree of localisation and implementation of the SDGs at the municipal level varies accordingly.

Given that sustainable development must be implemented at least in part at the local level, multi-level coordination and vertical integration of policies and activities at all levels and their coordination is an important and challenging task. The German Sustainable Development Strategy, which was last revised in 2021, understands policy for sustainable development as a cross-cutting task. It is the result of many political initiatives that converge in the State Secretaries' Committee for Sustainable Development. Already with the first meeting in 2012 on the topic of Sustainable Policy for the City of the Future, the decision was taken in 2015 to establish an inter-ministerial working group on "Sustainable Urban Development from a National and International Perspective" and further joint decisions with the states and municipalities. There have been constant efforts to coordinate sustainable urban development across levels.

These partly autonomous, partly shared responsibilities of the individual federal levels, as well as the interdisciplinary topic combining urban and sustainability expertise increase the need for political and administrative coordination in a cross-sectional policy field that again has various intersections with other policy fields such as structural, environmental, construction, transport, and social and labour market policy. In addition, the structural conditions in the approximately 11,000 municipalities are very heterogeneous in terms of urban/land settlement structures, topography, and demographics, as well as in social, economic, and fiscal terms. In recent years, however, important steps have been taken in Germany to realign urban development policy – also in line with the New Urban Agenda – in the sense of transformative urban redevelopment. Thus, municipalities are increasingly obliged to conceptually embed their planned urban development measures in corresponding sustainability strategies and vice versa. Even if many municipalities still lack a dovetailing of the various sub-concepts (sustainability, climate, energy redevelopment concept, etc.), an important step was taken in 2020 with the realignment of institutional urban development funding by the federal and state governments to promote the development of such holistic sustainability approaches in the municipalities.

This brief overview of the approaches taken by the federal government, states, and municipalities shows that political and public awareness of sustainability issues in Germany has grown considerably in recent years and is now reflected in a variety of guiding principles and approaches that are being continuously developed. However, the federal organisation of competences means that individual jurisdictional levels act autonomously in this field. As a consequence of this structure, strategies and indicator systems develop from different reference systems, resulting in a variety of individual thematic emphases and focal points. Despite various coordination efforts, sustainability monitoring at the federal, state, and local levels is still in its infancy (see chapter 5).

4. IMPLEMENTATION ACTIVITIES AT THE LOCAL LEVEL

Numerous municipalities in Germany have been involved in sustainable urban development processes for some time now. One of the starting points for this development was the Local Agenda 21, which was adopted by the United Nations in 1992 and found its way into cities, counties, and municipalities with very individual contributions under the slogan “Think globally, act locally!”. Further milestones for a stronger involvement of German municipalities in sustainability management could have been the Aalborg Charter, the adoption of the UN Millennium Development Goals and the first German Sustainable Development Strategy in 2002. Also, many municipal sustainability processes in Germany originated

from the initiative of citizens and were mainly driven by their voluntary commitment. For some years now, more and more municipalities have been bringing together existing commitment in municipal sustainability strategies and concepts. However, the depth of development varies considerably: while some municipalities focus on exemplary sustainability measures, other also define comprehensive mission statements and goals, or goal systems, and regularly review the degree of goal achievement (Bertelsmann Stiftung, 2016).

One contribution to the harmonisation of the processes is made by the Club of 2030 Agenda Municipalities. This comprises cities, counties and municipalities that have signed the Specimen Resolution 2030 Agenda for Sustainable Development: Shaping Sustainability at the Municipal Level by the German Association of Cities and the Council of European Municipalities and Regions (CEMR). The resolution consists of a general part on the commitment to the SDGs and a modifiable part for individual specifications on which SDGs should be localised and in which way. It can be signed by cities, counties, and municipalities alike. By signing the resolution, municipalities become members of the 'Club of 2030 Agenda Municipalities', a network with multiple opportunities for online collaboration, annual networking meetings, and the provision and exchange of relevant information. The Club of 2030 Agenda Municipalities is growing steadily: more than 240 cities (as of December 2023) have thus committed to the implementation of the 2030 Agenda and the 17 global Sustainable Development Goals of the United Nations since 2015. Participating municipalities are also asked to take optional measures in three thematic focus areas: Information and Awareness Raising, Networking and Advocacy Measures, and Transferring the 2030 Agenda to the Municipal Level. At the annual networking meetings organised by the Service Agency Communities in One World (SKEW), municipal representatives learn about the status of implementation of the 2030 Agenda at the local level.

Overall, the momentum of these sustainability activities at the municipal level is steadily increasing. The voluntary self-commitment of the municipalities is continuously increasing and is thus countering the pressure of higher-level policies and citizens' initiatives. In relation to the more than 11,000 municipalities in Germany, however, their number is still very manageable and does not yet reach, for example, the more than 2,000 Local Agenda resolutions that could be counted in the early 2000s (BPB, 2002). However, there are municipalities that have been working with individual sustainability principles and target systems long before these initiatives were established and that have given preference to the continuity of their sustainability monitoring over adopting the new global frameworks, supra-regional visibility and networking, although their activities actually correspond more or less comprehensively to at least one sustainable (urban) agenda. However, measuring the impact of these input/output activities requires systematic and holistic monitoring, which is not yet sufficiently established everywhere, given the resources and methodology involved.

There is no doubt that awareness, knowledge, and political will to implement sustainable development are not evenly distributed in the municipalities, which means in many cities, counties and municipalities sustainable development processes are not (yet) a priority. In many municipalities, however, various sustainability measures are implemented or at least discussed without this consciously taking place under the umbrella of sustainability, e.g., in the sense of the 2030 Agenda or New Urban Agenda. The circumstance that sustainability is understood as a voluntary municipal task and that a common frame of reference is lacking will have their share in this. Therefore, sustainability management must be monitored and evaluated just as much as the achievement of the goals itself (see, e.g., Hák *et al.*, 2016). In particular, it is important to mention the degree of integrated approach of municipalities, where different departments of the municipality have to work in a highly interdependent and cooperative way to avoid conflicting goals and optimise goal congruence within different departments and fields of action (see, e.g., Giles-Corti, 2020; Valencia *et al.*, 2019).

In addition to this horizontal integration and overcoming of sectoral structures, vertical integration and support at all levels naturally also play an important role. Only with adequate funding, balancing regional economic disparities, and linking support programmes to sustainability agendas and strategies can the transformation succeed.

Lastly, sustainability monitoring and management aligned with agendas and strategies can only be as good as the agenda or strategy itself. While the 2030 Agenda and the New Urban Agenda may be the best compass currently available for sustainable (urban) development, they bring with them various thematic gaps, such as aspects of community resilience and social cohesion, culture and the arts, and digitalisation as a means of sustainable development, sustainable finance, and the belief in economic growth, which is hardly questioned here, versus the concepts of strong sustainability with sufficiency, de-globalisation, and decentralisation approaches. Accordingly, many approaches reproduce these limitations and thus possibly neglect important factors in the impact structure.

5. INTEGRATING LOCAL INDICATORS AND DATA IN THE GLOBAL DEBATE

The 2030 Agenda assigned a crucial role to municipalities (UN Habitat, 2016) and the New Urban Agenda (NUA) of 2016 linked sustainable development to urban development. However, as mentioned above, the 17 goals, 169 targets, and associated indicators to monitor the success of the global goals relate to the national level and have limited local applicability. Similarly, while directly addressing cities

and towns, the NUA does not include a review mechanism in its 175 paragraphs. Therefore, systematic processes for localising the SDGs and reviewing the NUA at the municipal level are needed (see, e.g., Hák *et al.*, 2016; Valencia *et al.*, 2019). Localisation of the SDGs, their targets, and indicators refers to local adaptations that include 'translating' the goals and targets to the municipal level, selecting and prioritising them locally, framing them contextually, and assigning locally applicable target values.

This translation also encounters a peculiarity within the SDGs with regards to multi-level governance and monitoring: there are 107 outcome targets that refer to desirable outputs, outcomes, or even impacts of actions that can be implemented for sustainable development. These targets are numbered decimally. In addition, however, the SDGs also include 62 Means of Implementation (MoI; numbered alphabetically from SDG 1 to SDG 16 whereas SDG 17 is entirely dedicated to the MoI), representing 37 percent of all goals. They were introduced because one of the major limitations of the MDGs was the inability to specify the resources needed to achieve the goals (Bhattacharya and Afshar Ali, 2014). MoIs refer to either financial or non-financial measures to achieve the goals, and they vary in terms of the level addressed, from global such as the United Nations to national or subnational policies. In addition, some of them are non-specific in terms of the level they address, and can, therefore, be applied at the regional or local levels, especially in terms of community development policy and international cooperation. Integrating local indicators and data in the global debate and vice versa is thus made even more difficult.

Besides the debate on implementation options, generally the local level has an increasing need for an impact-oriented approach, which is intended to show relevant actors the link between the definition of their strategies, its measures and the intended and possibly unintended changes (see, e.g., Koch *et al.*, 2019). Impact logic seeks to systematically identify the resources that go into an activity (input), the outputs that the activity produces (output), and the effect on the target group (outcome) and on the society as a whole (impact). Undeniably, most impacts do not follow an ideal-typical linear course. Temporal and spatial divergences in the impact logic rather lead to a complex impact structure, in which the connection between input and impact can take very different paths and cannot always be explained causally in a flawless way. In particular, the unknown time lag between the components makes accurate predictions nearly impossible. In the sustainable urban development context, for example, impact linkages are usually not limited to city boundaries or the urban-rural context. Pressing sustainability issues, such as climate change, biodiversity loss, and inequality are most often global challenges – and relevant to the Global South – and highlight the need for coordinated and integrative action (see Knipperts, 2020). Practitioners, however, are more likely to face the question of how to make the use of funds efficient and impact-oriented, and how to measure output, outcome, and particularly impact.

The SDG Indicators for Municipalities (Bertelsmann Stiftung *et al.*, 2022) are an attempt to meet this need of impact orientation. It is a comprehensive set of indicators for reviewing the impact of SDGs at the local level. They are developed continuously and participatory in a working group of the same name and accompanied by a wide range of support services such as an interactive data platform, the so-called SDG portal (www.sdg-portal.de). The identification of suitable indicators includes the collection, scientific evaluation, and selection of indicators for the targets and sub-targets that are fundamentally relevant at the local level in Germany. For the compilation of the indicator catalogue, suitable indicators are reviewed from the UN level to the European and national to the local level. The respective data is made available for cities, counties, and municipalities with more than 5,000 inhabitants in the SDG portal. This sustainability monitoring service makes it easier for municipalities to take stock of their sustainable development, report on it transparently, for instance with the help of a Voluntary Local Review (VLR), and get started with impact-oriented sustainability management.

Although the New Urban Agenda also contains a wide variety of goals, it does not have its own indicators that can be used for national monitoring and the international benchmarking that builds on it. To address this issue, the existing SDG Indicators for Municipalities were used (see BBSR, 2021).

6. DISCUSSION

The first national progress report on the New Urban Agenda has confirmed that a wide range of efforts are being made at all levels in Germany to strengthen the framework conditions for sustainability in cities and municipalities. The Inter-ministerial Working Group for Sustainable Urban Development, the sustainability strategies of the federal and state governments, and the corresponding initiatives at the municipal level, such as the specimen resolution on the 2030 Agenda, make the diverse activities in the field of sustainability visible. However, these efforts encounter different municipal structures and conditions, which are often sectoral and characterised by a lack of resources. The report has revealed that larger, growing municipalities are generally in a better position to establish local sustainability monitoring and management. Where there is strong political will, committed administrative staff and support for local initiatives to actively address the most pressing sustainability challenges, even smaller communities are appearing on the map.

Monitoring as a first step for this commitment shows a very different state of development – both with regards to the availability of valid indicators and the availability and quality of corresponding data. In terms of indicators, many fields

of action, such as the climate sector, rely on input indicators, which measure and document the use of resources, while for instance in the mobility sector it is easier to measure output and outcome. The reasons for this lie in the nature of the areas of analysis (e.g., global greenhouse effect vs. local traffic volumes/loads), the sustainability dimensions addressed (e.g., predominantly ecological vs. predominantly social), and the possible measurement methods. These factors are also, or perhaps precisely, reflected in the paragraphs of the New Urban Agenda, which provides a higher validity of the indicators. While mobility data is generally well available and shows the little progress that has been made, which is comparably weak at the federal level, climate assessments, statistical evaluations on renewable energies, and measure evaluations are (still) rather seldom conducted locally – and this despite the fact that available data and survey values indicate a very high level of activity – at least with regards to inputs such as the increasing preparation of climate protection concepts. Often, measures, especially in the field of climate adaptation, are implemented in different parts of the administration and are not subsumed under the umbrella of sustainable development. Existing climate and mobility data has high data quality due to standardised measurement methods (e.g., the German balancing system for municipal GHG emissions (BISKO, Hertle *et al.*, 2019) and the system of representative traffic surveys (SrV; Hubrich *et al*., 2019)), official registrations and statistics (e.g., statistics of building completions, car registrations, and traffic accidents), as well as remote sensing (e.g., solar potential cadastre and traffic areas). Often, however, the data is not available centrally, but only in the individual municipalities, which makes inter-municipal analyses, which are sensitive anyway, even more difficult. Against the background of this problem, in some cases qualitative information was preferred to measurable data and to form indices by means of standardised questionnaires. In this way, it was possible to record the diverse measures of climate adaptation, urban-rural mobility, and the associated progress in digitisation. In both areas, the potential of digitisation has hardly been exploited to date and is often limited to information and citizen participation offerings.

In the course of the work and analyses within Germany on the first progress report on the New Urban Agenda, it became clear above all how diverse and varied the municipal sustainability activities of the counties, cities and municipalities in Germany were. This was based on the structural characteristics of the more than 11,000 municipalities in Germany, which in turn also influence the specific political and civil society prioritisation of sustainability activities in the sense of the Sustainable Development Goals (SDGs) and the New Urban Agenda. In addition, awareness of sustainability issues varies greatly between municipalities. In all of the cities and municipalities with which we were able to cooperate for the preparation of the progress report, the topic is organisationally located in very different administrations. This ranges from separate staff units to the departments for urban development and/or the environment to the departments for city marketing.

The sectoral structure of German local government often means that an interdisciplinary exchange on such cross-cutting issues is difficult to achieve or is still in its infancy in many municipalities. It is also not uncommon for large sections of urban society to lack the awareness of sustainability issues. In peripheral and sparsely populated areas, for example, sustainability is often equated with climate protection. Elsewhere, sustainability is discussed primarily from an economic perspective, focusing on the economic benefits for the region. In addition, many local authorities are already implementing or at least discussing various sustainability measures, without always consciously bringing them under the umbrella of sustainability in the sense of the New Urban Agenda and the 2030 Agenda. This is also due to a development that, in the course of the implementation of Local Agenda 21, on the one hand it saw sustainability as a voluntary task and, on the other hand, left the design of monitoring entirely to municipal self-determination without a common frame of reference for indicators.

Thus, the systems for monitoring the municipalities' own sustainability activities in Germany show a very different level of development. They range from comprehensive and indicator-based sustainability reports to initial qualitative stock-taking, which is used to first identify where there links in the municipalities' own work to the goals of the New Urban Agenda and the SDGs are. Considerable efforts are still required to establish a cross-level and standardised monitoring system in Germany. This applies even more as the indicator system used so far is based on different types of indicators. The main distinctions are the level of data collection and the availability of official data. However, the fundamental question of whether a comprehensively standardised sustainability monitoring system for municipalities would be desirable and effective on the one hand, and feasible on the other, remains open to political debate. The differences between the municipalities are considerable. Particularly in small municipalities it is apparent that a large number of the sustainability indicators are only suitable for their work to a limited extent. In the future, there will be a need for further scientific discussions on how this 'scale-blindness' of the indicators available today can be mitigated.

In order to intensify the progress in the implementation of the New Urban Agenda and the 2030 Agenda, it is, therefore, necessary to revise the level of the detail of existing municipal monitoring systems in the coming years. Only when a large number of municipalities systematically report on their own sustainability activities, it will be possible to assess the overall contribution of the municipal level to the achievement of the New Urban Agenda and the SDGs as a whole. However, it is important not to lose sight of the purpose of such monitoring. The systematic and indicator-based recording of municipal sustainability activities is an important contribution to raising political and social awareness. Ultimately, this is also the motivation for all the municipalities that have been involved in

in this report: raising the awareness of their own administration and civil society is of central importance − in the sense of a "global commitment to sustainable urban development as an essential step towards the realization of integrated and coordinated sustainable development at the global, regional, national, subnational and local levels with the participation of all relevant actors" (New Urban Agenda, paragraph 9).

With regards to the technical and practical challenges for municipalities in establishing sustainability monitoring, the cities, counties, and municipalities stated – as in many other areas – a lack of human resources as an obstacle to the accelerated expansion of their sustainability activities. Moreover, municipalities generally do not have their own statistics departments. In this case, networking and cooperation within and with the counties play an important role. However, the size of the city does not necessarily correlate with advanced sustainability management. Even smaller and medium-sized municipalities sometimes already proceed very systematically. In such cases, it is usually the direct effects of climate change and urbanisation, for example, that prove to be the drivers for active sustainability management – often in combination with local networks and an administrative leadership that has declared the topic a top priority. But even in these municipalities, the data issue remains the bottleneck. In Germany, current data from official statistics is only available for some of the sustainability indicators for all local authorities. Thus, the municipalities have to collect their own data for many indicators, which is again a question of resources.

7. CONCLUSION

The paper aimed to describe the state of an indicator-based multi-level governance for sustainable urban development in Germany, while identifying the opportunities and risks as lessons learned from the recent NUA national reporting. The discussion clearly shows that, on the one hand, there are mismatches in the architecture of sustainable urban governance. This is due to the interdisciplinary nature of the topic, which must unite the themes, actors and resources of urban and sustainable development – without a holistic orientation and implementation framework for the local level. On the other hand, conceptual questions, in particular regarding the monitoring of sustainable urban development, need to be answered. This ranges from the 'scale-blindness' of the indicators to data availability, and responsibilities. The dynamics with regards to sustainability efforts on the input side are currently relatively high. Without an integrated approach, constantly balancing the requirements of the different levels, frictional losses could counteract the progress in sustainable urban development.

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Marco KELLENBERGER *

MULTI-LEVEL TERRITORIAL MONITORING IN SWITZERLAND AS A CASE IN FEDERALISM AND MULTI-POLARITY

Abstract. In Switzerland, spatial observation and monitoring systems are very much defined and implemented at the various levels of government. This takes into account the fact that the main challenges and issues differ greatly not only between the levels of government but also regionally. The exchange processes between the levels of state, as well as between the various actors at the respective levels are interwoven in many ways, and this peculiarity of political work is also reflected in the implementation of indicator and monitoring systems. Although strongly characterised by the subsidiarity and independence of the respective level, a lively and well-balanced interaction between different actors can also be observed. This results in a somewhat multipolar picture within and across the levels, with a strong focus on cross-sectoral coordination and cooperation. The main goal of this article is to give an insight into and to deepen the understanding of the main characteristics and processes, dependencies, and interactions in the context of territorial monitoring in Switzerland. The insight is provided from a rather subjective perspective and based on a long-time institutional experience in this field.
Key words: sustainable development, spatial development, urban development, multi levels, multi poles.

1. METHODOLOGY

The paper is mainly based on personal observations, experiences, and interpretations of the territorial monitoring system in Switzerland. Although based on a review of the current planning system and some key – mainly governmental

* Marco KELLENBERGER, Swiss Federal Office for Spatial Development (ARE), 3003 Bern, Switzerland; e-mail: marco.kellenberger@are.admin.ch, ORCID: https://orcid.org/0009-0004-3618-0741

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– documents, it should not be regarded as a comprehensive overview. The main intention is to provide some reflections on monitoring and territorial indicators in Switzerland.

2. THE SWISS SPATIAL MONITORING SYSTEM

Spatial monitoring provides the necessary basis for spatial policies. The purpose of this activity, which is usually conducted at the administrative level, can be described in this short sentence. When it comes to the implementation, however, various questions arise that are not only of a technical nature (for example with regards to the definition and calculation of indicators) but they also concern aspects of the political and spatial multi-level orientation. How cross-level does a monitoring or indicator system have to be? Does harmonisation really stand above all? If so, does it work better top-down or bottom-up?

Using the situation in Switzerland as an example, I am going to show below how 'territorial monitoring' is implemented among the levels of government, and what roles the various actors play at the federal level. A brief look at the sustainability indicators on national, cantonal, and city levels will complete the picture.

Switzerland is a country with a strong federal structure. The 26 cantons have far-reaching competencies (see Fig. 1). This applies in particular to the area of spatial planning. Through the instrument of cantonal structure planning (in German: Kantonale Richtplanung) prescribed in the national framework law, the Federal Act on Spatial Planning (SPA) (Schweizerische Eidgenossenschaft, 2019), there are thus 26 of these 'plans' in Switzerland, the authority-binding content of which consists of text, as well as maps. The role of the federal government is, on the one hand, to ensure a certain harmonisation of the structure of the structure plans, whereby the spatial differences between the cantons are, of course, great–a large area canton in the Central Plateau with various large urban centres is confronted with challenges that differ greatly from those in a sparsely populated, small, mountainous canton away from the main traffic axes and densely populated urban areas. And, on the other hand, the Federal Council (in Switzerland, this is the name given to the college of government, which consists of 7 people: the heads of the 7 government departments) is responsible for examining and approving cantonal structure plans. As already mentioned, attention must be paid to the coherence between the spatial development ideas of the cantons (namely the directly neighbouring ones), as well as the nationally oriented strategies, e.g., Swiss Spatial Concept (Schweizerische Eidgenossenschaft, 2012), but also the requirements of the SPA.

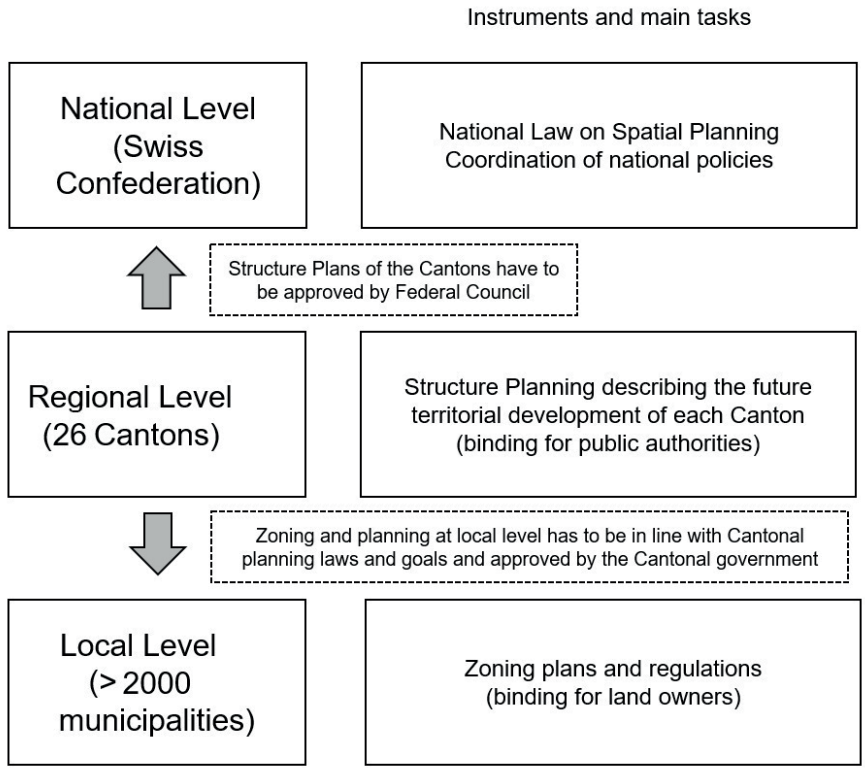

Fig. 1. Simplified overview on the Swiss Spatial Planning System highlighting the central role of the cantonal level

Source: own work (2023).

In accordance with their central role in spatial planning, the cantons are also very active in the area of spatial monitoring. The focus is often placed on the contents of the structure plans or the central spatial topics for the respective canton. The differences between the cantons are also huge here; the Canton of Zurich – as one example – has established a very comprehensive spatial observation, other cantons have much less resources and focus on rather basic activities, while in Eastern Switzerland, there has been established a pragmatic 'merger' of various (often smaller) cantons in the area of spatial observation and spatial analysis. It should be mentioned here that 10 years ago an attempt was made, initiated by the scientific community (IRAP, 2013), to harmonise the spatial observations, or more concretely: the indicators of the cantons that were in the foreground for this purpose. Many cantons were directly involved in this project, and the Federal Office for Spatial Development was also part of the project support group. As a result, around 30 central indicators were developed. The subsequent implementation was

then left to the cantons, or in other words: the cantons were free to decide whether or not they wanted to rely on this 'consolidated set' of indicators, depending on their needs. As far as I know, this harmonisation has not been monitored in terms of its success. It may be assumed that a certain orientation function has been achieved, but certainly not harmonisation throughout.

Let us turn to the level of the municipalities, which again presents a different picture. There are 2,136 municipalities in Switzerland (as of 01 Jan 2023). This number has been steadily decreasing since 1990: 30 years ago, there were still almost 3,000 municipalities. The drivers of the mergers are financial reasons and pressure for efficiency, but also the surge in professionalisation (not least in spatial planning), which in many cases has suggested a merger or even made it necessary. With regards to spatial monitoring, it may be stated that larger municipalities sometimes conduct comprehensive spatial monitoring as part of their planning activities. This will not be discussed further here. What should be emphasised, however, is the Statistics of Swiss Cities published by the Swiss Association of Cities (SSV), which was founded in 1897. The association has 130 members and is based on Article 50 of the Federal Constitution, which obliges the Confederation to take special account of the needs and interests of cities and agglomerations in its policies. From the point of view of spatial observation, these annual statistical volumes provide valuable material regarding the state of the urban space. This becomes evident just by looking at the thematic focus of the last three editions (Schweizerischer Städteverband, 2020, 2021, 2022): Land-Use in the City, Housing in the City, and A Look Beyond the Core City Boundaries. The table and analysis volumes have been published jointly by the SSV and the Federal Statistical Office (FSO) since 2016. This is certainly due to the high proportion of data from FSO, especially since the increased conversion to registers a good 10 years ago, which means that certain key figures are now available annually. The earlier editions were the result of a cooperation between the SSV and Statistics Zurich.

After a policy for urban space was formulated for the first time in 2001, the Federal Office for Spatial Development (ARE) established a special publication series in the 2000s entitled *Monitoring urban space in Switzerland*. There, the primary aim was to present and analyse the growing urban centres as diverse and interlinked spaces. The aim was to increase the understanding of the functional view of agglomerations – across the 'mighty' municipal borders. The monitoring was concluded in 2009 with a synthesis report (Schweizerische Eidgenossenschaft, 2009). At the same time, the federal government had already established a basis for financially supporting urban areas and their projects for the coordination of settlement and transport with the instrument of the so-called agglomeration programmes (Schweizerische Eidgenossenschaft, no date a) – provided that they would fulfil certain requirements. Since then, specifically defined monitoring and controlling indicators have been used within this framework. The more comprehensive, general orientation of the Monitoring urban space in Switzerland was

less in demand and thus no longer continued. To some extent, the *Statistics of Swiss Cities* in its new form since 2016 can be seen as a replacement − although here, of course, the perspective of the participating cities now dominates and not a view against the background of a (then new) federal urban policy as was the case at the time with the Monitoring urban space in Switzerland.

The European Programme City Statistics also examines the level of the cities. Switzerland participates in this framework with 9 cities. A description of the contents and orientation of the programme can be dispensed with here. FSO assumes the role of the patron for this participation – as a link between the involved Swiss cities and the programme – by organising the participation in the programme and processing the data in consultation with the cities. Of particular interest here are the cross-border datasets available for certain indicators for the transnational functional urban areas of Geneva and Basel. From the point of view of spatial observation, the synthesis reports that FSO regularly devotes to certain topics are also of great interest. In these reports, City Statistics indicators are highlighted, primarily for international comparison, of course, but at the same time other national indicators are also used that can bring added value to the investigation of the respective topic. This results in number and fact-based analyses that can be used for the interpretation of spatial trends. One recent example is the publication on Young People in Cities (Schweizerische Eidgenossenschaft, 2021b).

3. MONET

Before concluding with a look at spatial monitoring at the federal level, it is worth considering the topic of sustainability indicators: namely within the framework of the MONET System (Schweizerische Eidgenossenschaft, no date d) and the Cercle Indicateurs indicator system (Schweizerische Eidgenossenschaft, no date b).

MONET (Monitoring Sustainable Development) was established in the 2000s to measure the extent to which Switzerland was on the path to sustainable development. Later, the system was supplemented with indicators that also allowed comparability between developments in Switzerland and global developments. The system was also adapted to the systematics of the SDGs. Although much of the data is also available regionally, such an evaluation is not conducted – the focus is on development throughout Switzerland. The level of the cantons and cities, though, is very well represented, but in a different indicator system: the Cercle Indicateurs. This is – somehow distinctively Swiss – a bottom-up project led jointly by ARE and FSO in which 19 of 26 cantons and 29 cities are currently participating voluntarily. Both the set of cantons and the set of cities include the same 10 themes. Also, both sets consist of 32 indicators. However, the choice of

indicators differs in part because certain aspects are more relevant for cities than for the political level of the cantons. The indicators generally have an orientational function and do not allow the measurement and assessment of specific political programmes.

In the area of sustainability indicators, too, it thus becomes clear how strongly the respective level-specific requirements and needs dominate in Switzerland due to its political structure, as well as due to the great heterogeneity of the spatial conditions. It seems neither realistic nor does there seem to be a respective demand to design all-encompassing indicator systems that are accepted and usable across all levels. The definitional sovereignty to decide which indicators are appropriate for the respective level is clearly important for the federal units.

4. SWITZERLAND – A MULTI-LEVEL OR MULTI-POLAR SYSTEM?

Against this background, I will now focus on spatial observation and, at the same time, to a certain extent to another multi-level system.

On the first 'level' there are the authoritative 'non-political' data and indicator producers, such as the FSO and swisstopo (Swiss Federal Office for Topography) in particular. A large part of the data that can be used for national spatial observation and also various indicators are collected and made available by FSO. This includes mainly information on land-use and land-cover (Schweizerische Eidgenossenschaft, 2021a), but also on buildings and dwellings (Federal Buildings and Housing Register) or, of course, the basic data on population (STATPOP) and employment (STATENT). In addition, swisstopo provides a lot of mainly georeferenced data (and, by the way, also a stunning collection of historic maps and aerial pictures). This includes data from the official cadastral survey or the Topographic Landscape Model (TLM) (Schweizerische Eidgenossenschaft, no date c). Some of these datasets are rather new, but they can increasingly be used for analysis and intersected with each other or with other data in geographic information systems (GIS), which in some cases allows completely new types of analyses and insights. In addition, they provide support for new possibilities in the field of interpreting aerial and satellite images using machine learning approaches.

At the next 'level', sectoral, specialised policy systems (especially environmental policy or regional policy, but transport policy or housing policy could as well be mentioned here) can already obtain and use a large part of their required information from this basic data and indicator supply. In addition, further data from other providers, e.g., analyses of the housing market or special regional economic data and analyses, will add to the picture. In some cases, additional data

is also collected specifically. This information is then systematised and focussed within the framework of these specialised policies and processed into tailor-made monitoring and controlling instruments for the respective policies. The thematic focus and the requirements of the various sectoral systems are very specific, and the data needs are correspondingly heterogeneous. But the bottom line is that statistical-analytical information products are created which have the greatest possible utility and informative value for the corresponding policies.

ARE, being responsible for spatial development policy, can also be regarded as such a specialised system. However, spatial development is a cross-cutting task in which most other sectoral policies play a role in one form or another, or where there is by definition a strong thematic interconnection. For its spatial monitoring, ARE, therefore, requires information (data, indicators, analyses) of a large thematic breadth. In this respect, one can in fact speak of a further level here, where the information from the two upper (or 'upstream') levels flows together and is synthesised. In addition, of course, there is also a need for further, specifically spatial or spatial development, policy-based knowledge.

Exchange processes between the levels and actors are key. For the spatial monitoring of ARE, it is of outstanding importance that the content-related and political needs can be proposed and discussed in a close exchange with the primary data and indicator producers, and that the providers produce or report the data and indicators in such a way that they can be used as directly as possible for the purposes of spatial monitoring, both in terms of definition and methodology. To this end, there are various information and coordination networks, as well as close cooperation in concrete projects (for example, on register adjustments, new indicators, updates of spatial typologies, etc.).

Having stated that, as mentioned above, ARE is responsible for a cross-sectional policy (see Fig. 2). The data, indicators, and analyses compiled at the level of the related sectoral or sectoral policy observation systems thus provide important information that can be drawn on as needed. As already mentioned above, a certain heterogeneity must be dealt with in terms of spatial level, time series, methodology or definition of indicators. This requires adaptations in some cases. As with the primary providers, a regular, close dialogue is also important here. This dialogue takes place within the framework of networks or on a project-related basis. An example of this is the Swiss Environmental Report (Schweizerische Eidgenossenschaft, 2022b), which is published every three years under the direction of the Federal Office for the Environment (FOEN) and where there are various content-related interlinkages with spatial development policy. There is a need for regular mutual agreement on suitable indicators and their interpretation. Another indicator-based project of FOEN is Landscape Monitoring Switzerland (in German: Landschaftsbeobachtung Schweiz – LABES) (Schweizerische Eidgenossenschaft, 2022a) with a regular publication of new and updated results. Here, too, close coordination and cooperation is key.

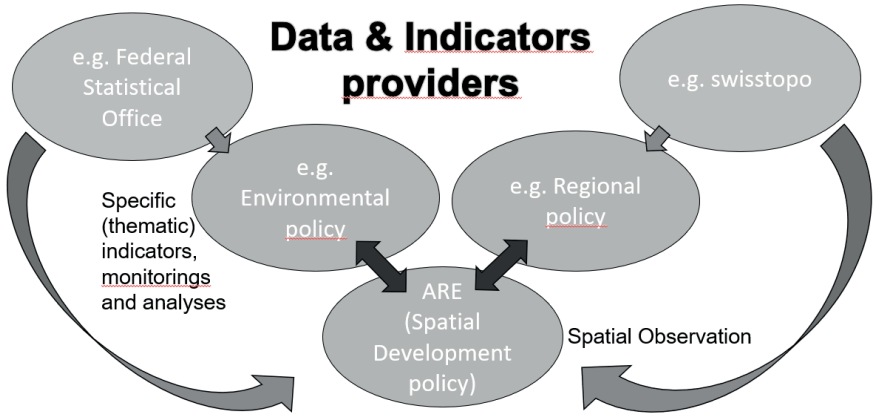

Fig. 2. Multipolar System of Spatial Observation in Switzerland (at the national level)
Source: own work (2023).

5. CONCLUSION

This article does not provide an actual and comprehensive description of spatial monitoring as implemented by ARE, as the focus here is on the multi-level and multi-polar aspects. Consequently, the various activities and strategies which of course shape and characterise the spatial observation of the ARE in addition to the described ones, like 'obtaining' and transforming the already available spatial observation-relevant information and the described exchange activities and project collaborations, will also not be dealt with.

It must also be made clear that the level of federal data and activities reflected here cannot, of course, be viewed in isolation – exchanges with cantons make a great deal of sense and are also maintained on a case-by-case basis. This exchange, for example with the cantonal spatial observation offices, could certainly be intensified in the future. The view across the national border is another aspect that is not discussed here, but which will also become even more important. It does not only consider the regional level of cross-border agglomerations (e.g., Geneva, Basel, Ticino) but also the link with the wider European territorial development and European spatial observation. The ESPON Programme (ESPON, no date), in which Switzerland has been actively involved since the first phase of the programme, comes to mind here. It is clear that this discussion would open the doors to yet another multi-level system.

In conclusion, it should be noted that Switzerland, with its federal structure, can probably serve as an example that one-size-fits-all solutions do not always

make sense. A certain degree of harmonisation is certainly important, and can be achieved by a mix of top-down and bottom-up measures – but should not be overvalued. It does not necessarily need huge indicator systems that are applicable to all users and harmonised across all levels. The approach of allowing the different levels of government, as well as the various sectoral policies the greatest possible freedom in defining and discussing their needs and structuring their indicator, monitoring and controlling systems may be more fruitful in the end. Because many small 'laboratories' often generate more suitable and beneficial – and ultimately more accepted – solutions. The decisive factor here is, as shown above, the continuous exchange and communication process. The daily work, so to speak, which provides the necessary 'cement' in this multi-polar system and also ensures its dynamic further development in terms of content.

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Philipp GAREIS [*], **Christian DILLER** [**]

IDENTIFYING EXURBS: A MULTI-CRITERIA APPROACH FOR GERMANY

Abstract. The debate about exurbanites and exurbs has ever been an Anglo-American phenomenon. Due to the limitless space for growth and the individual preferences of living in single-family homes, the exurban census tracts were the fastest growing urban type in the USA for several decades. The increase in highway infrastructure lead to an auto-centric development of land and an ongoing urban sprawl in search for natural amenities and affordable housing. This was not the case in Europe for a long time as Europeans preferred to live closer to the place of work and the historically grown structures of the urban development. However, after the COVID-19 pandemic and the restructuring of a new office culture with remote work as the new condition and growing preferences for more living space and green amenities, exurbs could also evolve in the European context. In this investigation, the authors try to identify exurbs in the German context based on a multi-criteria analysis. We find that they are mostly located in the east and north of Germany around Hamburg and Berlin, and to a minor extent to the west and south of Germany. While there has not been a significant increase of exurbs in the past years, the question remains whether the COVID-19 pandemic has influenced the exurbanisation and the related issues to a sustainable urban development according to SDG 11. Further research on the characteristics of exurbs is needed to provide additional policy recommendations and monitor the development of potential exurbs in the future.
Key words: exurb, urban development, regional development, residential location, commuting.

[*] Philipp GAREIS, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Deichmanns Aue 31–37, 53179 Bonn, Germany; e-mail: philipp.gareis@bbr.bund.de, ORCID: https://orcid.org/0000-0001-5093-992X

[**] Christian DILLER, Justus-Liebig University Giessen, Department of Geography, Spatial Planning and Urban Geography, Senckenbergstr. 1, 35390 Giessen, Germany; e-mail: christian.diller@geogr.uni-giessen.de, ORCID: https://orcid.org/0000-0003-2483-9719

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1. INTRODUCTION

In the current discussion on re- and suburbanisation (Schmitz-Veltin, 2015), as well as within recent urban development models for European cities (van den Berg *et al.*, 1982; Kabisch and Haase, 2011), one type of city outside the Anglo-American region rarely if ever appears: exurbs. The term 'exurbanities' was coined in the 1950s by A. C. Spectorsky (1958). It initially referred to metropolitan or suburban residents with a certain voluntarily chosen way of life in the countryside, but with an economic basis of work in the metropolis. Exurbs are essentially rural in character and are located outside the comfortable commuting distances to core cities and the area characterised by continuous suburbanisation. They are nevertheless a functional part of a region related to the core (Lamb, 1983). Due to the current development caused by the COVID-19 pandemic and the emergence of the so-called "zoom towns" in the USA, which are now used by formerly urban population strata for living and working and are characterised by high natural attractiveness and lower rents in the surrounding areas of the metropolises (Florida and Ozimek, 2021), the question arises whether this type of settlement could also have a certain significance in Germany in the future.

Initial results from an empirical approach based on a multi-criteria analysis suggest that the exurb urban type is not yet widespread, depending on the indicators and the choice of thresholds. However, it is not foreseeable how the mix of increasingly widespread remote work, still rising real estate and rental prices in and in the immediate vicinity of metropolitan areas, and the associated increase in commuting times will affect the development of exurbs in Germany. Initial surveys suggest a shift in residential preferences toward small and medium-sized towns (SMST) (Neumann *et al.*, 2022). The first theses are raised in this article in the discussion of results, and further recommendations for policymakers in dealing with the unknown city type of the exurb are formulated. First, however, a definition of the term and a discussion of the literature on the exurb debate will be presented.

2. STATE OF RESEARCH

2.1. About the term 'exurb'

The exurb debate is about both exurbs as places and exurbanites as residents with specific lifestyle preferences (Nelson, 1992). Even though they are outside of comfortable commuting distances, a significant proportion of their residents still commute to the core cities for work. These residents accept the long commuting distances because it allows them to combine high-quality jobs and urban infrastructure opportunities with a lifestyle fundamentally shaped by rural qualities.

The exurban space is, therefore, changing from a space of agriculture to a projection space of certain lifestyles (Goddard, 2009). The exurban lifestyle is anti-urban, but it is also anti-suburban (Taylor, 2011).

The outer boundaries of exurbia are determined by commuting distances, while the inner boundaries are determined by the rural character and natural area qualities that the space still retains despite its settlement growth. The typical settlement pattern of U.S. exurbs is isolated single-family development or strip development oriented along major roads, which is contrary to the goal of SDG 11 to promote resource-efficient transport systems (UN, 2023). In the U.S., the phenomenon of exurbs had relevance in that, according to official calculations and definitions of exurbs in official statistics, 59 million residents, or about 25% of the total population, lived in exurbs in 1985 (Nelson, 1992, p. 362). However, different definitions of the exurb phenomena lead to rather smaller population numbers in this city type starting at around 10 million people living in exurbs in the USA (Golding and Winkler, 2020). Between the 1980s and the early 2000s, the U.S. was diagnosed with largely continuous increases in migration rates to exurban areas: core cities and suburban areas lost a net 0.5% of their residents annually to exurban areas, which is consistently a remarkable figure when accumulated over long periods (Osgood, 2011). Against this backdrop, exurbs were even discussed at times as the most important form of living in the U.S. in the future. At the very least, the developmental dynamics of this space justified distinguishing it as a separate category even from suburbia (Nelson, 1992).

Although the debate about exurbs shares some similarities with the debate about multi-local living arrangements, there are also some key differences between the two concepts. While multi-locality highlights the importance of balancing different locations and embracing diverse commuting patterns and multiple places of residence (as discussed in Danielzyk *et al.*, 2020), the exurb debate focuses on the appeal of rural living and assumes traditional urban-rural commuting patterns between home and work.

2.2. Exurbs in the debates and models of urban-regional development in the U.S. and in Europe

The term exurb refers in its origin to the situation in the U.S. In parts of the data-based city-region research in the U.S., the term has become a fixed category of ring-zonal models. Exurbs can also be seen as an umbrella term for all developments outside the cores of cities, i.e., both core-based suburbanisation and developments in rural places far from cities (Larsen *et al.*, 2017). Closer to the basic idea of the term, however, is its use for the type of place further from the centres and also beyond the sub-urban zone, which still has significant linkages to metropolitan areas but is still predominantly rural (Crump, 2003). Carrutthers and Vias (2005) consequently define four spatial types: Urban, Suburban, Exurban, and Rural. Exurbs are thus classified here in terms of their location to the core and their density between

suburbs and rural communities (Robinson *et al.*, 2005). In the official statistics of the U.S., the counties were assigned to one of these types according to the area, which made it possible to roughly determine the quantities of exurbs: this results in the above-mentioned, longstanding and relatively high figure of one quarter of the population in the U.S. living in exurbs. Despite this zonal classification, however, researchers have repeatedly raised the question of whether suburbia and exurbia can be analysed separately at all (Nelson, 1992). In some cases, no distinction has been made between suburban and exurban sprawl (Audirac *et al.*, 1990, p. 475), partly because the transition from suburban to exurban space has been regarded as fluid (Lucy and Phillips, 1997, p. 267). It should be mentioned in addition that even in the U.S. by far not all zonal models explicitly adhere to the concept of exurbs. Antrop (2000), for example, distinguishes in his model: urban core, inner fringe, outer fringe, rural commuting zone, and deep countryside.

For the European debate, the concept of exurbs played, if at all, a much smaller role than for the U.S. This is partly because, compared to the U.S., European urban regions are more concentrated in the cores. Their outer boundaries expand less rapidly and, therefore, the phenomenon of exurbia is probably less pronounced, which could also be due to higher transportation costs (Hesse and Siedentop, 2018). Despite that, this circumstance could also be explained by the fact that in European urban region research, the term 'periurban' is often used instead of 'suburban,' and no distinction is made between more central suburban and more decentralised spaces. Much of what is referred to as periurban communities in France, for example, is located on the outer fringes of densely populated areas and would be classified as exurb in the United States (Charmes, 2009). Anyway: exurbs stand in contrast to the European concepts of polycentric urban regions (Growe *et al.*, 2012) and planning goals like decentralised concentration. Their low density and large distances to city centres hinder efficient public transport systems.

Compared to the 1980s and 90s, the term exurb also seems to have lost some meaning in the U.S. in recent years. It does not play a role in current urban-regional research, much of which is centred around the term "postsuburbia" and shaped by the intercontinental convergence of views (Phelps, 2015, 2017a; Wu and Keil, 2020; Wu and Phelps, 2011). On the one hand, this may be due to the fact that the trends of suburbanisation or even counterurbanisation in many European countries, but also in the U.S., have been eclipsed, if not replaced, by the unmistakable trend of metropolitan reurbanisation in recent years (Dembski *et al.*, 2017; Brombach *et al.*, 2017). In particular, qualitatively oriented post-suburbanisation research is levelling the contrast between urban cores and suburban space (Keil and Addie, 2016) and is overall more focused on the areas of urban regions closer to the metropolis (Keil and Shields, 2016) rather than their periphery. Furthermore, it does not distinguish – at least not consistently systematically – more central and wider surrounding areas (Keil, 2018). In some ways, exurb research thus even stands in contrast to the now highly differentiated research on new urban nodes in peri-urban spaces. After all, the exurbs are characterised

by the fact that they are more strongly connected to the metropolises through their commuting relationships than their distances would suggest, while the new nodes are characterised by their relative independence from the metropolises and are sometimes even seen as anchored in the global economy independently of them (Phelps, 2017a).

2.3. Delimitation criteria of exurbs

Exurbs, as shown above, are partly equated with the zone of the same name in U.S. studies based on official data, i.e., all municipalities located in this zone are referred to as exurbs. This also explains the high number of inhabitants of the exurbs determined by the means of this classification: already in the 1980s, a quarter of the U.S. population lived in exurbs (Nelson, 1992; Davis *et al.*, 1994; Nelson and Dueker, 1990). A central weakness of the general assignment of all places located in the exurban zone to the category of exurbs is, however, that not only the small places but also the relatively autonomous centres in this spatial category are designated as exurbs, even if they are not oriented toward the metropolises at all. Also, centres in rural areas are called exurbs, even though they no longer have a rural character in their settlement structure. Conversely, it is also debatable whether exurbs are really a place type in their own right or whether exurbanites are not seeking exurban niches in suburban municipalities that are relatively central in the ring-zonal model but still retain their rural character (Crump, 2016). What becomes clear is this: assignment to a zone alone is not sufficient to classify a municipality as exurb. First, the location in space, second, the intensity of interdependence with the nearest metropolis, and third, the density of the place are decisive.

Thresholds for exurbs used in empirical studies are based on the U.S. situation and vary considerably between studies (for a detailed overview, see Berube *et al.*, 2006, p. 4): on the question of the spatial delineation of metropolitan regions in which exurbs are to be located, U.S. studies vary between 50 and 70 miles (e.g., Shrestha *et al.*, 2012; Lamb, 1983). In terms of metropolitan linkages, for Nelson (1992), exurbs are characterised by more than 10% of employees commuting to the nearest metropolitan area. However, other authors set the threshold value much higher (up to 30%) which shows the inconsistency of the exurb definition (Wolman *et al.*, 2005). As far as the building densities to be applied are concerned, the studies for the U.S. vary considerably. Clark *et al.* (2009) define low-density development of exurbs as a density of 40–400 residents per square mile. Nelson and Sanchez (1999) even set the upper limit at 999 residents per square mile. Again, Theobald (2005) suggested other thresholds: exurban areas have densities of 0.69-16.18 ha per dwelling unit, thus lying between urban and rural densities, while Robinson *et al.* (2005) assumed a plot size of 0.2-20 ha for exurban communes.

The most well-founded study of exurbs in the U.S. to date, insofar as it contains the most convincing operationalisation of exurbs, was presented by Berube

et al. (2006). They schematically illustrate the situation in the space of exurbs. According to this, exurbs are characterised by the following features:

– The focus is on exurbs in metropolitan areas that have a total population of at least 500,000. They are located outside of core cities and their directly adjacent suburban areas. Exurbs outside these metropolitan areas are different type of exurbs and are therefore not analysed here.

– At least 20% of employees have their jobs in the nearest urbanised zone to the metropolitan area. The urbanised zone is defined as the areas around core cities with a total population of at least 50,000 people.

– The community has population growth above the metropolitan average.

– The average density of house units of 2.6 acres (= 10500 sq. m) per lot is not exceeded. This is in the lower third of the U.S. average.

According to this definition, 10.8 million residents, or 4 % of the total population and 6% of the residents of metropolitan areas in the U.S., lived in exurbs in 2000. They accounted for about 3% of U.S. census tracts and were less present than studies from the 1990s indicated. However, their growth was very strong: the population of exurbs increased by 30% between 1990 and 2000, twice that of the metropolitan areas as a whole. Also interesting are the findings on regional differences, some of which are contrary to studies of development in the 1970s (Lamb, 1983). The South and Midwest are thus more exurbanised overall than the Northeast and West, where the regions from which early exurbanisation research often drew its examples are located (such as New York / Niagara County or the Rocky Mountains; see Spectorsky, 1958; Goddard, 2009; Carruthers and Vias, 2005).

Typologies of exurbs have been only tentatively developed, nor have they been pursued: Hayden (2003) distinguished three types of exurbs: 'reluctant suburbs' that resist growth, 'hot towns' that are attractive for telecommuting, and 'residential wallhallas' in particularly high-value landscapes. Berube *et al.* (2006) differentiated low cost exurbs from those with particularly high quality housing and those with particular recreational value.

Finally, however, it must be indicated that the threshold values for the determination of exurbs are arbitrary in some respects and, apart from the wide range of values, refer almost exclusively to the situation in the U.S. Similarly, data availability plays a major role in the selection of indicators in the U.S. (Ottensman, 2017). Here, this study attempts to establish an adaptable, exploratory approach for the case study of Germany, which is equally transferable to other countries in Europe.

2.4. Social aspects and ecological aspects of land-use change by exurbs

From the beginning, the debate about exurbs has been explosive because the term exurbanite was used to refer to a certain group of inhabitants that, due to its increasing importance, could also have a decisive influence on elections (Berube

et al., 2006). Originally, the exurban lifestyle was considered a privilege of population groups with the highest social status; however, in the course of mass motorisation, it became possible for upper-middle-class groups as well.

U.S. statistics provide more precise information on the socio-structural characteristics of exurban communities. However, it is important to note, on the one hand, the broad definition of exurbs in the statistics, which refer to entire zones, and, on the other, the fact that exurban communities have disproportionately high shares of commuters. However, exurbanities are also a minority in these communities. An analysis of socioeconomic data from the 1990s U.S. Census showed that compared to the U.S. average, exurb residents tended to be white, middle-class, they lived in childless households, and commuted more. While in the U.S. the percentage of whites in core cities was less than 50%, in the exurbs it was 95%. In the 2000 and 2004 presidential elections, 58% and 62% of exurb residents voted for the Republican candidate Bush, respectively, which was clearly the highest proportion in any spatial category (Lang and Sanchez, 2006). However, it also became clear in the studies based on U.S. statistics that the similarities between exurban and suburban households were greater overall than the differences (Nelson and Sanchez, 1999). Regional primary surveys, however, certainly uncovered greater differences between suburbanites and exurbanites: a study of the commuting behaviour of exurbanites in the Portland region (Davis, 1993; Davis *et al.*, 1994) showed that compared to the residents of sub-urban communities, exurbanites accepted longer commute times in exchange for more space with lower housing costs, a rural setting, and also better schools. In addition, significant differences were found between exurbanites in small towns and those in villages, but these were likely explained by region-specific factors. Again, the results of the study by Berube *et al.* (2006, p. 1) are particularly illustrative, as the type of exurbs is clearly specified here; it clarifies some preconceptions about exurbs:

> "Residents of the 'average' exurb are disproportionately white, middle-income, homeowners, and commuters. Yet exurbanites do not conform to all popular stereotypes. For instance, they do not appear to telecommute, work in the real estate industry, or inhabit super-sized homes at higher rates than residents of other metropolitan county types. Middle-income families' 'drive to qualify' for more affordable new homes that are in limited supply elsewhere fuels growth in many metropolitan exurbs."

In much of the earlier exurb research, their spatial consequences were viewed as problematic. In some assessments, a certain scepticism towards the self-interested exurbanites is not infrequently evident, at least subliminally: exurbanites maintain a primarily rural lifestyle, but also take advantage of the benefits of the big city (Nelson, 1992). They enliven the economic life of metropolises, but claim a large share of the resources in rural areas. For Lamb (1983), the exurbs are more expensive and energy consuming than more compact forms; they cost agricultural land and are fiscally problematic (Berube *et al.*, 2006).

It causes transportation problems and does not create stable neighbourhoods; in some cases, it even leads to conflicts between old and new residents. These conflicts are mainly related to land-use, the change of which is associated with the loss of importance of agriculture (Smith and Sharp, 2005) and forestry (Egan and Luloff, 2000). Environmental impacts associated with exurbanisation have also been viewed sceptically (Larsen *et al.*, 2017). Studies showed that land-use change associated with the increase in exurban residential forms (Theobald, 2004) was accompanied by a reduction in the biodiversity of regions (Hansen *et al.*, 2005). There is criticism of new, larger settlement units that have been built in a nevertheless rural environment at great speed without integration into existing structures.

However, in contrast to the sceptical assessment of changes in rural social structures, especially in exurbanisation research in the 1980s, views have increasingly emerged in recent years that accepted this phenomenon rather as part of the transformation of cultural landscapes, viewed it in a more differentiated way, and tried to deal with it constructively. Larsen *et al.* (2017) analysed for a former agricultural valley in Colorado how new networks between old and new inhabitants emerged in these spaces, in which common perceptions of the space played an important role, especially with regard to natural disasters and aspects of environmental protection. With growing numbers of people working remotely, time spent in the exurbs could increase and lead to improved integration of new inhabitants in the formally rural villages and towns. For the structural conflicts between newcomers and existing residents (Crump, 2003, p. 190), methodological tools for conflicts of use were developed (Caruso *et al.*, 2007). Negative assessments of expansive exurban settlement forms are based on GIS analyses (Clark *et al.*, 2009) and analyses of exurban settlement types and building forms, for example, in relation to their carbon footprints (Visscher *et al.*, 2014; Nassauer *et al.*, 2014). Increasing costs for building and maintaining infrastructure are still the biggest problem with the ongoing expansion of exurbs and should be observed closely in the future.

3. EMPIRICAL INVESTIGATION WITH REGARD TO THE RELEVANCE AND STRUCTURAL CHARACTERISTICS OF EXURBS IN GERMANY

3.1. Delimitation and typification approach

It has been shown that the U.S. reference values cannot be considered for the identification of exurbs. These values vary, on the one hand, due to the available land mass and settlement density, and, on the other, due to different plan-

ning systems used. Thus, new thresholds based on the American values must be used to identify potential exurbs.

The first reference here are the metropolitan and urban regions, to which a large part of the commuting movements must lead. To ensure comparability of urban regions at the European level, the Functional Urban Areas (FUA) from Eurostat (2018), which are delineated at the municipal level (Link, 2021), are suitable. These are characterised by the following features (Eurostat, 2018):

– They have a core city with at least 50,000 inhabitants.
– They additionally consist of a commuter zone with at least 15% of commuters commuting to the core city to work.
– The core city and commuter zone together form the FUA.

The FUAs serve to delineate the exurbs from the suburban catchment areas of the core city and also to identify the exurbs' own commute to the nearby FUA.

In addition to the FUAs, the census-adjusted population of the association municipality in the current 2019 data year is used to delineate the exurbs (Laufende Raumbeobachtung des BBSR, 2022). We use the association municipality level to have a uniform municipality definition in the study and to be able to verify comparative analyses. These association municipalities must be between 2,500 and 50,000 inhabitants in order to calculate commuting movements from community associations not located in the FUAs to the FUAs. Here, not only movements to the core city of the FUA count as relevant commuting movements, but to the entire FUA, since previous studies on the commuting behaviour of exurbanites considered both urban and suburban areas as destinations (Davis *et al.*, 1994). Three reference values are used to incrementally approximate an exurb delineation for Germany: >10% and <15% (low restriction), ≥15% and < 20% (medium restriction), and ≥20 % (high restriction) of commutes into the FUA. In addition, highway accessibility plays a critical role in delineating exurbs in the United States. In the context of identifying the exurbs in Germany, the component of local and long-distance public transport is added, which in this case is accounted for by long-distance transport and the large distances it can bridge in a short period. Depending on the degree of restriction, the proximity is set at <30 and ≥20 (low restriction), <20 and ≥10 (medium restriction), and <10 (high restriction) minutes of driving time. Important indicators continue to provide the endowment of community associations with single-family homes, which makes the communities interesting for potential exurbanites. For this purpose, we calculate the share of residential buildings with one dwelling in all residential and non-residential buildings, the share of residential buildings with one dwelling in all residential buildings, and also the living space per residential building. In this way, we can ensure that the dominant building type is the single-family house, and conversely, we can ensure via floor space that there is little multi-storey construction in the municipal associations. For this purpose, deciles rather than percentages were used,

following the classification of Berube *et al.* (2006). Here, for the percentage of residential buildings with one dwelling in all residential and non-residential buildings and the percentage of residential buildings with one dwelling in all residential buildings, all values ≥ the 5th decile represent low restriction, values ≥ the 7th decile represent medium restriction, and values ≥ the 9th decile represent high restriction. The living space per residential building would have to be low analogous to the high proportion of single-family houses, thus the low restrictions there are ≤ the 5th decile, medium restrictions ≤ the 3rd decile, and high restrictions ≤ the 1st decile. In addition, there is the settlement and transport area per inhabitant, which must be high due to the low population density and the good accessibility of the potential exurbs. Thus, for this indicator, values ≥ the 5th decile represent the low restriction, values ≥ the 7th decile represent the medium restriction, and values ≥ the 9th decile represent the strong restriction. Table 1 provides an overview of the indicators and sources.

Table 1. Indicators, target values and sources

Indicator	Target value (low/ medium/ strong)	Sources
Location of place of residence outside FUAs, location of place of work in FUAs	Generally valid	Eurostat (2018); Laufende Raumbeobachtung des BBSR (2022)
Percentage of commuters in FUAs	10%/ 15%/ 20%	Eurostat (2018); Laufende Raumbeobachtung des BBSR (2022)
Population of place of residence	2,500–50,000 inhabitants	Laufende Raumbeobachtung des BBSR (2022)
Accessibility of highways or IC/ EC/ICE stations	30 minutes/ 20 minutes/ 10 minutes	Laufende Raumbeobachtung des BBSR (2022)
Proportion of residential buildings with one dwelling unit out of all residential and non-residential buildings	≥5th decile/ ≥ 7th decile/ ≥ 9th decile	Laufende Raumbeobachtung des BBSR (2022);
Share of residential buildings with one dwelling in all residential buildings	≥5th decile/ ≥ 7th decile/ ≥ 9th decile	Laufende Raumbeobachtung des BBSR (2022);
Proportion of settlement and traffic area per inhabitant	≥5th decile/ ≥ 7th decile/ ≥ 9th decile	Laufende Raumbeobachtung des BBSR (2022);
Living space per residential building	≤5th decile/ ≤ 3rd decile/ ≤ 1st decile	Laufende Raumbeobachtung des BBSR (2022)

Source: own work.

3.2. Results

The set of indicators used makes it possible to identify potential exurbs in Germany and to determine initial characteristics. First of all, the localisation of exurbs is the first step towards understanding which municipalities in Germany exhibit exurban characteristics at all. Here, the map in Fig. 1 shows the municipalities with strong restrictions in red, medium restrictions in blue, and low restrictions in green. FUAs are highlighted in translucent pink, with highways as solid lines and rail lines as dashed lines. In addition, to monitor the development of potential exurbs, the exurbs from 2008 and to the most current period of 2019 are shown in comparison. It should be noted that all housing-related data for 2008 is from the 2011 Census and, therefore, only partially reflects 2008 conditions.

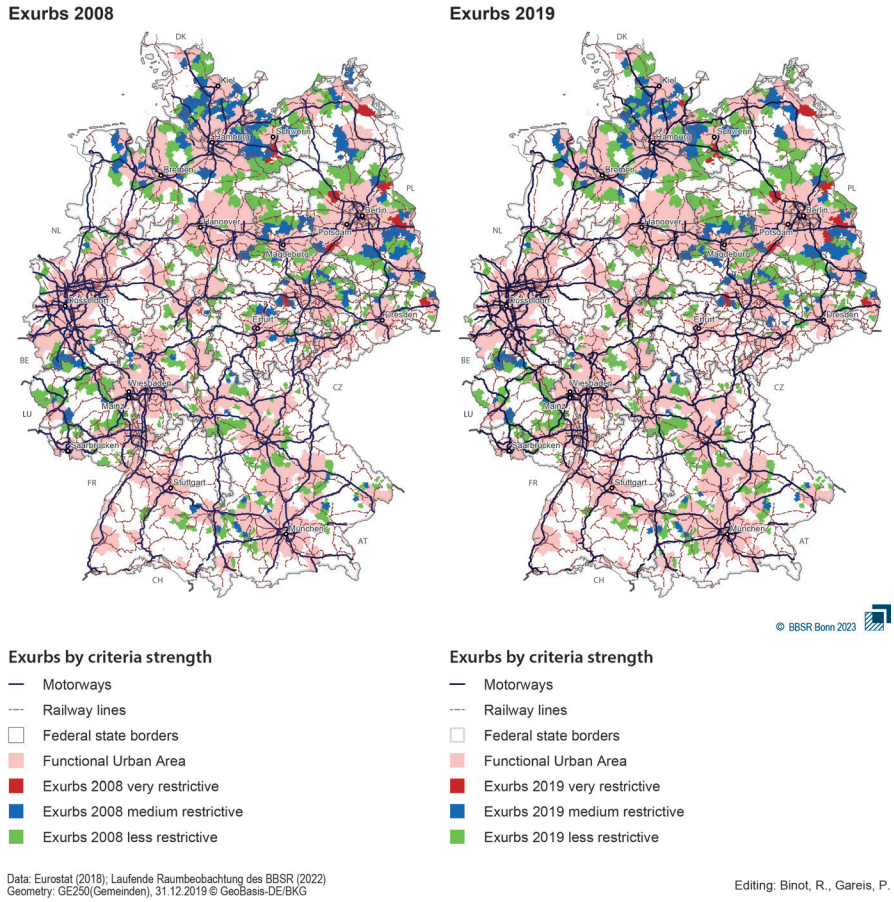

Fig. 1. Exurbs in Germany

Source: Laufende Raumbeobachtung des BBSR (2022).

The map shows that exurbs with strong restrictions are only located in the Berlin area, south of Greifswald, Schwerin and in 2019 also Kiel, as well as near Bautzen and Leipzig. This strong concentration in eastern Germany testifies to a settlement structure that is less polycentric, resulting in a more concentrated commuting pattern. In addition, the population density in rural eastern German areas are often lower than in western German municipalities, and thus the settlement and transport area per inhabitant is much more pronounced. Despite all this, it must be noted that the strict restrictions result in only eight (2008) or ten (2019) municipalities that meet the criteria of an exurb. If the restrictions were relaxed to a medium level, significantly more municipalities would have already shown the potential to be an exurb. 126 (2008) and 119 (2019) exurbs were identified using these criteria. In this case exurbs are strongly concentrated in the Berlin and Leipzig hinterland, as well as the areas between Hamburg and Schwerin, and Kiel. In addition, there are some clusters in the Eifel region, as well as between Hanover and Magdeburg, and near Erfurt. Generally, there is a clear concentration in the north and east of the country. At the lowest level of restriction, southern German municipalities are increasingly being considered as exurbs. Likewise, the gaps to the FUAs are filled with potential exurbs on a larger scale, so that many municipalities no longer have a direct border to the FUAs and are sometimes very solitary, such as in Mecklenburg-Western Pomerania, Lower Saxony, and Rhineland-Palatinate. In total, 474 (2008) and 461 (2019) potential exurbs could be found there. It is noticeable that exurbs are strongly represented in the Polish and Luxembourgian border regions, but less so in other border regions of Germany.

3.3. Discussion

The localisation of exurbs provides a first overview of a community type that has been affected by severe shrinkage in the past two decades, but which may be a potential winner after the pandemic and the accompanying changes in residential preferences and new work realities. Population trends, compared to all small and medium-sized towns (SMST) in the 2,500−50,000 population range, were significantly more negative as shown in Fig. 2. While the comparison cities tended to grow over the period from 1994 (index value = 100) even through 2019 and survived the wave of urbanisation since 2000 relatively unscathed, by comparison the exurbs with strong criteria lost over 10% of their populations. The exurbs identified with medium restrictions in 2019 had a population loss of just under 5%, whereas the exurbs with medium restrictions only lost just over 2% in 2008. The exurbs with low criteria are in between in their population development. What is striking, however, is the strong plateauing since 2016, which represents a weakening of the previous urbanisation wave. The remaining question is whether this development will evolve

into population growth from 2019 onwards or whether the plateau or previous downward trend will be maintained. In favour of growth is the fact that remote work will remain even after the pandemic and this can already be demonstrated in European office real estate markets (Bergeaud, 2023). This will not only lead to a change in the cities themselves, since purchasing power will flow out of the cities (Court and Borak, 2023) and public transport will be utilised less (Olayode *et al.*, 2022), but will probably also result in a change in the demand for housing.

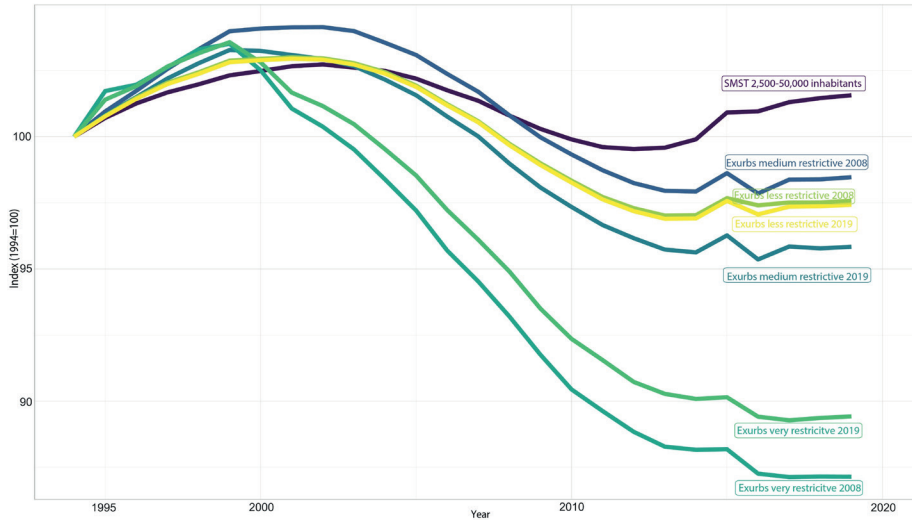

Fig. 2. Population development in Exurbs 1994–2019

Source: Eurostat (2018); Laufende Raumbeobachtung des BBSR (2022).

For example, it has been proven for many years that for families with children, who are the driving factor behind the growth of exurbs in the U.S., the single-family house is still strongly preferred as a form of home ownership, despite all the sustainability efforts. For families with three children, the acquisition rate of single-family homes compared to all other housing types in Germany is 99%, and for four-person households it is still 93% (Amman and Müther, 2022). In addition, real estate prices have risen sharply, coupled with an enormously tight interest rate situation. This combination, which in particular makes home-ownership in the city and its suburban communities almost unaffordable, can be another driver for a residential location decision far outside the core cities. Here, it is already evident that the demand for existing properties is gaining in importance compared to new construction (Amman and Müther, 2022), which may lead to increased demand, particularly in well-connected exurbs. Especially single-family homes from the 1970s and 80s might become very popular

in the near future when no sufficient construction of homes will be authorised or affordable. Privacy and affordability have always been the main reasons for moving to exurbs (Johnson, 2013). The trend towards exurbs, driven by the aftermath of the pandemic and changing work and commuting patterns, may become more prevalent in Europe in the future.

4. CONCLUSION, PERSPECTIVES AND FURTHER RESEARCH NEED

A debate on the existence of exurbs in Europe has not been opened yet in European research for many reasons. The distances of commuting, the relatively rigid planning laws due to the lack of land and the historically developed cities, and settlement structures differ significantly from the situation in the U.S. Despite all this, there are initial tendencies that the so-called exurbs could also be found in Europe. Although the spatial scales in the U.S. are larger than in Europe, the term 'exurbs' so far seems to be appropriate for an international discussion, instead of searching for another term for the European or German context.

The classification approach presented in this paper shows for the first time for Germany where exurban communities could be localised considering three different criterion strengths and two different time points. The increased occurrence in eastern and northern Germany indicates a relatively high potential in these areas to be considered as residential locations for people with exurban residential location preferences. Especially the concentration of exurbs with very restrictive thresholds for the indicators around the monocentric region of Berlin is striking. Furthermore, the lack of exurban communities in the polycentric metropolitan regions of Rhine-Ruhr, Rhine-Main, and Rhine-Neckar shows that they might be too densely populated to attract exurbanites.

When discussing sustainable development, it is crucial to emphasize that exurbs are not aligned with the principles of sustainable spatial development, as defined by the United Nations' Sustainable Development Goals (2023). The extensive surface sealing caused by single-family homes and the accompanying road infrastructure, which characterizes exurbanisation, directly contradicts the objectives of SDG 11: sustainable transport and sustainable cities and human settlements. In contrast, polycentric structures with decentralised concentrations (Growe *et al.*, 2012), located closer to city centres, appear to be a more favourable settlement forms for sustainable development. Exurbs, with their significant distances from core cities and limited population size, hinder the establishment of efficient public transport infrastructure necessary for sustainable urban living. Thus the question of the role of spatial planning emerges.

The extent and form of exurbanisation in the future will also be influenced by how restrictive regional and local urban containment policies are (Osgood, 2011). Exurbs can be a result of regional planning that limits residential development in suburban areas, which encourages leap frogging, and the spillover of residential development into adjacent more peripheral areas. In addition, community associations identified as exurban have experienced significant population declines over the past two decades and in many cases are likely to have relatively high vacancy rates. Since existing properties in the form of single-family homes are being acquired in particular, due to the current situation on the real estate market, precisely the community associations identified here could experience population growth again in the near future (Amman and Müther, 2022).

The phenomenon of exurbs is likely to continue to change significantly with the digitalisation of work. Exurbanites have so far accepted longer commuting times and are often employed in traditional office jobs, which have a high potential for remote work. Therefore, the thesis that the option of remote work opens up the possibility moving outside comfortable commuting distances than ever before might become reality in the near future. Even if the place of work may still be formally located in the FUA in the statistics, this could lead to a stronger counter-urbanisation from exurbs, which would be accompanied by the creation of new infrastructure and all of its problematic consequences for the society.

Exurbs are still strongly defined by commuting behaviour. Trips between work and home, however, are losing importance in the travel budget compared to leisure-oriented trips. Exurbs are often located outside of regionally planned areas. Long commutes are made not only to work but also for leisure (Taylor, 2011). It would be worth discussing whether, for example, exurbs in the future will also combine living and (digital) working in a rural location that is associated with intensive use of leisure facilities in metropolitan areas or if the connection to the metropolises will loosen due to less frequent travels to work.

Another aspect is how social life in the community associations identified as exurbs will develop in the future. Related to the debates on multi-local lifestyles, since even infrequent commutes involve traveling long distances and thus taking up time that might be lacking for important local volunteer work, exurbanities could change the cohabitation of the identified municipalities. This effect, already identified by Scaff (1952), has also been confirmed in recent studies and requires further investigation in the identified exurbs (Rüger *et al.*, 2022), especially after the COVID-19 pandemic and the increasing facilities for remote work.

Lastly, it is essential to emphasize the importance of future data collection to monitor potential exurban developments. Firstly, comprehensive data should be gathered regarding the construction and age of single-family homes within potential exurban communities. Additionally, conducting interviews with individuals who choose to move to exurbs is crucial in order to gain deeper insights into their motivations. By understanding why people opt for exurban living and exploring the role of spatial

planning, we can develop more sustainable options for where and how individuals can lead fulfilling lives. This data collection and analysis will aid in informing future strategies and decision-making processes aimed at promoting sustainable living choices.

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Andrea JONAS[*], André MUELLER[**]

IMPACT OF LEARNING CITY NETWORKS ON MULTI-LEVEL URBAN DEVELOPMENT AND TRANSFORMATION PROCESSES

Abstract. Learning city networks are real-time laboratories related to national and local urban development policies. In order to support learning city networks, the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) together with the Federal Ministry of Housing, Urban Development and Building (BMWSB), the U.S. Department of Housing and Urban Development (HUD), the German Marshall Fund of the United States (GMF), the Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ), and partner cities have developed and further enhanced the multi-level D4UC (Dialogues for Urban Change) Method since 2012. This method makes an international exchange on the specificities of urban transformation processes, based on purposeful projects, possible for participating cities. The article discusses methods and lessons learned and is framed within a theoretical background of learning networks.
Key words: urban laboratories, multi-level governance, D4UC method.

[*] Andrea JONAS, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division Urban Development, Deichmanns Aue 31–37, 53179 Bonn, Germany; e-mail: andrea.jonas@bbr.bund.de

[**] André MUELLER, Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), Federal Office for Building and Regional Planning (BBR), Division European (and International) Spatial and Urban Development, Deichmanns Aue 31–37, 53179 Bonn, Germany; University of Bonn, Faculty of Mathematics and Natural Sciences, Department of Geography, Meckenheimer Allee 166, 53115 Bonn, Germany; e-mail: andre.mueller@bbr.bund.de

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1. FRAMING LEARNING

Ministers responsible for urban development of the Group of Seven (G7) met for their first G7 Summit on Urban Development in Germany in 2022 and agreed upon joining forces in order to make cities more liveable (G7 Germany, 2022). They highlighted the importance of coordinated multilateral cooperation in order to overcome global challenges (G7 Germany, 2022a:2). Germany's Federal Chancellor Olaf Scholz stated that especially in cities ideas, concepts and solutions could grow (G7 Germany, 2022b). The Ministers' communique highlighted the interconnection of cities on the global, national and regional level. City networks, according to the communique, "are becoming major global players" (G7 Germany, 2022a, p. 3). By building up and further developing multi-level and multiple-stakeholder cooperation, as well as sharing information at intra, inter and supra-national levels, cities play a central role for sustainability (G7 Germany, 2022a, pp. 4–5). This role can be strengthened by increasingly involving cities in the development and implementation of urban development policies and the dialogue between local and national levels (G7 Germany, 2022a, pp. 7–8), as cities remain crucial local arenas for decision-making (cf., Barber, 2013; WBGU, 2016).

The question of governance and actors willing to learn may play a major role in this context. The introduction of this context completes the topic in the same way as a conclusion is drawn focusing on which forms of learning networks are necessary in order to address all or some of the multi levels.

This decentralised power role of cities has been emphasised by a couple of agreements, particularly on the global level, e.g., the New Urban Agenda of the United Nations (United Nations, 2017) and the Sendai Framework for Disaster Risk Reduction (United Nations, 2015), or in a more informal setting by the Memorandum of Understanding on Urban Energies (Mueller, 2013).

Apart from the data-oriented and thus quantitative view on the multi-level analysis of urban development, taken by this special issue, this article focuses on a qualitative look at multi-level city learning networks and their impact on urban transformation processes. International cooperation on the future of cities and urban development policies seems to be more important than ever, as global challenges increase and influence cities in a direct way. The aforementioned agreement of the G7 Ministers clearly underlined this necessity and the importance of multi-level cooperation. Not only with the G7 Agreement of 2022 but in general it pursues the German Federal Government actively the international cooperation on urban development and housing. Accelerating urbanisation, as retraced by the United Nations while applying remote sensing data (UN DESA 2018), and still ongoing globalisation trends are seen as a chance to fostering an international dialogue on urban development, for example in the framework of urbanisation partnerships.

Germany's international activities on urbanisation in a sustainable manner consist of five aspects (Deutscher Bundestag, 2015): (1) good governance and administration, (2) human rights and social engagement/ participation, (3) sustainable economy, (4) environmental protection, natural resources and climate, and (5) education, research, and culture. Considering the first aspect in this series, the Federal Government facilitates an international discourse on sustainable urban development and best practices at the national, regional, and local levels, i.e., in the sense of a multi-level approach. The German National Urban Development Policy, a joint initiative of the federal, state and local government(s), as well as their representative bodies, is one example of the implementation of this multi-level cooperation on urban development (BMWSB/ BBSR, 2023). It includes the D4UC international city learning network as the focus of this article. As global challenges and the so-called "wicked problems" (Weber and Khademian, 2008) increase, the need for a systematic international exchange becomes ever more urgent. As research on learning city networks within the field of urban development only exists in fragments, this article exclusively analyses the D4UC multi-level governance learning city network. Measurable indicators on the multi dimensions of urban development, as described in this special issue, are of outstanding value for urban development and related transformation processes. Successfully implementing changes, which are based on quantitative approaches, governance and learning processes constitute the second important aspect. This article thus aims at enlarging the primarily data-oriented view of this special issue by the qualitative aspect of multi-level governance and learning networks.

2. LEARNING NETWORKS IN THE CONTEXT OF URBAN DEVELOPMENT

City networks, twinning partnerships, and exchange programmes have been for many years an essential part of international cooperation on urban development. *Learning* city networks on urban development including multi-level (national, regional and/or local) governance actors, in contrast, are relatively rare.

Learning networks in general "are a form of collaboration that enables groups of stakeholders to cultivate connections across communities and organizations and to strengthen a whole system simply by focusing on the potential for participants to share information and learn from one another" (Ehrlichman and Sawyer, 2018). New collaborative actions are not the primary goal of a learning network. The focus is rather on deeper connections and shared learning with the aim of building a robust network that can lead to a concrete strategy for change (ibidem).

Based on their experience with several networks over a few years, Ehrlichman and Sawyer (2018) defined four characteristics of learning networks:

1. Network coordination to support the network as a whole,
2. Gathering information from the field,
3. Disseminate information out to the field, and
4. Information to flow across the field.

Collecting information from the field and from participants, defining a clear process structure and work target, and providing a technical infrastructure to facilitate and share information within the network are the central tasks of a learning network. This includes listening and learning to and from the network (information in). Bringing information from outside the network into it is the second important issue (information out). Examples include newsletters, webinars, calls, and meetings. Yet, a learning network goes further than just collecting information. It aims at directly connecting stakeholders, independently from a central coordination and based on a self-organisation, as well as a support of members to coordinate activities on their own (information across) (Ehrlichman and Sawyer, 2018).

Learning from each other is the central aspect of a learning network. Simons and Ruijters (2004, p. 4) referred to learning as "implicit or explicit mental and / or overt activities and processes leading to changes in knowledge, skills or attitudes or the ability to learn of individuals, groups, or organizations. These can under certain conditions also lead to changes in work processes or work outcomes of individuals, groups, or organizations." Implicit learning or "hands-on learning" (van den Dool and Schaap, 2020, p. 16) can also be seen as least or even more important than formal learning processes in training classes. Hambleton (2020, p. 32) has advocated for a focus on "relevant practices" instead of "best practices" in a city dialogue. A relevant practice, from his perspective, includes insights and approaches that can help cities look for specific objectives. This is especially important in a rapidly changing world that requires public innovation. Best practices already exist and are not necessarily an essential innovation (Hambleton, 2020, p. 33).

Learning in governance networks includes its own challenges, as problems have become more and more complex in the same way as finding solutions for the challenges requires communication and interaction with a diverse group of stakeholders. Handling these "wicked problems" on a governance level is complex, as national, state, and local authorities act in a relatively institutional framework (Weber and Khademian, 2008, p. 334; Riche *et al.*, 2020, p. 148; Schaap and van den Dool, 2020a, p. 1). Global trends like climate change, migration or social polarisation affect cities often in an intense manner. Therefore, city leaders and administrations in particular have to find answers to these challenges. Many examples show that they are successful in finding these answers. Sharing successful stories and learning from each other is key to the future of cities.

A first step in a city learning network may thus be to clearly define the given problem (Schaap and van den Dool, 2020a, p. 4). Finding solutions for often diffuse and abstract urban development problems requires different methods than a specific problem, but provides more room for consideration and reflection (van den Dool and Schaap, 2020, p. 25). Weber and Khademian (2008, p. 337) have identified three dimensions of "wicked problems": they are either/or unstructured, crosscutting and relentless. Handling these challenges requires broad knowledge to develop a new knowledge base and enable cooperation. Transferring, receiving, and integrating knowledge are seen as continuous central issues as "wicked problems," modified in different dimensions.

Learning in a network includes individual and collective learning elements. The diversity of conditions affects these learning processes. Positive perceptions can foster individual learning within a network, whereas negative perceptions support individual learning from outside a network. In order to foster individual and collective learning, network leaders or moderators, who facilitate the sharing of information and the handling of different opinions, are crucial (Riche *et al.*, 2020, p. 155). Learning in a governance network is more successful when informal rules enable creativity and consensus while formal rules provide guidance for imbalances and information exchange (ibidem, p. 158). Including different participants in governance networks and building trust between these stakeholders are other central elements of an effective network (ibidem, p. 147). As more and more "wicked problems" require the involvement of private and societal actors, a "hybrid" governance network of private and public participants would constitute another network type (Schaap and van den Dool, 2020, p. 2). Governments, businesses and citizens depend on each other and have thus to interact with each other (van den Dool and Schaap, 2020, p. 17).

Learning city networks "profit from the countervailing principle of governance and management, i.e., higher levels of governance respect lower levels of governance in the same way as lower levels of governance in return orient their work towards higher levels of governance and the pro-active participation of all relevant stakeholders" (Mueller, 2016, p. 3).

3. THE TRANSATLANTIC LEARNING CITY NETWORK D4UC

In order to support learning city networks, the Federal Ministry for Housing, Urban Development and Building (BMWSB), the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR), the Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ), all in Germany, as well as

the U.S. Department of Housing and Urban Development (HUD), the German Marshall Fund of the United States (GMF) and partner cities have developed D4UC since 2012. D4UC is part of the German National Urban Development Policy (BMWSB/ BBSR, 2023) and aims at an international exchange to promote public welfare-oriented and integrated urban development. The multiple partners advocate for the (further) development and implementation of national urban development policies and promote innovation (GMF, 2015, 2019; Mueller, 2016). An important guideline and framework of Germany's National Urban Development Policy is the New Leipzig Charter, which was adopted in 2020 by the European Ministers on Urban Matters. It also highlights the importance of multi-level governance: "As recommended by the Pact of Amsterdam and the New Urban Agenda, vertical and horizontal multi-level and multi-stakeholder cooperation, both bottom-up and top-down, is key to good governance" (BBSR, 2020, p. 38).

The D4UC "basically refers to the necessity of managing urban development and urban planning in a continuous dialogue of all those stakeholders and actors who carry out planning decisions and thus strive for an optimal shape of urban transformation processes" (Mueller, 2016, p. 4). This concept has been adopted in three different countries: the U.S., South Africa, and the Ukraine. This article focuses on the transatlantic part of the dialogue, based on a systematic literature review of the network's observations published by GMF (2015, 2019) and Mueller (2016).

The dialogue is based on a joint declaration of intent in the field of urban development and housing signed by HUD and the German Ministry for Urban Development, as well as respective predecessor institutions and explicitly requesting multi-level exchange formats. The first declaration was signed in 2011, and an the agreement was amended in 2019. Ten cities on both sides of the Atlantic Ocean have participated in the network so far, six cities joined in late 2022.

Fostering integrated and sustainable urban development by including different stakeholders on different government levels is set as an important goal on both sides of the Atlantic. While policies and instruments vary between both nations (see Table 1), frameworks at the national and supranational level in Germany and the U.S. draw upon comparable political aims for urban development. The European New Leipzig Charter – the currently relevant political agreement in Europe − "aims to bolster integrated urban development for the common good, in the interest of preserving and improving quality of life in all of Europe's cities and communities" (BMI, 2020). HUD's six liveability principles constitute a foundation for interagency coordination on urban development in the USA (HUD, 2023b).

Table 1. National urban policies in Germany and the USA

Variable	Germany	USA
Name of national urban policy	National Urban Development Policy – a joint initiative of the federal, state and local governments	No national urban policy, but cross-agency and cross-sector federal initiatives and locally-driven efforts, including Choice Neighborhoods Program, Promise Zone Initiative, Sustainable Communities Initiative and other place-based efforts
Date of national urban policy	2007	2009
Legal status	Administrative guidance/ framework document	Not applicable
How developed (e.g., through a participatory/ stakeholder process, or act of parliament)	Stakeholder participation, resolution of parliament, resolution of standing conference of ministers responsible for urban development	Legislative enactment with stakeholder engagement and locally-driven implementation
Type of national urban agency	General urban development authority	Not applicable
Implementation mechanism (e.g., committee, involvement of multiple agencies, national-local coordination)	National Urban Development Board	Involvement of multiple agencies, national-local coordination

Source: OECD, 2017, p. 61 et seqq. and 133 et seqq.; HUD, 2023b.

3.1. Central characteristics

The central characteristic of the D4UC transatlantic learning city network is an ongoing dialogue between local practitioners, the federal government and other 'city makers' in Germany and in the U.S. on the current topics of urban development. Mueller (2016, p. 4; see also GMF, 2015, 2019) has described three modules of the so-called D4UC method: (1) a real-time learning laboratory (project-based work), (2) a guided and spontaneous exchange of experiences (regular workshops), and (3) a zooming of the findings.

The uniqueness of the D4UC is based on:

– Its focus on local real-time challenges,
– Participation of all relevant governance levels,
– Project-based and place-based approaches,
– Fixed learning goals and standards in the same way as

– Developing new or improving existing planning tools, processes and instruments at different governance levels.

Its multi-level approach, integrating local, regional, national, and subnational stakeholders, is special. The results of the network are transferred to all different levels and thus allow the influence of national policies related to urban development. Hands-on and pragmatic instruments, tools and processes are in the centre of the network discussions. Participants are active members and take responsibilities for topics and methods applied in the network sessions, as well as transferring lessons learned into actions (ownership) (GMF, 2015, 2019; Mueller, 2016).

3.2. Network participants

The multi-level approach includes stakeholders from the local and the national level, as well as international organisations. Each network cohort usually includes three cities from the U.S. and three cities from Germany, with two to four participants on each side (see Table 2). These participants rely on a background in city administration, policy or civil society. If possible, participants should join the full network cohort. Apart from different institutions, participants bring different professional backgrounds to the network. This ensures a learning network that includes multiple professions and institutions, as well as multiple views on the complexity of urban development issues. Selection criteria for participating cities are existing pilot projects within the specific network focus theme. The national ministries of both countries define the overall themes. Furthermore, openness to new tools, experiments, processes, a critical reflection on one's own work and processes, a curiosity for innovation, and a willingness to share own experiences with others are crucial in the same way as readiness to cooperate (GMF, 2015, 2019; Mueller, 2016).

Table 2. Overview of the transatlantic D4UC city networks

Network cohort	I: 2011–2013	II: 2013–2015	III: 2016–2018	IV: 2022–2023/2024
Network cities from Germany	Bottrop, Leipzig, Ludwigsburg	Bottrop, Leipzig, Ludwigsburg	Bottrop, Karlsruhe, Leipzig	Berlin, Frankfurt, Munich
Network cities from the USA	Austin, Flint, Memphis	Austin, Flint, Memphis	Baltimore, Charlotte, Pittsburgh	Atlanta, Seattle, St. Louis
Focus themes	Participation and engagement	Civic engagement and active planning processes	Integrated urban development	Breaking barriers to housing for all

Source: GMF, 2015, 2019; Mueller, 2016.

3.3. Learning methods

Learning Laboratories (Labs), especially Urban Living Labs, are an essential setting (cf. Nesti, 2018), particularly in a real-time mode (cf. WBGU, 2016). These labs focus on project-based work and include real projects, for which the participating cities are currently responsible. This approach includes a moderated and well-organised as well as a spontaneous exchange and dialogue between the participating stakeholders and actors (information in and information out). In each cohort, site-visits in the U.S. and in Germany are part of the network programme. Network members are able to see most of the discussed projects in reality. During these face-to-face interactions, cooperation and exchange are organised in different digital formats, e.g., video-calls or webinars. The aims of and standards for the learning network are defined at the beginning of each cohort. Success is not only measured in numbers and data but also in implementing lessons learned in participant daily work routine (GMF, 2015, 2019; Mueller, 2016).

Especially sharing best and relevant practices, as well as successful solutions, is helpful for the learning process and testing new approaches and paths in urban development. A key element of the D4UC network is a 'peer-to-peer' learning method. Network participants exercise the role of a 'peer' or a 'coach' and work in teams – depending on the city structure and adequate projects, as well as the current challenges in urban development. In many ways, participants drive the learning process (information across) (GMF, 2015, 2019; Mueller, 2016). They prioritise, based on their knowledge, expertise and experience, learning issues (GMF, 2019, p. 8). Teamwork is later integrated into the full network in order to find common solutions, which are thought-provoking and stimulating for the cities (GMF, 2019, p. 22). These solutions can emerge independently of local specific contexts and are neutral and open for a broader transferability to others. The discussion includes repressive and promotive aspects. Experts in a specific theme, e.g., on creating a culture of participation or applying innovative media in civic engagement, provided external input in the second cohort (GMF, 2015, p. 12–13).

The multi-level approach is addressed in local-national sessions. National actors are able to learn about concerns and challenges on the local level. Due to the dialogue, local participants were able to intensify their contacts with their respective national government. Before the network started its work, 41% of the participants had little or no contact with the national level (GMF, 2019, p. 24).

A successful example of this peer-to-peer learning method is a project of the participating City of Pittsburgh. The city applied the ideas commonly created in the workshop to develop a pilot project that won a nomination for an award – the Champion Cities by Bloomberg Philanthropies – and subsequently received funding for implementation. The innovative idea was to enhance the demand for retrofitting housing by reducing costs through a group purchase of material and support of DIY product installation (GMF, 2019, p. 22). Another example was the City of

Charlotte where – in the sense of the focus theme of integrated urban development – subsidised housing was geographically placed in areas of social and economic potentials in order to stimulate in the long run social mobility and a respective social upscaling (Chetty *et al.*, 2022). These are two specific projects, addressing "wicked problems" of and for the network cities.

3.4. Lessons learned

The first three network cohorts showed many similarities in urban development on both sides of the Atlantic Ocean – despite cultural and regulatory differences. A central element of the network is the common work on one main issue or question, which is of significance for the network cities and their daily work routines. Engaged individuals are often also important for the success of the network. So far, cities of different sizes have participated in three network cohorts, though size has not been a factor for success in the networks. The openness to and willingness for a trustful exchange and the sharing of information among each other has been the more important factor. An exchange on thematic basis seems more helpful than novelties and best practices. This includes applying instruments and concrete solutions in the respectively local administrative practice (GMF, 2015, 2019; Mueller, 2016).

Participants of the third cohort gave feedback on their network experiences (see Fig. 1). A majority described the network experience as important for their own work. It helped to improve the way in which they carried out their work and thus enhanced the respective local project (GMF, 2019:8).

Based on the experiences so far, it could be possible to enhance the D4UC method in certain aspects. One modification scheme has already started in the fourth and current cohort. The network will be guided by two research teams supporting the network with in-depth research on both sides of the Atlantic Ocean. The support in Germany includes an in-depth research on density and mixed-used development approaches (BBSR, 2023). Interviews with participating cities were undertaken as the first step to learn more about the specific challenges in the cities, as well as expectations and wishes for the network cohort (information in). The research teams[1] also bring new and external knowledge into the network (information out). Enlarging the city network has already grown by the inclusion of thematic experts on a case-to-case-basis, but it could also be intensified. Most of the dialogue occurs during the organised workshops on site or digitally. Deepening the relations among the network members in between those workshops could also help to strengthen processes and partnerships (GMF, 2015, 2019; Mueller, 2016).

[1] The research team in Germany is composed of TSPA (Thomas Stellmach Planning and Architecture), Stefan Heinig Stadtentwicklung, Planung und Beratung and Bauhaus University Weimar.

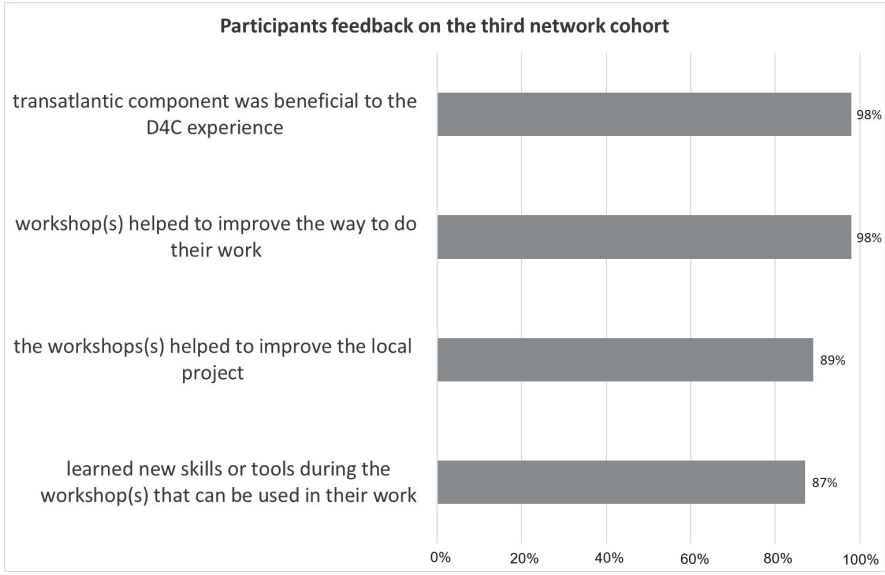

Fig. 1. Participants' feedback on the third network cohort 2016–2018

Source: own work based on GMF, 2019, p. 8.

A possible modification on the national level could be to foster exchange and dialogue between cities and multiple planning levels (local, regional, national, and supranational) on specific themes. Furthermore, giving best and relevant practices more attention via awards and promoting network results via conferences, publications and the use of social media, is another option in order to strengthen the network. Respective pilot projects and incentives could also be an alternative (GMF, 2016, 2019; Mueller, 2016). Besides, the multi-level approach of these learning networks generates many beneficial insights for the national level. These could be adapted by a stronger focus on planning tools and instruments in the international context, providing policy recommendations for different stakeholders and actors at the local, regional, and national level during the network cohort (i.e., policy paper) or enhancing learning methods and transferring lessons learned to other national and international city networks, with which both nations cooperate (GMF, 2015, 2019; Mueller, 2016).

4. CONCLUSION

Why is it important to anchor a city network on present issues of urban development on a respective national level? An international multi-level exchange not only offers fresh ideas, new solutions and new contacts, but also enables network

participants to reflect on their own work by getting a feedback and resonance or suggestions from foreign experts and counterparts. It also enables a multi-level discussion between national, regional, and local stakeholders on existing and new tools and instruments, as well as regulatory barriers and processes.

Based on the four characteristics of learning networks defined by Ehrlichman and Sawyer (2018), an information flow across the network is particularly essential. Building deeper connections and enabling co-creation between multi-level and multi-sector stakeholders is at least as important as sharing information, best and relevant practices, and lessons learned with each other.

The so-called D4UC method facilitates and supports this information flow across the network in multiple ways through:

– In-person meetings on both sides of the Atlantic Ocean, including site-visits to learn from and to talk about specific projects and challenges within the network cities;

– Peer-to-peer learning, providing participants with an ownership role of network processes and content, and

– Multi-level and multi-sector stakeholders, creating new connections between different planning levels as well as public and private stakeholders.

An information flow inside a network between participants themselves and the involved organisations is as important and helpful as an information inflow from the outside from external experts and research teams. The D4UC is a governance network that also includes non-public stakeholders. It works with formal rules within an organised context, but also allows an informal exchange between network participants (van den Dool and Schapp, 2020).

What may be learned from the learning network for further processes? The transatlantic cooperation in the context of Germany's National and International Urban Development Policy achieves important impulses (e.g., inter-city dialogue, pilot projects, transnational exchange, and awards) for continuously adapting national urban development and building laws, as well as funding programmes. Based on the work of GMF (2015, 2019) and Mueller (2016), key factors for a successful city learning network secure network continuity and stability in the same way as they build trust among the participants. This is particularly important for cross-sector teams and different governmental levels. It may be fostered by peer-to-peer learning, providing network members an ownership role within the network. Taking multi-level and multi-disciplinary approaches across sectors and scales and institutionalising them is, therefore, another key component.

The D4UC Network shows how learning can be implemented in the complex field of urban development in an international and multi-level cooperation. The peer-to-peer method seem the most important among the different learning methods , just as the ownership principle of network members in designing the network workshops is. By sharing experiences, information and knowledge in a trustful surrounding, city networks contribute valuable lessons for handling global challenges.

Different forms and formats of a city learning network may be helpful in addressing the various levels of governance. An explicit exchange between the various levels, i.e., the federal/ national and the local, may focus on regulations, instruments or funding programmes, which are applied by the local level but designed by the federal/ national level. Delving deeper into specific local challenges may help achieving a better understanding of prevailing local challenges by all levels on the one hand, while, on the other, developing possible solutions for those challenges jointly may build a stronger and more trustful cooperation structure between local actors and stakeholders, as well as between the various levels of governance.

For the increasing international activities on the federal level in Germany, for example in the context of G7, the experiences and results made in the D4UC Network are of outstanding value. The D4UC proves profoundly that an international network can help find ideas to handle the wicked problems, like affordable housing. Learning methods include information in and out from a network and, most importantly, across a multi-level network.

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PART II

ARTICLES

Federica ROSSI *

AGING IN PLACE AND ELDERLY MOBILITY HABITS: EVIDENCE FROM ITALIAN NATIONAL SURVEYS

Abstract. The aim of the paper is to provide an empirical framework of the ageing process in Italy, with a focus on aging in place and mobility behaviour of the elderly, as emerging from two national surveys: the "Aspects of Daily Life" survey by ISTAT and the ISFORT mobility survey.
Results show that the Italian cities and towns are sufficiently age-friendly, with some improvement opportunities to be implemented. Loneliness and isolation represent a warning sign, hindering the aging in place. Finally, the study confirms that the Italian older adults use public transport only a few times, in favour of private cars.
Key words: ageing, mobility habits, aging in place, Italy.

1. INTRODUCTION

The change in the population structure with a marked increase in the number of elderly people is a consolidated trend in many Western countries. As emerges from a United Nations report (2019), in 2019 Italy was the second country in the

* Federica ROSSI, DAStU, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 Milano, Italy; e-mail: federicamaria.rossi@polimi.it; ORCID: https://orcid.org/0000-0003-0651-1680

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world, after Japan, in terms of dependency ratio: since 1992, when the over 65s exceeded the 0−14 years old for the first time, the proportion of elderly people in the country has increased.

The Italian National Statistical Institute (ISTAT) highlighted that 22.8% of Italians are over 65 and the average age of the population is 45.4. These values will grow over the next thirty years: forecasts estimate that people aged 65 or more will represent 32.2% of the population, and that the average age will be 50.2. In contrast, the population of people aged 0−14 is expected to maintain the same weight as today (13.5%) or even to decrease to 10.2%.

These forecasts of a sharp increase in the elderly population in Italy are closely linked to the so-called "baby boom era": the today adults (born in the 1960s) will become the elderly of tomorrow.

The rising life expectancy has also led to an increase in the number of the so-called "great elderly" (i.e., aged 85 and over), who in 2019 were about 2.2 million (3.6% of the population and 15.6% of people aged 65 and over) (ISTAT, 2019, p. 122).

From these figures it is clear why population ageing − with its effects on health expenditure, labour market and retirement expenditure − is one of the hot topics in the public debate, requiring public policies to be implemented to cope with the inevitable changes in intergenerational relations (ISTAT, 2019, pp. 35−37).

The aim of this paper is, therefore, to provide an empirical framework of the ageing process in Italy, with a specific focus on the so-called aging in place and on the elderly mobility behaviour, as emerging from two national surveys. Specifically, the paper tries to give an answer to the following research questions: (i) are the Italian cities/towns age-friendly (as defined by World Health Organization (WHO, 2007)?, (ii) Which mobility habits are specific for Italian older people?, and (iii) Can Italian elderly age in place?

These three questions are interrelated. Indeed, elderly-friendly cities (in terms of accessibility to services, social inclusion, and participation), as well as the possibility to easily move guarantee a certain degree of independence to the older people, determining, therefore, the possibility to age in place.

The paper is organised as follows: the next paragraph presents the most recent literature on aging in place, accessibility to services, older adults' mobility, and how these concepts are linked with the elderly wellbeing and health. The third paragraph is dedicated to the description of the method and the main data source used − the ISTAT "Aspects of Daily Life" survey − by illustrating some socio-demographic characteristics of the older adults interviewed. The fourth paragraph discusses the main results of the analysis on aging in place and older adults' mobility habits, combining information from two national surveys (ISTAT and ISFORT). Finally, some concluding remarks are proposed.

2. LITERATURE REVIEW

The concept of aging in place refers to the possibility for older adults to choose to continue living in their own homes and neighbourhood despite aging (Mestheneos, 2011). This is only possible if the provision of services and support to older people is adequate, so that they can get old in a familiar environment, ensuring a certain degree of independence (Gilleard *et al.*, 2007; Davies and James, 2011; Gonyea and Burnes, 2013).

Previous studies have demonstrated that older people prefer to stay at home as they age (Means, 2007; Mariotti *et al.*, 2018). Indeed, as discussed by Gilleard *et al.* (2007), as people aged their residential mobility declined and they felt more attachment and belonging to their community. Moreover, analysing the case study of Milan (Italy), Mariotti *et al.* (2018) found that most of the older adults interviewed were satisfied with their living environment and preferred to age in place, to enjoy an independent living.

Housing as well as neighbourhood features, such as transportation, recreational opportunities, and amenities that facilitate physical activity, social interaction, and cultural engagement are crucial aspects in people's ability to age in place (Wahl and Weisman, 2003; Buffel *et al.*, 2019; Gardner, 2011; Wiles *et al.*, 2012).

The World Health Organization's (WHO, 2007) "Global Age-Friendly Cities" project identified six dimensions enabling the elderly to 'age in place': (i) social participation, (ii) social inclusion, (iii) (accessing) community support and health services, (iv) (making use of) outdoor spaces and buildings, (v) (allocating) housing, and (vi) accessing local public transport (LPT).

Previous studies have examined several of these dimensions. Pinto and Sufineyestani (2018) have identified the main requirements of an age-friendly neighbourhood, among which there are services availability (e.g., supermarkets, banks, post offices, etc.), the distance from transport stations and the infrastructures of the built environment, such as cycle paths, parking, and green areas.

There is a growing strand of literature exploring the linkages among aging in place and older adults' quality of life, wellbeing, and health (Giraldez-Garcia *et al.*, 2013; Vanleerberghe *et al.*, 2017; Zhang and Zhang, 2017; Gardener and Lemes de Oliveira, 2020). For example, Gardener and Lemes de Oliveira (2020) performed a meta-analysis to investigate how the perception of urban environment features acted as health and well-being determinant in an ageing population. They found that poor health and reduced activity were associated with negatively perceived environments. Similarly, Giraldez-Garcia *et al.* (2013) found that older adults who were satisfied with community services had higher self-rated health and functional independence. Moreover, Banister and Bowling (2004) highlighted the importance of living in a safe neighbourhood with good community facilities and services (including transport) for older people's life satisfaction.

Social participation and perceived social inclusion (Wong *et al.*, 2017), as well as friendship, neighbourhood cohesion and solidarity (Strobl *et al.*, 2016; Cramm and Nieboer, 2014) were positively associated with health and wellbeing. Specifically, Gao *et al.* (2017) highlighted the crucial role of the neighbourhood's physical (aesthetic quality and walking environment) and social features (social cohesion and interaction) on the wellbeing of older adults in Shanghai (China). Similarly, Ma *et al.* (2018) showed that a walkable and cohesive neighbourhood increased transport accessibility and community integration, thus positively influence wellbeing.

To be independently usable by the elderly, services and facilities must be accessible (Shergold and Parkhurst, 2012; Lättman *et al.*, 2018). Metz (2000) defined accessibility as the ease of reaching destinations for different purposes; while Hansen (1959) defined accessibility as the number of potential opportunities for interaction, highlighting the importance of reaching desired destinations.

Moreover, accessibility has recently been used as a social indicator (Arellana *et al.*, 2021; Foth *et al.*, 2013), since poor accessibility to opportunities may cause social exclusion by limiting socioeconomic participation, and therefore negatively affecting health and quality of life (Al-Rashid *et al.*, 2021).

Several studies focused on measuring accessibility to services by the elderly (Gargiulo *et al.*, 2018; Vendemmia and Lanza, 2022). Specifically, Manfredini and Di Rosa (2018) proposed a method for mapping and measuring pedestrian accessibility of elderly to Milan subway stations, by means of isochrones to specific urban functions. Conversely, Papa *et al.* (2018) developed a GIS-based method to analyse public transport accessibility of older adults in Naples (Italy).

Looking at the literature on elderly's mobility, Webber *et al.* (2010) underlined the complexity of this topic, which takes place on several space levels and is influenced by both psychological factors (Mifsud *et al.*, 2019) and physical environment (Siu, 2019). Mobility captures the ability of movement between different places (Morris *et al.*, 1979) when desired and not just when needed (Stjernborg *et al.*, 2015), thus playing a key role in avoiding loneliness and isolation and contributing to older adults' well-being (Pantelaki *et al.*, 2021). Some studies (Arentze *et al.*, 2008; Newbold *et al.*, 2005) revealed that older adults were "more mobile" than in previous decades: the travel activities, leisure trips, car trips and licensing rate have grown. However, the number of mobility options (cars, motorbikes, bicycles, LPT, etc.) is limited for this age cohort, given their actual ability to make use of all the available options (Burlando and Cusano, 2018). In general, a good transport system is a prerequisite for easing accessibility to goods, services (Hounsell *et al.*, 2016; Mariotti *et al.*, 2021) and welfare-spaces (Johnson *et al.*, 2017), as well as for fostering social and community participation (Brown *et al.*, 2018; Green *et al.*, 2014).

Numerous studies in the literature have investigated the relationship between LPT use and health or wellbeing (McPhee *et al.*, 2019; Akhavan and Vecchio, 2018; Metz, 2000; Banister and Bowling, 2004; Mollenkopf *et al.*, 2005; Nordbakke and Schwanen, 2014). Kim *et al.* (2020) found that Japanese older peo-

ple who used public transport reported high quality of life. Eibich *et al.* (2016) showed that access to LPT was related to better outcomes on all measures of health and wellbeing. Aceves-González *et al.* (2015) focused on the role of bus services on older adults' health and wellbeing. They found that some bus services attributes (e.g., features of bus design, crowded buses, pedestrian infrastructure, etc.) represented a difficulty to older passengers who needed or wanted to use them, thus influencing their mobility choices.

Moreover, the use of LPT often requires additional physical activity to reach the bus/train station (Coronini-Cronberg *et al.*, 2012; Rissel *et al.*, 2012), implying numerous benefits to health (Webb *et al.*, 2012; Laverty *et al.*, 2018; Webb *et al.*, 2016).

Looking at the linkage between older people mobility and the built environment, Cheng *et al.* (2021) found that proper neighbourhood setting facilitates walking levels, thus making accessibility to recreational areas easier, and increasing social ties with the community (Enssle and Kabisch, 2020). Moreover, poor physical activity was associated with low availability of bus shelters, bus frequency, and bus routes (Mahmood *et al.*, 2012; Adams *et al.*, 2012), as well as inadequate night-time lighting (Bjornsdottir *et al.*, 2012; Giehl *et al.*, 2012; Mahmood *et al.*, 2012; Strobl *et al.*, 2016).

Looking at the case of Italy, some studies are worth to be mentioned. Crotti *et al.* (2021), using data from the "Aspects of Daily Life" 2017 survey, examined the association between older adults' health and their mobility. The authors found that a frequent use of LPT or car positively influenced psychological and self-perceived health, while the use of LPT at least once a week increased the older adults' physical health.

Mariotti *et al.* (2018) showed that older adults living in Milan moved at least twice a day outside and preferred walking (35.4%), using LPT (30.8%), driving a private car (22.8%) or cycling (11%).

Finally, Mariotti *et al.* (2021) analysed the older people motivations not to take trips and activities because of the perceived inadequacy of LPT in the cities of Milan and Genoa. Results showed that the perceived quality of LPT service significantly influence the probability of giving up making trips and carrying out activities.

3. DATA AND METHOD

The survey "Aspects of Daily Life" by ISTAT was analysed to investigate the six dimensions enabling elderly to age in place (WHO, 2007), through descriptive statistics. The average values presented in the next section are disentangled by age cohorts (65−74 years old and over 75) and geographical dimension (Italian NUTS2 regions). Despite the simplicity of the methodology used, the analysis depicts a clear picture of the aging process in Italy, uncovering some specific patterns.

The survey is part of the "Multiscopo Household Surveys" integrated system launched by ISTAT in 1993, and it is included in the National Statistical Programme. The survey target population is made of households and their members, living in Italy. It is conducted every year with the aim of producing a wide range of information on individuals and households: work, family life, housing, lifestyle, mobility, health, leisure, and political and social participation.

The 2018 survey (ISTAT, 2020) collected information on a sample of 44,672 citizens nationwide, who answered 691 questions. Among them, 5,295 (11.8%) were older adults aged between 65 and 74, while 5,331 (11.9%) were aged over 75.

The analyses proposed in this paper focus on these two age cohorts (10,626 respondents), to discuss the Italian elderly's possibility to age in place and their mobility habits.

Figure 1 shows the geographical distribution at the regional level (NUTS2) of the interviewed older adults: 8.5% lived in Lombardy, 7.7% in Piedmont, 6.9% in Campania, 6.1% in Tuscany, etc.

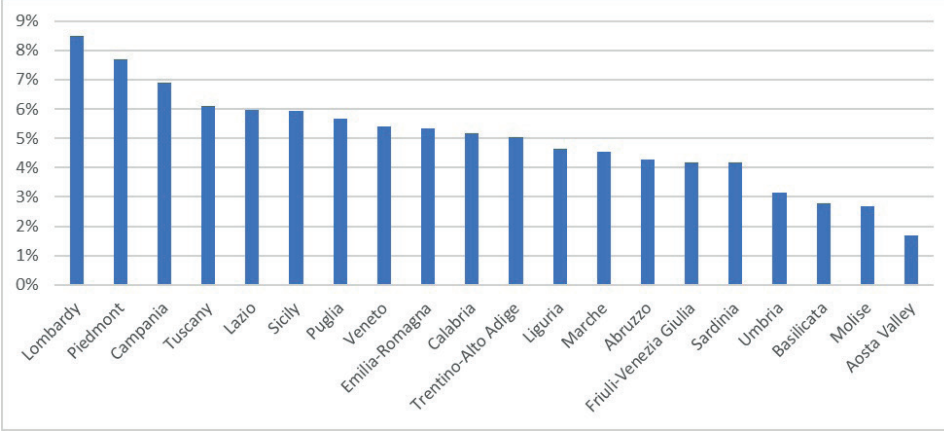

Fig. 1. Geographical distribution of the elderly respondents

Source: own work based on ISTAT data (2020).

Looking at the socio-demographic characteristics, most of the sample is made up of women: they constituted 53% in the 65−74 age cohort, while they constituted 58.3% in the over 75 group.

19% of the elderly aged 65−74 and 37% of the over 75 lived alone. 70% of the older adults aged 65−74 years old were married, while 15.4% were widowed. These percentages are respectively 46.8% and 42.8% for those aged over 75. Women's life expectancy is higher than men's, so the share of men living with a partner is significantly higher than that of women, who generally outlive their partners (ISTAT, 2019, p. 151).

Considering the educational level, those aged over 75 presented a lower level of education: 64% completed only primary education or had no qualification at all, and 16.8% completed middle school. Instead, 33.7% of the elderly aged 65−74 completed primary education or had no qualification at all, against 30.3% having middle school education.

As indicated by ISTAT (2019, p. 151), the progressive postponement of retirement has led to an increase in the active age years. From 2008 to 2018, the employment rate of the population aged 65−69 gradually increased from 7.6% to 12.3%, both for men and women. Among those who stated that they had worked in the past (75.8% in the 65−74 age cohort, and 78% in the over 75 cohort), 30.5% of the 65−74 year olds were blue collar workers, while 28.7% were white collar workers or managers. Among those aged over 75, 34.8% were blue collar, while 17.8% were white collar or manager.

Finally, looking at the older adults' main source of income, 77.5% of the elderly aged 65−74 (91% of those aged over 75) received a pension, while 10.6% (4.5% of those aged over 75) were supported by their families.

4. RESULTS AND DISCUSSION

As discussed above, the first dimensions enabling the elderly to age in place (WHO, 2007) are social participation and social inclusion. A proxy that can be used to measure social participation is the older adults' attendance to some cultural and leisure activities, such as theatre, cinema, etc.

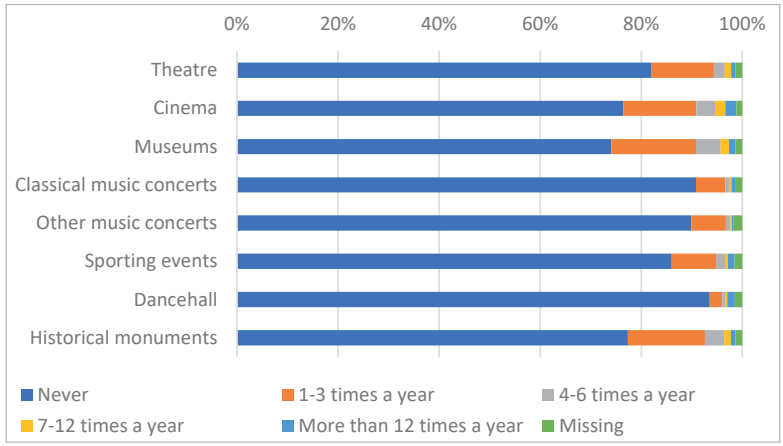

Fig. 2. Participation to cultural and leisure activities, aged 65−74

Source: own work based on ISTAT data (2020).

As depicted in Fig. 2 and 3, most Italian older adults never went to theatre, cinema, museums, etc. At least once a year 25% of the elderly aged 65−74 visited museums, 22% went to cinema, and 21% visited historical monuments. These percentages drastically fell in the over 75 cohort: 10% visited museums, 8% went to cinema or theatre, and 8% visited historical monuments.

As underlined by some previous studies (Koponen *et al.*, 2017, 2023), attending cultural events positively influences older adults' quality of life, increases their wellbeing, and decreases their feeling of loneliness.

Given this evidence, it would be a question of whether Italian older adults do not go to the cinema, theatre, etc. because there is not enough supply of easily accessible cultural and leisure activities, or because they are not interested in them. Moreover, we would expect differences between urban and rural contexts (with higher supply in cities and bigger towns), but the dataset does not provide this specification.

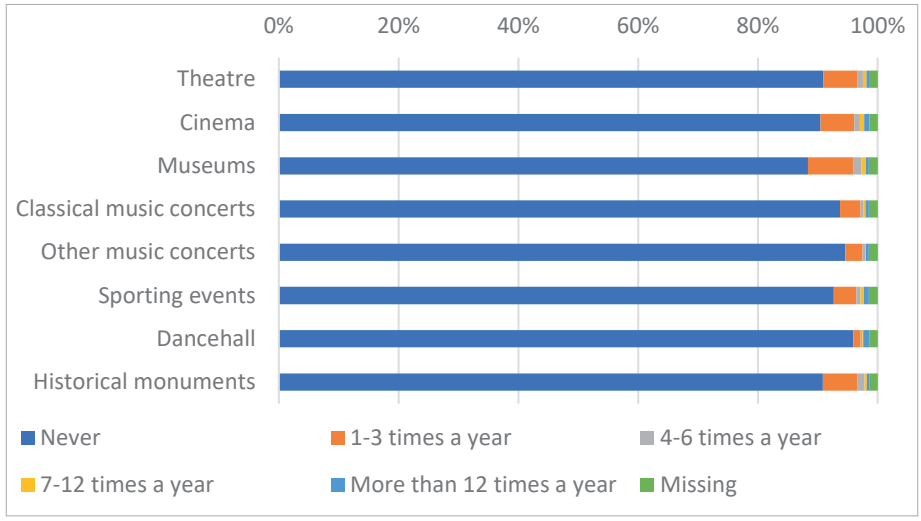

Fig. 3. Participation to cultural and leisure activities, aged 75 and more
Source: own work based on ISTAT data (2020).

Concerning the social inclusion dimension, it emerges that a consistent number of Italian older adults are isolated and lonely. Indeed, the data showed that 29.6% of the elderly aged 65−74 had no friends, 37.8% had no trusted neighbours, and 57.7% had no other relatives they could rely on (excluding parents, sons, siblings, and grandchildren). For those aged over 75, the percentages increased, suggesting a condition of greater loneliness: 44% had no friends, 39.8% had no trusted neighbours, and 62.1% had no other relatives they could rely on. Among those who had friends, 14.2% of the elderly aged 65−74 (13.3% of those aged over 75) saw them every day, while 43.8% (31.4% of people over 75) saw them at least once a week.

These results highlight a critical issue in comparison with previous studies. Indeed, as underlined by Chen and Schulz (2016), the prevalence of social isolation (defined as the absence of contact with people who provide social support) among people over 60s is between 7% and 24%, a condition that is even more severe among the older old people (aged 75–85).

The provision of services and support to older people is an essential component of the aging in place. Since the characteristics of the neighbourhoods in which people live are related to their well-being and quality of life, as discussed in the second section, it is interesting to investigate the accessibility to essential services by older adults, such as drugstores, first aid, etc. Fig. 4 and 5 present a summary of the answers, distinguishing between the two age groups (people aged 65–74 and people over 75).

The first interesting remark concerns the difficulty in reaching the post office: thinking about the withdrawal of pensions, the access to this service is very important for the Italian elderly population. 76% of seniors aged 65–74 stated that they had no difficulties in reaching a post office. This percentage decreased to 65.5% for those aged over 75. Respectively, only 4% and 8% said that the access was very difficult. These latter percentages, however, were quite diversified throughout the country. Indeed, the regions where the elderly have the greatest difficulty in accessing post offices are in the south: in Sicily (10% for the 65–74 age cohort and 11% for those aged over 75), Calabria (10% and 14%, respectively), Campania (8% and 12%, respectively), Basilicata (3% and 13%, respectively), and Sardinia (3% and 13%, respectively).

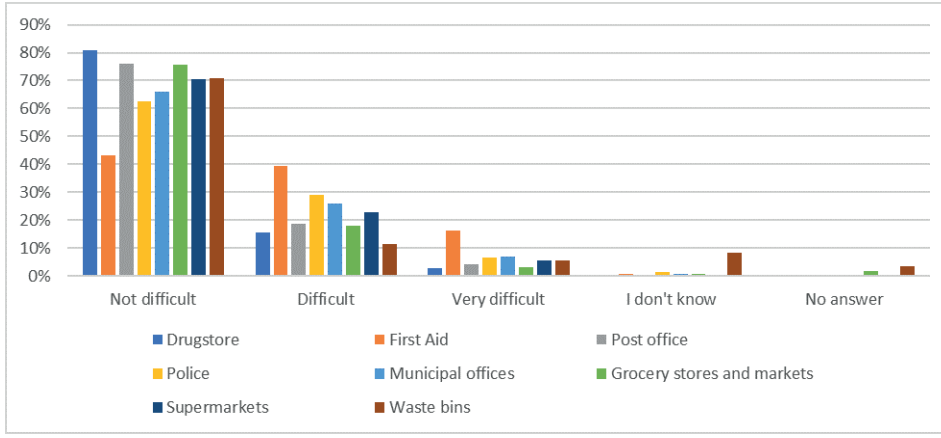

Fig. 4. Difficulties in accessing services, aged 65–74

Source: own work based on ISTAT data (2020).

The same applies to the drugstore accessibility: in the 65–74 age group, 80.7% said they had no difficulties in accessing it, while the percentage dropped to 72.5%

for those aged over 75. The elderly who said they had great difficulty were respectively 2.8% and 6.4% at the national level. Even in this case there were differences among regions; drugstores have low accessibility in Calabria (very difficult: 9% of older adults aged 65−74 and 16% of those aged over 75), Basilicata (3% and 12%, respectively), and Molise (3% and 11%, respectively).

39.4% of the elderly aged 65−74 complained about some difficulties in reaching general practitioners, and 16.2% stated that they had great difficulties in accessing this service. These percentages increased respectively to 40% and 23% for the over 75. Looking at the territorial dimension, the regions with the highest difficulties in accessing this health service were Campania (31% of older adults aged 65−74 and 36% of those aged over 75), Calabria (30% and 36%, respectively), Sicily (27% and 34%, respectively), Sardinia (19% and 35%, respectively), and Aosta Valley (29% and 40%, respectively).

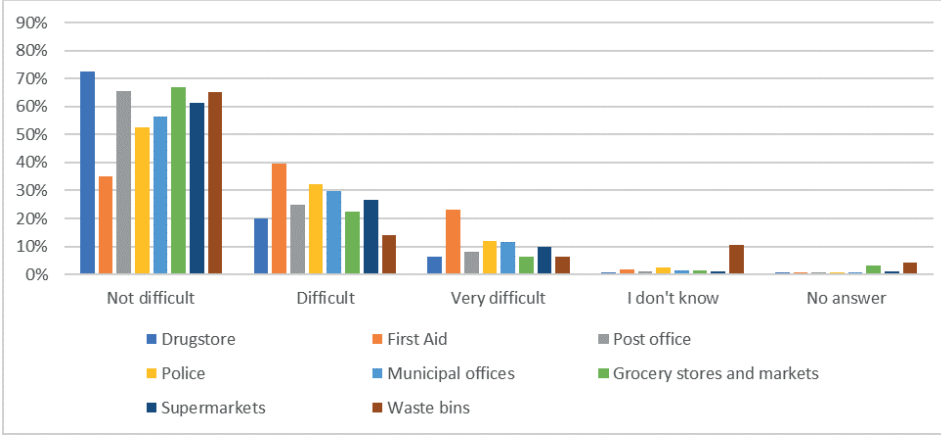

Fig. 5. Difficulties in accessing services, aged 75 and more

Source: own work based on ISTAT data (2020).

62.6% of the elderly aged 65−74 stated that they had no difficulty in accessing police stations, while for those over 75 this percentage was 52.7%. Calabria, where 13% of the elderly aged 65−74 and 19% of those over 75 answered "very difficult", Sicily (13% and 15%, respectively), and Sardinia (8% and 18%, respectively) were the regions that deviated the most from the national average values (6.5% and 12%, respectively).

66% of the elderly aged 65−74 stated that they had no difficulty in reaching municipal offices, while for those over 75 the percentage was 56.3%. Respectively, 7% and 11.6% of the elderly complained that it was very difficult to reach these offices; the percentages increased in some regions: Sicily (18% and 15%, respectively), Lazio (11% and 20%, respectively), and Umbria (8% and 19%, respectively).

Instead, looking at the ease of access to grocery stores and markets, considering the elderly aged 65−74, 75.8% declared to have no difficulty at all; this percentage decreased to 67% for those over 75. The regions where there were more difficulties in the access were Calabria (4% of the older adults aged 65−74 and 12% of those over 75), Umbria (2% and 11%, respectively), and Friuli-Venezia Giulia (9% and 7%, respectively), against national averages of 3.3% and 6%, respectively.

The percentages concerning supermarket accessibility were slightly lower: 70.6% of the older adults aged 65−74 declared to have no difficulties at all, while the percentage for those over 75 was 61.5%. Respectively, only 5.6% and 9.7% of the elderly declared that it was very difficult to reach supermarkets. In some regions these percentages were higher: Calabria (12% of older adults aged 65−74 and 17% of those over 75), Sicily (9% and 14 %, respectively), and Sardinia (5% and 16%, respectively).

Finally, 71% of older adults aged 65−74 stated that they had no difficulties in reaching waste bins, against 56% of those over 75. The worst situation was in Sicily, where 18% and 15%, respectively, complained that it was very difficult to access the waste bins, against a national average of 5.6% and 6.4%, respectively.

As underlined in the literature review section, satisfaction with neighbourhood and amenities is related to a low level of loneliness (van den Berg et al., 2016). Moreover, service accessibility, social support, aesthetics, and walkable neighbourhood are among the strongest predictors of elderly quality of life (Tiraphat *et al.*, 2017). This evidence is also confirmed by Mariotti *et al.* (2021): living in a neighbourhood with commercial and social activities, well-maintained sidewalks, good quality of public spaces, and where the perception of security is good, enables older adults to remain independent for as long as possible.

Another interesting section of the ISTAT survey regards the neighbourhood, and specifically the presence (rated on a Likert scale from 1-not at all, to 4-very much) of some features, such as traffic, noise, crime risk, etc., which influence area liveability.

Figure 6 shows the results, considering both age cohorts (65−74 year olds and those over 75) together, since the differences in the answers between the two classes were minimal. Bad conditions of the road surface emerged to be one of the most common problems of elderly's neighbourhoods (52% answered "Very high" or "Quite enough"), followed by traffic (39%), air pollution (34%), parking difficulties (34%), and insufficient road lighting (31%). This data shows a worrying situation since, as found by Zhang and Zhang (2017) for the Chinese case, the neighbourhood perceptions are positively correlated with life satisfaction.

Moreover, many of these problematic issues directly influence the older adults' mobility, potentially compromising their independence (e.g., bad conditions of the road surface increase the risk falling while walking or cycling), and, therefore,

the possibility to age in place. Indeed, an age-friendly and safe neighbourhood supports walking (Curl and Mason, 2019). As underlined by Vine *et al.* (2012), the urban space sharing among pedestrians and cyclists, as well as the quality of pathways, prevent older people from fully living in the outdoor environment. Moreover, a walkable environment positively influences elderly physical activity levels (Marquet *et al.*, 2017).

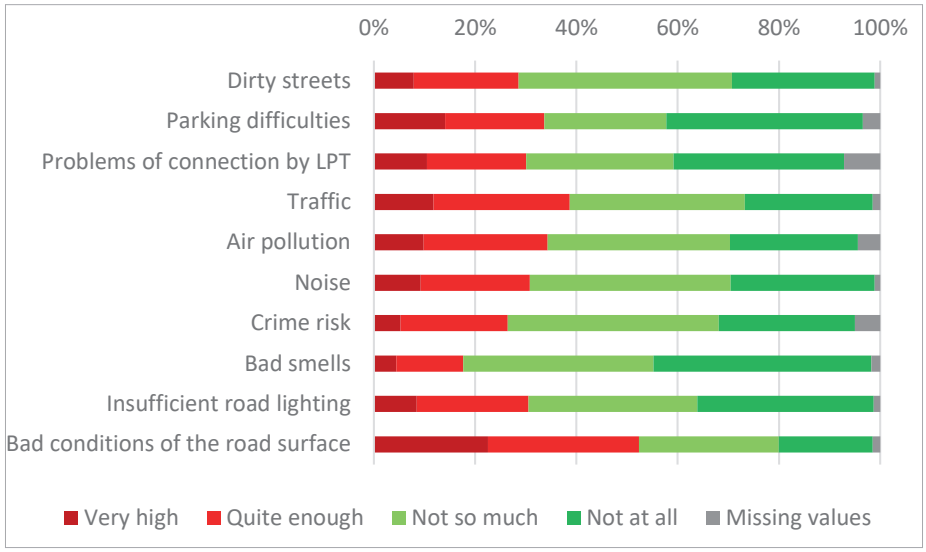

Fig. 6. Neighbourhood characteristics

Source: own work based on ISTAT data (2020).

Another dimension enabling the elderly to age in place (WHO, 2007) concerns the housing conditions. Looking at this issue, the ISTAT survey does not provide particularly detailed information. Indeed, the main evidence regards the housing property and structure.

The analysis shows that for both age groups, the Italian older adults live in their own houses (more than 80%), which are relatively large: more than 50% of the respondents live in houses with three or more rooms, and 42% enjoy a private garden. Oversized houses potentially represent a problem for aging in place, since they required heavy housework; however, they also allow older adults to easily host a caregiver/helper if needed.

Access to LPT represent the last key dimension of aging in place, which need to be discussed together with general elderly mobility habits.

In the ISTAT (2020) survey, there is a set of questions about mobility habits with both public and private means of transport. Figure 7 summarises this information, distinguishing between the two age cohorts.

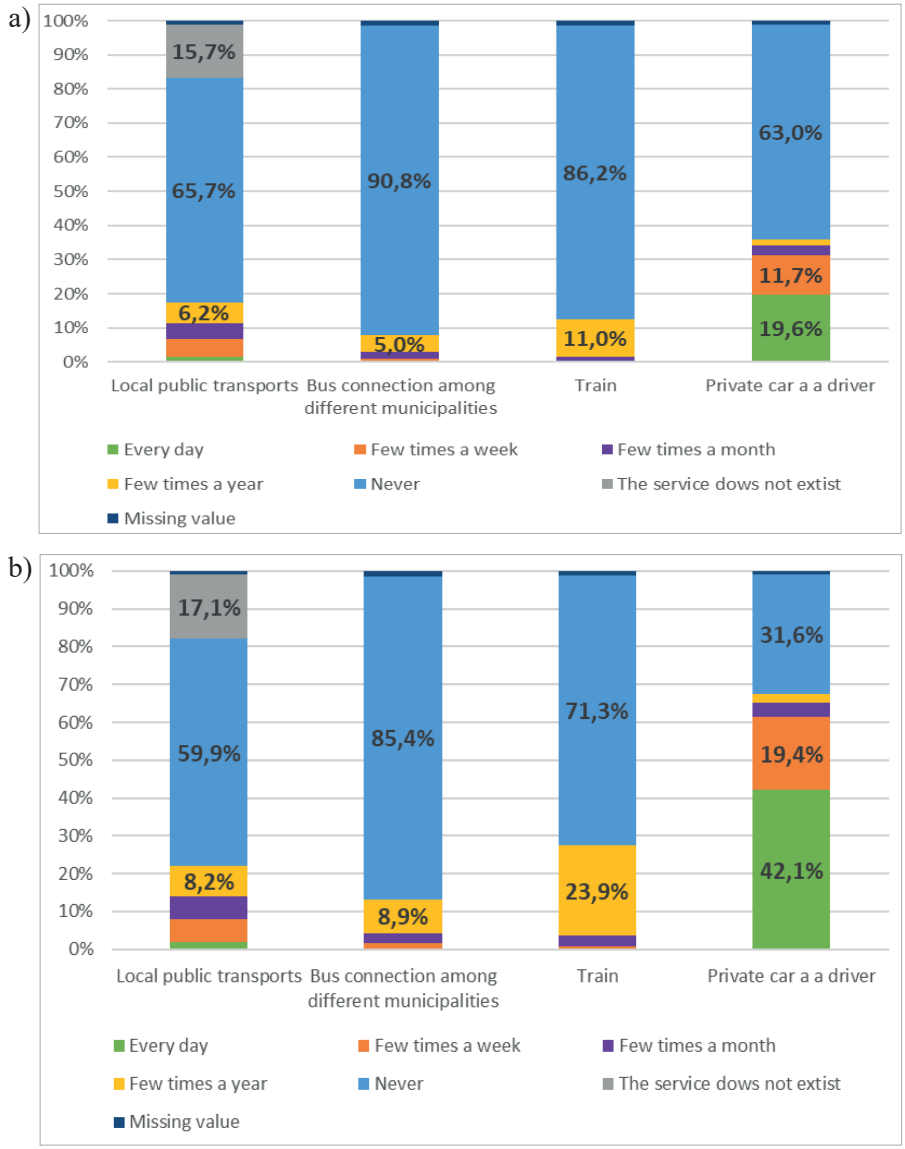

Fig. 7. Transport use frequency a) aged 65–74, b) aged 75 and more

Source: own work based on ISTAT data (2020).

Looking at the private means of transport, 42.1% of the elderly aged 65–74 used car as a driver every day, 19.4% used it a few times a week, while 31.6% never used it. In the over 75 cohort there was a decrease in the percentage of elderly people who used car as a driver every day (19.6%), 11.7% used it a few times a week, while 63% never used it.

Instead, the majority (59.9%) of elderly people aged 65−74 declared that they never used local public transport, while 17.1% stated that there was no such service in their municipalities. The percentages were similar for the over 75 cohort: 65.7% declared that they never used LPT, while 15.7% indicated the absence of the service.

Another peculiar means of transport were buses connecting different municipalities, which were rarely used by the elderly: 85.4% of the respondents aged 65−74 declared that they never used them, and only 8.9% used them a few times a year. This situation was accentuated in the over 75 cohort: 90.8% stated that they never used these means of transport, and only 5% used them a few times a year.

Finally, 71.3% of the elderly aged 65−74 stated that they never used the train, while 23.9% used it a few times a year. 86.2% of those over 75 declared they never used the train, while 11% used it a few times a year.

It is, therefore, clear that the Italian elderly prefer to use private means of transport (cars) wherever they travel. With age, however, mobility generally decreases. As underlined by Schwanen and Páez (2010), while reduced mobility could be related to preferences, low mobility levels could be an undesired effect of aging, becoming an issue if it reduces elderly's participation in social, economic, leisure, and cultural activities, with the consequent decrease in the quality of life (Metz, 2000; Banister and Bowling, 2004).

The picture described above is also confirmed by the ISFORT (Istituto Superiore di Formazione e Ricerca per i Trasporti, 2019) national survey, which is included in the annual report Audimob (Osservatorio su stili e comportamenti di mobilità degli Italiani).

Looking at the overall Italian population, in 2018, about six in ten trips were made by car, five of which as drivers. Moreover, considering the overall trips made by Italians, the elderly (aged over 65) used bicycles (24.1%), cars (16.5%), LPT (14.5%), motorbikes (10.9%), and 20.6% went by foot.

The ISFORT (2015) report represents a complementary source of information on the Italian elderly mobility. This survey systematically collects all the trips made by elderly people aged between 60 and 80, recording their main characteristics: length and travel time, origin and destination, motivation, and means of transport used. As analysed by Trapanese (2019) and Burlando and Cusano (2018), some results of this survey are reported below, distinguishing two classes: 60−69 years old and 70−80 years old.

First, the elderly mobility rate was lower than the population average: in 2015, three in four older adults aged 60−69 left home on a "typical" weekday. This percentage dropped to 63.8% for those aged 70−80 (16.5% lower than the population average). Looking at the time trend of these shares, the 60−69 age group followed the population trend, with a minimum in 2012 (68.3% versus 75.1% for the total population). Instead, considering the 70−80 age group, the number of older adults leaving home on an 'average' day has increased over time: from 55.4% in 2001 to over 60%

in the following years. However, it should be noted that between 2001 and 2015 the elderly population increased from 5.4 million in 2001 to 6.1 million in 2015.

The average number of trips per day is less than three, in line with the population average.

Looking at the motivation behind trips, 90% of older adults aged 60−69 reported trips for leisure and family management. Since 2012, however, the number of trips for family activities has increased (61.2%) and there has been a decrease in trips for leisure activities (from 41.4% in 2001 to 27.9% in 2012). Moreover, work-related trips have increased (from 10.4% in 2001 to 16.4% in 2015).

In the 70−80 age group, family activities increased slightly (from 54.2% in 2001 to 57.7% in 2015), at the expense of leisure activities.

The ISFORT survey highlights that the elderly mobility is predominantly short-range, especially among the over 70: 68.1% of trips are less than 5 km (42% is less than 2 km), and only 7.3% of trips are longer than 20 km. Instead, 53.3% of older adults aged 60−69 travel within 5 km, and about 25% travel more than 10 km.

The mobility characteristics of Italian elderly are like those in other countries. Indeed, several studies (i.e., see Schwanen and Páez, 2010; Páez *et al.*, 2007; Mercado and Páez, 2009) found that, on average, older adults often did not leave the house on a given day, made fewer trips on days they went out, and travelled over shorter distances than do younger cohorts.

Regarding the choice of the means of transport, the 60−69 age group has increased the private car use (from 49.8% in 2007 to 57.7% in 2015) at the expense of cycling/ walking (from 34.9% in 2007 to 26% in 2015). Similarly, the percentage of older adults aged 70−80, who cycle or walk has decreased (from 43% in 2007 to 34.6% in 2015), while the percentage of those driving private car has increased (from 37.7% in 2007 to 48% in 2015). Moreover, the percentage of those using public transport has decreased by about two percentage points for both classes.

Finally, 31.7% of the 60−69 age group would like to reduce car usage and 34.2% would like to increase the use of public transports. Instead, older people are less inclined to a modal shift: only 19.3% would like to reduce the car usage, and 10% would like to increase trips with public transports.

From the picture described above, it emerges that car use is a consolidated lifestyle for the Italian elderly. As underlined by Unsworth *et al.* (2022), older adult car users can more easily remain active and present in community activities. Instead, Aceves-González *et al.* (2015) underlined that scarce LPT services did not allow the elderly to fully participate in life opportunities. Therefore, transport policies providing alternative (to car) transport options are advocated for older adults who do not drive anymore.

It is likely that seniors will use public transport whether it is accessible and safe (Burlando and Cusano, 2018). To make LPT use more appealing, the factors discouraging older adults from using it should be identified and removed. However,

the mobility needs of the elderly have strong geographical and age connotation, thus both the geographical context and the specific needs of the age segment should be considered in the urban mobility planning (Burlando and Cusano, 2018).

In the ISTAT (2020) survey, those using public transports at least a few times a year were asked to give an opinion on some service characteristics, including frequency, timing, possibility to seat, etc. Fig. 9, 10, and 11 summarise this information, considering both age cohorts (65–74 year olds and those over 75) together, since differences between the two classes are minimal.

To avoid overestimation of some judgements, it is necessary to specify that relatively few people answered these questions on public transports:

– LPT use: 1,170 elderly in the 65–74 age cohort, and 934 in the over 75 cohort.

– buses connecting different municipalities use: 699 older adults aged 65–74, and 417 aged over 75.

– trains use: 1,452 elderly in the 65–74 age cohort, and 667 in the over 75 cohort.

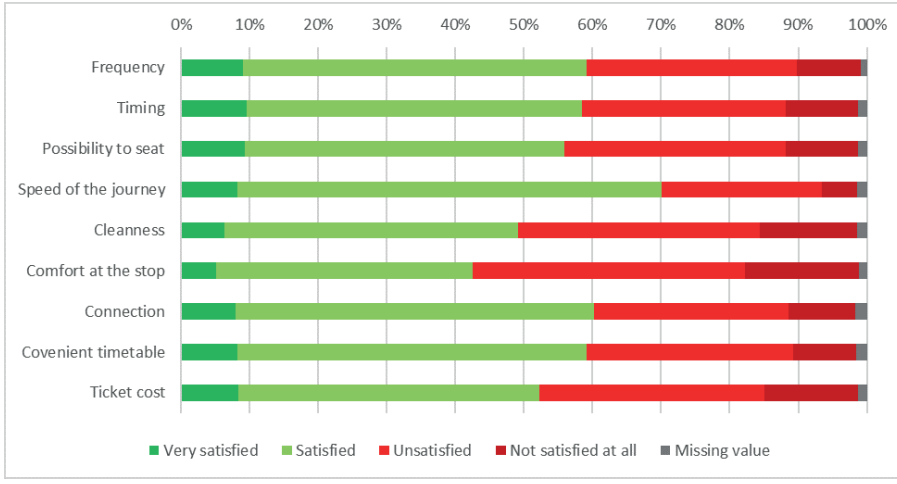

Fig. 8. Satisfaction with LPT characteristics

Source: own work based on ISTAT data (2020).

Figure 8 shows that most of the elderly (more than 50%) who use LPT have an overall positive opinion: for example, about 70% were satisfied or very satisfied with the speed of the journey, and 60% were happy with the connection, frequency of the journeys, and timetable convenience.

The characteristics that reveal most unsatisfaction are the comfort at the stop (56.3% were unsatisfied or not satisfied at all), and the cleanliness (49.4% were unsatisfied).

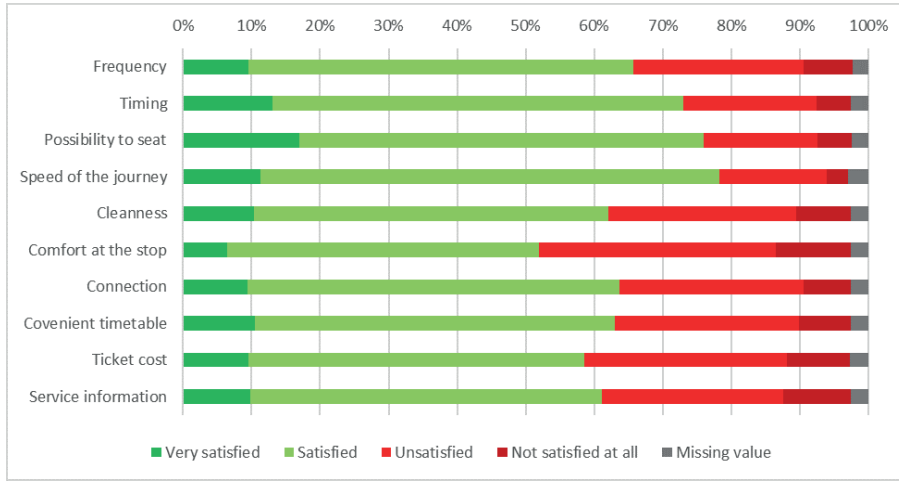

Fig. 9. Satisfaction with buses (connecting different municipalities) characteristics
Source: own work based on ISTAT data (2020).

Instead, Figure 9 shows the elderly satisfaction with buses connecting different municipalities. Also in this case, the opinion is overall positive: older adults are especially satisfied with the speed of the journey (78.2% are satisfied or very satisfied), the possibility to sit (76%), the timing (73%), and the frequency (65.7%). Conversely, the comfort at the stop is the least appreciated feature (45.5% are unsatisfied or not satisfied at all).

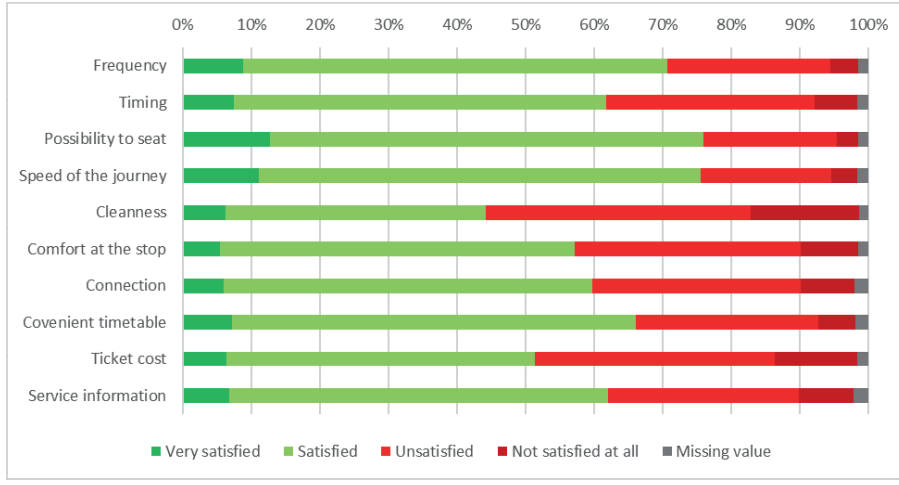

Fig. 10. Satisfaction with train characteristics
Source: own work based on ISTAT data (2020).

Finally, as illustrated in Fig. 10, the opinions on trains are overall positive: the possibility to sit (76% were satisfied or very satisfied), the speed of the journey (75.5%), and the frequency (70.7%) were particularly appreciated. Conversely, 54.5% of older adults were unsatisfied or not satisfied at all with the cleanness (54.5%), the ticket cost (47%), the comfort at the stop (43.3%), and the connection to other municipalities (38.2%).

As suggested by Metz (2003), there could be many elements that make the experience of riding a bus/tram almost 'hostile' to older people, such as the average time allowed for boarding and validating the ticket, or the comfort of seats and benches. Mariotti *et al.* (2021), analysing the case of Milan and Genoa, found that the perceived quality of LPT service affects the probability of giving up making trips: the higher the satisfaction, the lower the probability of giving up. They considered six features of LPT service: comfort inside the vehicles, information at the stop and inside the vehicle, waiting time, LPT ticket cost, security at the stop and inside the vehicle, and punctuality. Their results confirmed the key role of the perception about high quality LPT service in diminishing the probability of older adults giving up their usual activities, and consequently improving their quality of life. Therefore, from the picture described above, it emerges that public transports are relatively rarely used by the Italian older adults, especially by those over 75, but those using them have an overall positive opinion.

5. CONCLUSION

This paper provides a synthetic description of the population ageing process in Italy, focusing on the various dimensions influencing the possibility to age in place.

As far as the first research question is concerned, Italian cities/towns are sufficiently age-friendly, with some improvement opportunities: accessibility to services is generally quite good, except for access to the emergency room, while the neighbourhoods' most common problems are the bad conditions of the road surface and traffic. As age increases, the difficulty of access likewise rises for all the services, advocating a special attention by the policy makers to cope with the needs of this fragile population group.

More effort could be done in considering the older adults' point of view in guiding both mobility planning and urban planning (Guida *et al.*, 2022). Specifically, the transport system should facilitate the accessibility to the destinations such as services, amenities, and other activities (Hounsell *et al.*, 2016).

We can argue that the outdoor environment could represent a stress factor (Phillips *et al.*, 2013) for many Italian older adults. Therefore, policies should promote age-friendly neighbourhoods, by improving planning and designing for pe-

destrians. Examples could be paying attention to the road surface, road lightning, benches position, etc., and removing possible barriers (Akhavan *et al.*, 2022).

Loneliness and isolation, as well as the relatively modest participation to cultural and leisure activities, represent a critical issue for a consistent number of older people. To cope with this problem, contemporary information and communication technologies (ICT) could be used and have the potential to prevent or reduce the social isolation of elderly people via various mechanisms (Chen and Schulz, 2016).

Regarding the mobility habits of the elderly, the paper outlines some characteristics by analysing data from two national surveys, which showed that Italian older adults use public transport only a few times, in favour of private cars (as Italians in general). When public transports are used, those over 65 have a positive opinion, except for the comfort at the stop, requiring, therefore, the provision of additional shelters and seats.

To improve health in later life, policy makers should consider measures to enhance transport aspects for elderly, such as prolonged driving capability, car availability and accessibility of destinations through well-served public transport systems (Nordbakke and Schwanen, 2015). Specifically, LPT should be promoted, given the environmental sustainability perspective. However, alternatives to car should be appropriately designed for elderly's needs (Mifsud *et al.*, 2017). Older adults are open to innovative mobility options, if properly informed, with limited costs for the public administrations thanks to ICT (Burlando and Cusano, 2018). Moreover, since the supply and demand for LPT are highly heterogeneous across the country, specific regional interventions should be promoted (Crotti *et al.*, 2021).

There are some limitations to the current work, both concerning the methodology and the data. First, descriptive statistics allow us to give a picture of the current state of the art, without the possibility of discussing causal relations among the variables considered. Econometric analysis could therefore represent further research in exploring the causal linkages among mobility, access to services and actual possibility to age in place.

Regarding the ISTAT dataset, the main limitation is the geographical level at which the data are provided. Considering the Italian regions (NUTS2) does not bring out the possible inequalities existing within the territory (e.g., mountainous, and peripheral areas could be very different in terms of accessibility to services, LPT provision, etc., from big cities such as Rome and Milan). The use of other datasets could be helpful to explore this dimension.

As underlined by ISTAT (2019, p. 159), although the proportion of elderly people will increase significantly over the next thirty years as the so-called "baby-boomers" will overcome 65 years old, they are likely to become "elderly" later and later, since they benefit from healthier habits and lifestyle. Moreover, this generation is characterised by a higher level (compared to previous generations)

of human and social capital, as well as a higher level of education. Since today's young population will be tomorrow's elderly population, over a period of thirty years, we will see a profound transformation in the characteristics of those over 65. For example, in ten years' time, at least half of women aged 65−74 will have a medium-high educational qualification, in twenty years' time they will be six in ten, and in thirty years' time they will be seven in ten (ISTAT, 2019, p. 160). Therefore, policy makers, both at the national and local levels, are required to actively support the demographic transformation, by making age-friendly the Italian cities and towns.

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Özge Deniz TOKÖZ [*], Ali Berkay AVCI [*], Hasan Engin DURAN [**]

FACTORS AFFECTING TOURIST VISITS TO ARCHAEOLOGICAL SITES IN TURKEY: A SPATIAL REGRESSION ANALYSIS

Abstract. The study focuses on the factors affecting visitor numbers to archaeological sites in Turkey. The aim is to investigate the geographical, economic, and demographic factors underlying the visits using statistical methods. The study covers 117 archaeological site visits in 2019. Although existing studies analysed determinants of visits to archaeological sites of different countries, the evidence needs to be explicit. Methodologically, the classical linear regression models are primarily applied in the literature, whereas the incorporation of spatial dependence has largely been ignored. This study contributes to the literature by employing demographic, economic, and climatic factors and spatial relations between the sites. Therefore, spatial autoregressive (SAR) and spatial error models (SEM) are developed in the analyses. According to the results, WHL inscription and distance to the city centre are crucial factors for the visits. In addition, the study emphasizes the significant negative effect of spatial dependence on visitor numbers of archaeological sites near each other.

Key words: archaeological sites, World Heritage List, tourist, OLS regression, spatial regressions.

[*] Özge Deniz TOKÖZ, Ali Berkay AVCI, Department of Architecture, Izmir Institute of Technology, Gülbahçe Campus Urla-İzmir 35430, Turkey; e-mails: ozgetokoz@iyte.edu.tr, aliavci@iyte.edu.tr, ORCIDs: https://orcid.org/0000-0002-2150-5468, https://orcid.org/0000-0001-8291-4567

[**] Hasan Engin DURAN, Department of City and Regional Planning, Izmir Institute of Technology, Gülbahçe Campus Urla-İzmir 35430, Turkey; e-mail: enginduran@iyte.edu.tr, ORCID: https://orcid.org/0000-0002-0743-9943

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1. INTRODUCTION

Visibility and recognition of Turkey's archaeological heritage have developed in recent decades. As a subgroup of cultural heritage, the archaeological sites of Turkey consist of such structures as ancient cities, theatres, sanctuaries, castles, monasteries, mounds, caves, underground cities, mausoleums, rock tombs, and rock churches, which represent different periods from the prehistory to the Ottoman Empire. As of 2022, 22,898 archaeological sites, 35 urban archaeological, 63 archaeological-urban (mix), 18 archaeological-historical (mix), and 7 archaeological-historical-urban (mix) sites were registered in Turkey, which constituted approximately 97% of all of the site types (MCT, 2023a). The diversity and plentifulness of archaeological sites attract the attention of visitors. Formerly being the entertainment of merely the upper-class, cultural excursions became an activity that any segment could perform since the 1960s (Çokişler, 2022; Eres and Özdoğan, 2018). Governmental initiatives involving comprehensive conservation programs, partnerships with international organisations, and legislation to make sure the accessibility of archaeological remains were implemented (Ahunbay, 2010). The Ministry of Culture and Tourism, Republic of Turkey carries out activities for the identification, registration and, if necessary, expropriation of immovable cultural assets, including archaeological sites. The scientific excavation of archaeological sites approved seasonally by the Ministry is conducted by local and foreign universities. The Ministry provides the budget for these excavations, and, in some cases, private associations also contribute to the funding. It is also the responsibility of the Ministry to establish landscape organisation of the sites to open them for visitors. The Ministry also allocates a budget for the conservation and restoration projects of the structures in the archaeological sites. Some projects and implementations are funded internally, while others are awarded through the tender procedure (MCT, 2023b). In addition to financial support and cooperation, the Ministry announces certain years as archaeological site years to enhance the prominence of these significant sites. For instance, the year 2018 was declared the Year of Troy (MCT, 2018), 2019 was the Year of Göbeklitepe (MCT, 2019), and 2020 was the Year of Patara (MCT, 2020). These actions enhanced the visibility of Turkey's archaeological sites and also fostered a deeper appreciation among both domestic and international visitors for the country's cultural heritage (Türkoğlu, 2020). As a result, cultural excursions have been increasingly important for Turkey's tourism industry, offering opportunities for visitors to immerse themselves in history and past civilisations.

The emergence of interest in archaeological and historic sites in the 19th century brought attention to the conservation of cultural heritage. In 1972, UNESCO initiated the Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO, 1972, 2021), which resulted in creation of the

World Heritage List (WHL) containing selected cultural and natural properties having Outstanding Universal Value (UNESCO, 1972, 2021). Inclusion in the WHL increases the chances of protection and raises the visibility of these sites (Selcuk *et al.*, 2023). In Turkey, both governmental and academic efforts have been undertaken to facilitate the inclusion of archaeological sites in the WHL (Ulusan, 2023; Ulusan and Ersoy, 2019). These initiatives encompass various activities such as conservation, presentation, and promotion, all aimed at unveiling the value of these archaeological sites. As a result, these endeavours have significantly contributed to the inscription of sites in Turkey in the WHL (Türkoğlu, 2020). For the first time, the cultural properties of Turkey were included in the WHL in 1985. As of June 2023, Turkey has had 19 sites in the WHL and 84 sites on its Tentative List (TL), awaiting inscription to the WHL. Among these, 14 from the WHL and 51 from the TL are archaeological heritage sites (UNESCO, 2023a, 2023b). This information demonstrates Turkey's ongoing commitment to increasing its recognition of its archaeological heritage, as also remarked by Ulusan and Yıldırım (2016). Moreover, 6 of Turkey's top 10 most visited places are archaeological heritage, while 8 of the 10 most visited archaeological sites are in UNESCO's WHL (DÖSİMM, 2019). Over the years, being in UNESCO's WHL became an expression of prestige, as the List provided sites worldwide recognition (Meskell, 2018). Consequently, with the effect of rapid globalisation, WHL inclusion increased their visibility and usage for touristic purposes (Allkja and Dhrami, 2021; Assumma *et al.*, 2022).

Along with being included in the WHL, there are also other factors that attract visitors, such as an area's demographic, economic, climate, and geographical characteristics. For instance, the population of the region plays a vital role in understanding the visitation patterns. Research conducted by Huang *et al.* (2012) indicated that population significantly influences the visitation demand in archaeological sites. The influence of weather and climate on demand for tourism has also been widely recognised, as highlighted by Ridderstaat *et al.* (2014). The influence of climate and weather is expected to be significant for visits to archaeological sites, which predominantly comprise open areas. In addition to climate and weather, geographic factors have been acknowledged as crucial in shaping tourist behaviour. For instance, Liang and Zhang (2022) asserted the significance of the region's distance from the city centre, while Mejjad *et al.* (2022) highlighted the role of being located on the coast or within a coastal city in attracting visitors. Furthermore, economic factors have a pronounced impact on visits. Nepal *et al.* (2019) and Karabulut *et al.* (2020) introduced the reciprocal effects of variables such as income per capita of the host region in promoting tourist visits. It is of great significance to investigate the effects of these variables on cultural heritage sites.

Several studies have related cultural heritage sites to tourism development due to the substantial appeal of these sites as tourist destinations. In these stud-

ies, among other factors such as income per capita, population, origin country, travel cost, and accommodation, the effect of the World Heritage Site (WHS) on visitors was examined. Yang *et al.* (2010) and Patuelli *et al.* (2013) examined the effect of being a WHS on visitor numbers. Along with that, Abuamoud *et al.* (2014) investigated the demand by tourists for visiting heritage places in Jordan. These studies emphasized the positive effect of the WHS on both domestic and international tourist numbers. Furthermore, in the study of Carey *et al.* (2012), the positive effects of the city museum on tourist visits were expressed. In these studies above, the factors affecting visitor numbers are as follows: education level, age, the income of visitors, crime rates, health infrastructure, the population of destination region, other attractive points such as national park and beach, accommodation and service infrastructure, transportation, and travel costs. However, to our knowledge, the number of previous studies fall short to investigate the factors affecting tourist numbers of the archaeological sites in Turkey by employing statistical models. Given the fundamental role of archaeological sites in Turkey's tourism industry, it is essential to examine various factors that influence tourist visits empirically. While being included in the WHL represents a significant aspect, it should be noted that it is not the sole determinant. Therefore, the present study aims to determine the impact of other influential site-specific factors alongside the WHL by implementing a coherent and comprehensive approach. In detail, the current study aims to extend the literature in specific directions. (i) although existing studies have attempted to analyse underlying determinants of visits to cultural/archaeological heritage sites for different countries, the evidence needs to be more apparent, and there needs to be a clear cut in the literature; (ii) to the best of our knowledge, no existing studies investigate these factors in the case of Turkey; (iii) methodologically, the classical linear regression models are primarily applied in the literature, whereas the incorporation of spatial dependence has largely been ignored. However, in local/regional studies, it is widely known that ignoring spatial interaction across units may lead to misleading results (Anselin, 1988a, 1988b; Anselin *et al.*, 1996; Anselin and Florax, 1995).

Hence, this work aims to examine the factors influencing visitor numbers to archaeological sites in Turkey by pursuing the innovations mentioned above. The study is limited to only archaeological site visits rather than other cultural heritage sites, without separating domestic or international tourist numbers. In this study, 81 provinces of Turkey were analysed as for the year 2019. The dataset includes a wide range of economic and geographical variables for 117 sites which were organised as archaeological sites established as a controlled area; therefore, the number of visitors could be recorded and provided by the Ministry of Culture and Tourism, Republic of Turkey. In the methodology section, several regression techniques are employed, such as ordinary least squares (OLS), spatial autoregressive model (SAR), and spatial error models (SEM). In the remaining sections, Part 2 explains the literature on implementing statistical methods in tourism studies, es-

pecially those investigating the determinants of visitor numbers. Part 3 describes the data collection, applied methods, and variables. Part 4 presents the empirical findings and their interpretation of this study. Concluding remarks and future research suggestions are summarised in the final part.

2. LITERATURE REVIEW: STATISTICAL METHODS IN VISITOR STUDIES ON HERITAGE SITES

Several studies have introduced statistical methods in visitor studies on heritage sites. These studies analyse the influence of heritage sites on the number of domestic or international tourists. Moreover, some have investigated economic, demographic, and geographical determinants of visitors and destinations. Yang *et al.* (2010) investigate the influence of WHS on tourist numbers in China. Panel analysis for 2000−2009 was adopted. Based on 31 provinces, a gravity model is established. The model includes the determinants such as income level, origin country's population, distance to the origin country, travel coast, crime rate, transportation, health utilities, natural spots, and tourism service infrastructure. As a result of the study, WHS status is found critical for tourist arrivals. Also, cultural sites attract tourists more than natural ones because of China's deep-rooted history and culture.

Similar to the study by Yang *et al.* (2010), Patuelli *et al.* (2013) analysed the impacts of WHS on domestic tourism in Italy's different regions with different methods. Annual panel data between 1998−2009 are used in domestic tourism flows to understand the determinants of regional arrivals to accommodation units. In addition, the impact of contiguity for every twenty regions is investigated in the spatial sensitivity analysis. The variables are the number of WHS, regional GDP, tourism service, leisure activities, population, price index, crime index, transportation, polluted coasts, distance, off-seasonal stays, and cultural demand index. It is concluded that inscriptions to the WHL positively affect domestic tourism flow. Furthermore, the contiguity relationship has a negative influence on regional tourist numbers.

As in the study of Patuelli *et al.* (2013), Huang *et al.* (2012) analysed the influence of WHS on tourist numbers in the Macau region of China. Panel data between the years 1999−2009 was used. The impact of Macau's (WHL) inscription was measured for the international tourist coming from 19 countries. The variables were GDP and population of origin country, distance, transportation cost, currency rates, overnight stays, crime index, and the number of casinos. The results showed that income per capita, population, distance, and currency rates were crucial. In addition, features of the cultural site, hotels and casinos, and crime index played an important role in tourism.

Another study on the impacts of WHS on visitor numbers was done by Su and Lin (2014). Panel dataset covering 66 countries and the 2006−2009 period was used. The income per capita, population, exchange rate, railway lines, the index of political rights, health expenditure, and education expenditures were determined as independent variables. Differently from other studies, cultural and natural sites were analysed separately, while mixed sites were not included. The study showed that the effect of natural sites was more significant than cultural sites. Furthermore, the increasing number of WHS increased tourist arrivals, as they were already tourist attractions.

Cuccia *et al.* (2016) examined the effect of WHS on tourism development in Italian regions by using data envelopment analysis for the 1995−2010 period. Independent variables included accommodation capacity, overnight stays, visits to the museum or historic buildings, natural park area, beach size, motorways, and crime index. The results showed a negative relation between WHS and tourism destinations. At the same time, it was positively correlated with cultural and natural attractions because the management and infrastructure of WHS had a crucial role in tourism demand.

Abuamoud *et al.* (2014) presented the marginal impacts of factors influencing the visitor numbers to Jordan's cultural heritage sites. The study was limited to 9 registered sites in Jordan's Northern Badia area. 32 questions consisted of primary personal data of the participants, characteristics of the places, and tourism activities of the participants are asked 300 participants. The study results showed that the participants' main reasons for visiting those sites were business, wildlife observation, and religion. The most significant factor was the income of the participants rather than their age, gender, education status, study area, or nationality.

Naudé and Saayman (2005) investigated the factors that affected visits to 43 African countries. In the study, cross-section data and panel data were used for the 1996−2000 period. Independent variables were the number of internet users, political stability index, number of hotel rooms, death rate, income per capita, the distance between countries, urbanisation rate, the prevalence of malaria (health conditions), number of telephone lines, and number of frost days. According to the results, the origin country's income level, travel cost, and prizes were ineffective.

Apart from the studies mentioned above, Carey *et al.* (2012) analysed the relationship between the tourist flow to the capital city of Wellington and the opening of Te Papa Tongarewa Museum (New Zealand). The economic regression model was developed to assess museum visits and the tourism growth of the accommodation sector of the city by using time series data for the 1999−2009 periods. It was obtained that the museum's opening had a positive effect in terms of tourist arrivals and their stays.

The studies above have tried to find the determinants behind visits to cultural or archaeological heritage sites from different countries. In the majority of reviewed studies, significant attention was directed towards assessing the impact of

the WHL inscription, especially within State Parties boasting a substantial number of WHS, such as Italy and China (UNESCO, 2023a, 2023b). While these studies have established a positive linear correlation between WHS designation and tourist visitation, it is noteworthy that one study identified a negative impact associated with WHS inscription (Cuccia *et al.*, 2016). In summary, other than the WHL, income, population, distance, currency rates, crime index, hotels, features of the cultural site, and museums significantly affect the visitor numbers. The contiguity relationship has been found to exert a negative influence, while factors such as visitors' age, gender, education level, nationality, travel cost, origin country, prices, transportation, and health utilities were found ineffective.

3. METHODOLOGY

The 117 archaeological sites evaluated in this study are illustrated using a map in Fig. 1. The examined archaeological sites encompass the entirety of those sites for which visitor number data was recorded and shared by the Ministry of Culture and Tourism, Republic of Turkey for 2019, ensuring that all were included in the study (DÖSİMM, 2019). The enumeration of the archaeological sites presented on the map was done in alphabetical order. The names and index numbers of each site with the visitor numbers are provided in Appendix A. According to Fig. 1, most archaeological sites are grouped near the Aegean and Mediterranean Coastlines. Another major grouping of sites is around Göreme National Park and the Rock Sites of Cappadocia in Central Anatolia.

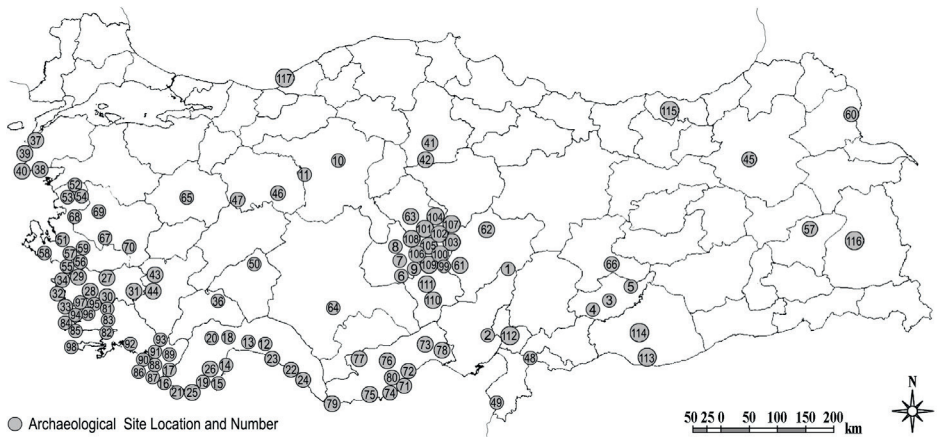

Fig. 1. Archaeological Sites in Turkey

Source: own work. Locations were marked using Google Earth and Photoshop.

It is presumed that the WHL inscription of an archaeological site may significantly affect visitor numbers (Huang *et al.*, 2012; Patuelli *et al.*, 2013; Su and Lin, 2014; Yang *et al.*, 2010). Since some archaeological sites are on the seacoast or in a coastal city, they can be attractive to people who want to take sea vacations. In addition, the presence of archaeological sites within a national park may also attract visitors (Cuccia *et al.*, 2016; Mejjad *et al.*, 2022; Su and Lin, 2014). Having an on-site archaeological museum may provide a variety of activities during sightseeing (Carey *et al.*, 2012). Transportation facilities to the site and the region's temperature may also affect the visit numbers (Ridderstaat *et al.*, 2014). Moreover, the economic development level of the cities can be determined by income per capita (Abuamoud *et al.*, 2014; Huang *et al.*, 2012; Karabulut *et al.*, 2020; Nepal *et al.*, 2019), population, and distance (Huang *et al.*, 2012; Liang and Zhang, 2022) may influence visits to the site. Hence, the variables selected for the study encompassed several factors that included the presence of an on-site archaeological museum, location within a natural park, inclusion in the WHL or TL, being a coastal site or situated within a coastal city, distance from the city centre, temperature, population size of the corresponding city, and income per capita.

Due to its simplicity and applicability, the OLS technique was initially chosen to explore the factors affecting archaeological site visitor numbers. The following equation represents the regression model that is proposed in the study:

$$Visitor_i = \alpha + \beta 1 museum_i + \beta 2 natpark_i + \beta 3 whl_i + \beta 4 coastsite_i + \beta 5 coastcity_i + \beta 6 distance_i + \beta 7 temperature_i + \beta 8 population_i + \beta 9 icp_i + \in_i \quad \textbf{(1)}$$

$$i = archaeological\ sites, 1, \ldots, 117$$

The Visitor dependent variable refers to the visitor numbers to the archaeological sites recorded in 2019. $\in$ represents the error terms, which are observed to have heteroskedasticity, and non-normal distribution. In order to overcome this problem, Newey-West HAC Heteroskedasticity and Autocorrelation Consistent was adopted in the study (Newey and West, 1987; White, 1980).

As indicators of the characteristics of the archaeological sites, Museum, NatPark, WHL, and CoastSite are included as discrete variables in the equation. Museum indicates if an archaeological site has an on-site archaeological museum, while NatPark refers to the specialty of whether a site is in a natural park. As a prominent index of novelty, the variable WHL denotes the archaeological site is inscribed to UNESCO's WHL, the country's TL, or not. Following similar studies that focus on the prominence of WHS in the literature, this variable is expected to be significant in the visitor numbers (Cellini, 2011; Huang *et al.*, 2012; Yang and Lin, 2011; Yang *et al.*, 2010). As the last characteristic of the site, CoastSite is the variable that shows if a site is near the sea within a 25 km threshold. It is another variable anticipated to be positively influential on the visitor numbers

since being on the sea site may combine the summer activities. Consequently, the archaeological site can be more attractive to visitors.

The remaining factors represent economic and geographical variables, including CoastCity, Distance, Temperature, ICP, and Population. CoastCity is a discrete variable that indicates whether a city that has an archaeological site is located on a sea coast. In contrast, the Distance variable denotes a site's distance to the city centre in kilometres. Temperature, population, and income per capita of the provinces were also included in the study to see their influence on visitor numbers, as they were employed in other studies in the literature. The definition of all the variables is summarised in Table 1. Also, the correlation matrix of the variables is given in Appendix B.

Table 1. Definition of Variables

Variable Name	Definition	Units	Data Sources	Year
Visitor	Visitor number of the archaeological sites	People	Republic of Turkey, Ministry of Culture and Tourism (DÖSİMM, 2019)	2019
Museum	Whether or not the archaeological site has an on-site archaeological museum (1 yes or 0 no)	Discrete Variable	Central Directorate of Rotary Capital Management/ Republic of Turkey Ministry of Culture and Tourism-Museums (MCT, n.d.)	2019
Natpark	Whether or not the archaeological site is in a national park (1 yes or 0 no)	Discrete Variable	General Directorate of Nature Conservation and National Parks (Republic of Turkey Ministry of Agriculture and Forestry, n.d.)	2019
WHL	Whether or not the archaeological site is in UNESCO's World Heritage List or the Tentative List (2 WHL, 1 TL, or 0 no)	Discrete Variable	UNESCO / Republic of Turkey Ministry of Culture and Tourism (UNESCO, 2023c, 2023d)	2019 (not included 2023 Lists)
CoastSite	Whether or not the archaeological site near the coast (25 km threshold) (1 yes or 0 no)	Discrete Variable	Google Maps (Google Maps, n.d.)	–
CoastCity	Whether or not the archaeological site in a coastal city (1 yes or 0 no)	Discrete Variable	Google Maps (Google Maps, n.d.)	–

Table 1 (cont.)

Variable Name	Definition	Units	Data Sources	Year
Distance	Distances of the archaeological sites to the city centre	Kilometres	Google Maps (Google Maps, n.d.)	–
Temperature	Average temperature of the provinces that archaeological sites are located	Degrees of Celsius	Turkish State Meteorological Service (Turkish State Meteorological Service, n.d.)	1929–2019
Population	Population of the provinces that archaeological sites are located	People	Turkish Statistical Institute (TUİK, 2019)	2019
ICP	Income per capita of the provinces that archaeological sites are located (in Turkish Lira)	Turkish Liras	Turkish Statistical Institute (TUİK, 2019)	2019

Source: own work. Each data source is given in the table.

Two variables were not included in the study: 'entrance fees' to archaeological sites and 'tourist numbers' of the cities in which the archaeological sites are placed. However, both variables already cannot answer the study's research question. Entrance fees increase in relation to an increase in visitor numbers because management raise the prices of popular sites. As for tourist numbers, they are highly correlated with the visitor numbers since archaeological sites are significant tourist attractions. Consequently, these two variables were excluded from the study.

In addition to the OLS technique, the presence of spatial dependence of each variable was also sought in the study. It is essential that failing to include such a component is problematic and may cause biased estimations (Anselin, 1988a, 1988b, 2001; Anselin *et al.*, 1996; Anselin and Moreno, 2003; Anselin and Rey, 1991; Anselin and Florax, 1995; LeSage and Pace, 2010; Rey, 2001). In order to examine the spatial dependence of the variables, Moran I's test was applied, which was first introduced by Moran (1950) and is employed in empirical literature (Rey and Montouri, 1999). The test details can be found in Rey, (2001), and Rey and Montiouri (1999).

The present work employs a spatial weighting matrix as a raw standardised inverse distance matrix (Herrera Gomez *et al.*, 2012; Anselin, 1988a, 1988b). So, the closest neighbours obtain a higher weight. A positive and significant value of Moran's I would point to a positive spatial correlation, meaning the

archaeological sites with closer values are located nearby. As nearby archaeological sites possibly have similar geographical and economic characteristics, their tourist visits are likely to be similar. It may even be the case that an increase in the tourist number in an archaeological site may trigger an increase in the neighbouring site since touristic tours may divert tourists to the nearby sites as daily excursions.

The presence of spatial autocorrelation can be examined by Lagrange Multiplier Tests, such as LMerr, LMLag, RLMerr, and RLMLag (Anselin, 1988a, 1988b, 2001; Anselin *et al.*, 1996; Anselin and Moreno, 2003; Anselin and Rey, 1991; Anselin and Florax, 1995; LeSage and Pace, 2010; Rey, 2001; Rey and Montouri, 1999; Elhorst, 2014; Duran and Gajewski, 2023). LMerr tests assume spatial dependence in error terms, whereas LMLag tests assume spatiality in the dependent variable. The rule offered by Anselin and Florax (1995) is employed to decide on models. According to that rule, if the LMlag test statistics are observed to be higher and more significant than LMLag, SEM is more appropriate (Anselin and Florax, 1995). In contrast, if the reversecondition is valid, then the SAR is more appropriate (Anselin, 1988a, 1988b, 2001; Anselin *et al.*, 1996; Anselin and Moreno, 2003; Anselin and Rey, 1991; Anselin and Florax, 1995; LeSage and Pace, 2010; Rey, 2001; Rey and Montouri, 1999; Elhorst, 2014).

Finally, to empirically consider the effect of the spatiality, two more models have been established, which are SAR and SEM (Anselin, 1988a, 1988b, 2001; Anselin *et al.*, 1996; Anselin and Moreno, 2003; Anselin and Rey, 1991; Anselin and Florax, 1995; LeSage and Pace, 2010; Rey, 2001; Rey and Montouri, 1999; Elhorst, 2014). The former incorporates the spatial interaction among neighbour's dependent variables, while the latter regards the spatial connectivity in residuals. The most general form is as follows:

$$\begin{gathered} Visitor_i = \alpha + \beta 1 museum_i + \beta 2 natpark_i + \beta 3 whl_i + \beta 4 coastsite_i + \\ \beta 5 coastcity_i + \beta 6 distance_i + \beta 7 temperature_i + \beta 8 population_i + \\ \beta 9 icp_i + \rho \omega Visitor_i \quad \in_i \qquad \in_i = \lambda \omega \varepsilon_j \end{gathered} \tag{2}$$

$$i = archaeological\ sites, 1, \ldots, 117$$

When λ=0, it refers to the SAR model. ρ symbolises the effect of the neighbour sites' visitor number on i's visitor number, ω is the spatial weight matrix. When ρ=0, the model becomes SEM. λ is the spatial dependence among the error terms of the neighbour sites i and j (Anselin, 1988a, 1988b, 2001; Anselin *et al.*, 1996; Anselin and Moreno, 2003; Anselin and Rey, 1991; Anselin and Florax, 1995; LeSage and Pace, 2010; Rey, 2001; Rey and Montouri, 1999; Elhorst, 2014). All of the OLS, SAR, and SEM models are estimated in the study. The empirical analyses are implemented with the help of R-4.1 software with SP, SPLM, and SPDEP packages (Bivand *et al.*, 2013; Millo and Piras, 2012; Millo *et. al.*, 2018; Pebesma and Bivand, 2005).

4. RESULTS

The initial step in the study is to describe the visitor numbers to the archaeological sites in Turkey and the variables that may affect it. Table 2 provides the descriptive statistics of each variable. Specifically, it provides the mean, standard deviation, and maximum and minimum values. The visitor numbers to the archaeological sites varied between 2,557,868 and 638 people in 2019. The highest number of visitors was recorded in Hierapolis-Pamukkale in Denizli (no. 43), while the lowest was observed in Niğde Andaval Archaeological Site (no. 111). The mean of the visitors to all archaeological sites in Turkey was observed to be 128,058.5, with a standard deviation of 327,421.8.

Table 2. Descriptive Statistics for the Variables

Variables	Mean	SD	Max	Min
Visitor	128058.5	327421.8	2557868	638
Museum	0.09	0.29	1	0
Natpark	0.04	0.20	1	0
WHL	0.68	0.78	2	0
CoastSite	0.38	0.49	1	0
CoastCity	0.59	0.49	1	0
Distance	71.94	52.91	236	1
Temperature	15.3	3.36	19.1	4.7
Population	1520309	1234182	5639076	242938
Income per Capita	38957.03	9664.20	60249	16068

Source: own work.

According to Moran I's test applied to the variables of the present study, all the variables are spatially correlated, except the dependent variable Visitor Numbers and Natpark (Table 3). Hence, to understand the reasons for visitor numbers to the archaeological sites in Turkey, basic OLS without spatial indicators may lead to deficiencies.

Table 3. Moran I's Test Results

Variables	Moran I Test Statistics	P-Values
Visitor	-0.0156	0.6034
Museum	-0.0119	0.5427
Natpark	*0.0315	0.0825
WHL	***0.2112	2.16E-12
CoastSite	***0.3088	2.20E-16

Variables	Moran I Test Statistics	P-Values
CoastCity	***0.4146	2.20E-16
Distance	***0.2964	2.20E-16
Temperature	***0.3652	2.20E-16
Population of the City	***0.3463	2.20E-16
Income per Capita	***0.3886	2.20E-16

*** represents p-values <0.01, ** p-value between 0.01 – 0.05, * p-value between 0.05 – 0.1

Source: own work.

After determining the variables' spatial dependence, spatial autocorrelation was examined using LMerr, LMLag, RLMerr, and R LMLag tests. The results are presented in Table 4. In all tests, positive autocorrelation is evident. Therefore, it is proven that spatiality is a crucial issue in the present model.

Table 4. Lagrange Multiplier Diagnostics

Test Name	Test Statistics	P-Value
LMerr	***13.72	0.0002
LMlag	***7.42	0.0064
RLMerr	***10.5	0.0011
RLMlag	**4.2	0.0404

*** represents p-values <0.01, ** p-value between 0.01 and 0.05, * p-value between 0.05 and 0.1

Source: own work.

The study results are given in Table 4, considering all the regression models. The first column denotes the regular OLS results, while the other columns present the SAR and SEM spatial model results (Table 5).

Table 5. OLS, SAR and SEM Results

	OLS (Newey-West HAC)		SAR		SEM	
	Estimated Coefficients	P-Value	Estimated Coefficients	P-Value	Estimated Coefficients	P-Value
Alpha	-284,919.7	0.2590	-248,370	0.247413	-299,930	0.10293
Museum	180,482.2	0.3298	*159,380	0.083659	141,060	0.10852
Natpark	-201,560.2	0.1111	*-228,370	0.084145	**-244,000	0.04289

	OLS (Newey-West HAC)		SAR		SEM	
	Estimated Coefficients	**P-Value**	**Estimated Coefficients**	**P-Value**	**Estimated Coefficients**	**P-Value**
WHL	***176,514.4	0.0009	***197,360	3.214E-08	***196,880	6.1E-12
CoastSite	*106,766.7	0.0598	*126,040	0.077847	***168,590	0.00412
CostCity	-140,903.3	0.1504	*-163,310	0.079081	**-173,660	0.02751
Distance	***-1,464.407	0.0085	***-1,724.2	0.003347	***-1,940	6E-05
Temperature	16,200.33	0.2476	16,644	0.165438	16,732	0.10798
Population	-0.044775	0.2660	-0.042403	0.189904	-0,038181	0.15914
IPC	6.456475	0.1336	*7.4013	0.075068	**7.0604	0.0409
N	117		**Rho:** **-0.458	0.0199	**Lambda:** ***-0.839	0.0003
R-Squared	0.25					
F-Statistics	***3.98	0.0002				
White Heteroskedasticity Test (OBSxR-Squared)	**26.56	0.0220				

*** represents p-values <0.01, ** p-value between 0.01 - 0.05, * p-value between 0.05 - 0.1

Source: own work.

Quite different results were observed from OLS compared to the Spatial models, indicating the relevance of spatial regressions. The ρ and λ parameters are negative and significant. It means that an increase in the tourist of one site leads to a decrease in the surrounding ones. It may happen for several reasons. A plausible explanation is that popular sites compete very well with the neighbours, so the surrounding sites cannot attract too many tourists.

First, the WHL variable has a positive and significant coefficient regardless of the model type in all regressions. So, it is evident that the archaeological sites in WHL are visited more than the others. The sites that are rated in WHL or the TL have welcomed more visitors than the ones which are not on the Lists. It can be concluded that being in UNESCO's WHL increases the reputation of the sites, thus drawing visitors' attention.

Second, Distance has a negatively significant coefficient in all three models. It means the closer the archaeological site is to the city centre, the more visitors it hosts. When the site is near a city centre, it is more accessible to the people. Therefore, people will tend to visit archaeological sites more.

Third, CoastSite is another significant variable in all three models. When the archaeological site is near the sea coast, it influences the visit numbers positively.

Being a coastal site is expected to create an opportunity for summer activities for the people and the archaeological site visit.

Finally, although not in all estimated regressions, Natpark and CoastCity variables have a negative and significant coefficient, while IPC has a positive and significant coefficient depending on the spatial models. It is expected that income per capita to have significance on visitor numbers since it is an index of the vividness of the economy. However, being in a natural park and a coastal city did not perform as positively significance as it is presumed. These variables do not arouse incentives to visit the archaeological sites.

5. CONCLUSION

Archaeological sites in Turkey are very significant cultural attractions for all tourists. The visits to the archaeological sites depend on various reasons such as location, climate, other cultural and recreational activities, and being a UNESCO WHS. Despite the importance of archaeological sites in Turkey and the country's intentions to promote its cultural heritage through them, a noticeable research gap exists regarding the motivations underlying tourists' visits to these sites. In this paper, the factors that affect visitor numbers of 117 archaeological sites in Turkey are analysed. So, empirical applications are carried out for 2019 data of the determined variables as the on-site archaeological museum, national park, WHL/TL, coastal site, coastal city, distance to the city centre, temperature, income per capita, and population of the city by using OLS, SAR, and SEM models. The findings indicate that three of the determinants are significant in the visitor numbers.

According to the results, UNESCO's WHL and the TL inscription significantly increased the archaeological sites' novelty. UNESCO WHL inscription supports the development of heritage management plans and infrastructure upgrades, which are vital in enhancing the appeal and accessibility of archaeological sites (Winter, 2015). Therefore, being in WHL or TL is a variable representing the value of the places and leads the visitors to see the archaeological sites. Consistently, the inclusion of Ephesus, Hierapolis, and Göreme archaeological sites in UNESCO's WHL has resulted in them emerging as the top three most visited sites in Turkey. The result of the WHL inscription's positive effect on visitor numbers are parallel with the studies of Su and Lin (2014), Tan *et al.* (2023), and Yang and Lin (2011). However, contrasting perspectives have been presented by Cellini (2011) and Huang *et al.* (2012), suggesting that the impact of being included in WHL on tourist numbers may not be deemed crucial.

The results showed that people visit sites located closer to the city centre. When the site is easy to access from the city centres, it creates more incentives for

visitors, as indicated by Huang *et al.* (2012). Since archaeological sites are usually outside the city centres, distance from the city centre and transportation to that place is effective. For instance, Hierapolis and Göreme archaeological sites, situated close to city centres, serve as prime examples of this phenomenon, attracting a high number of visitors due to their convenient accessibility. Another significant determinant indicated by the study is coastal proximity. The findings revealed that an archaeological site near the sea tends to generate higher visitor interest than other sites, as in the study of Cuccia and Rizzo (2011). Some exceptional places such as Phaselis, Olympos, and Patara archaeological sites allow swimming and visiting the archaeological sites simultaneously.

The study also highlighted the significant negative effect of spatial dependence on visitor numbers of archaeological sites near each other. The negative effect of spatial dependence was also supported by Patuelli's finding on the contiguity relationship (Patuelli *et al.*, 2013). Although archaeological sites are concentrated in four regions (Eastern Antalya, Western Antalya, Western Anatolia, and Inner Anatolia/ Cappadocia), the findings of the spatial dependence tests suggested that increased tourist activity at one site leads to a decrease in visitor numbers at neighbouring sites. This phenomenon underscores the severity of incorporating the spatial dependence; however, contrary to the notion of proximity to other tourist attractions promote visitor numbers, which were suggested in previous studies (Magablih and Al-Shorman, 2003; Oh *et al.*, 2019). Having an on-site archaeological museum was found to not have a significant effect on visits in the study. This result contradicts the conclusion of Carey *et al.* (2012) suggested in their study that the existence of the museum increases the number of tourists. It is presumed that visitors do not visit the site to see the museum, but after visiting the site, they also visit the museum as they have already come there. The reason why the archaeological sites inside the national parks also do not affect the number of visitors is probably due to the tight restrictions in these areas to protect archaeological remains and wildlife. In addition to having an on-site archaeological museum, the monthly temperatures, income per capita, and population were also found to be not significant on the number of visitors, contrary to studies that claim the opposite (Abuamoud *et al.*, 2014; Huang *et al.*, 2012; Ridderstaat *et al.*, 2014).

This study contributes to the literature regarding employing economic, demographic factors, and spatial relations between the sites. In this manner, to provide a holistic understanding, the study focuses on all of the archaeological site visits in 2019 rather than focusing on a single area. Moreover, while the effect of being on the WHL is mainly discussed in the literature, in this study, besides the effect of being on the WHL, other factors were also examined. The statistical results present novel findings and suggestions to the discussions on the factors affecting tourist visits to the archaeological sites. In future research, it will be essential to examine the impact of advertisement, novelty, and recognition on visitor numbers of archaeological sites. Understanding the relationship between these factors and visitor engagement can provide valuable knowledge for site management and promotional

strategies. Additionally, evaluating the sociocultural significance of the region and the effectiveness of environmental design projects in enhancing the visitor experience at the heritage sites are also suggested for further investigation. Moreover, in order to understand whether being a WHS increases the number of visitors, the data of WHS before and after inscribing in the List can be compared with panel data. The error terms in this study indicate that there are also other non-quantifiable factors affecting the number of visitors. Therefore, statistical and qualitative methods should be developed to understand a site's features that attract tourists.

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APPENDIX A

Province	Nr	Archaeological Site	Visitor Number
ADANA	1	ŞAR KOMANA ARCHAEOLOGICAL SITE	650
	2	ANAVARZA ARCHAEOLOGICAL SITE	15,329
ADIYAMAN	3	PIRIN (PERRE) ARCHAEOLOGICAL SITE	21,939
	4	SOFRAZ TOMB	1,637
	5	NEMRUT ARCHAEOLOGICAL SITE	46,206
AKSARAY	6	IHLARA VALLEY ARCHAEOLOGICAL SITE	566,917
	7	SARATLI KIRKGÖZ UNDERGROUND CITY	56,923
	8	ST. MERCURIUS UNDERGROUND CITY	35,144
	9	MANASTIR VALLEY ARCHAEOLOGICAL SITE	15,321
ANKARA	10	ROMAN BATH ARCHAEOLOGICAL SITE	10,103
	11	GORDION MUSEUM AND TUMULUS ARCHAEOLOGICAL SITE	36,011
ANTALYA	12	ASPENDOS ARCHAEOLOGICAL SITE	320,856
	13	PERGE ARCHAEOLOGICAL SITE	116,426
	14	PHASELIS ARCHAEOLOGICAL SITE	237,962
	15	OLYMPOS ARCHAEOLOGICAL SITE	251,085
	16	PATARA ARCHAEOLOGICAL SITE	193,214
	17	XANTHOS ARCHAEOLOGICAL SITE	35,573
	18	KARAIN CAVE	28,105
	19	MYRA ARCHAEOLOGICAL SITE	274,605
	20	TERMESSOS ARCHAEOLOGICAL SITE	43,750
	21	SIMENA ARCHAEOLOGICAL SITE	47,957
	22	ALANYA CASTLE	223,209
	23	SIDE THEATRE	231,553
	24	ALANYA SYEDRA ARCHAEOLOGICAL SITE	9,464
	25	ANDRIAKE ARCHAEOLOGICAL SITE AND LYCIAN CIVILIZATIONS MUSEUM	19,424
	26	LYMRA ARCHAEOLOGICAL SITE	13,413
AYDIN	27	NYSA (SULTANHİSAR) ARCHAEOLOGICAL SITE	8,672
	28	ALINDA ARCHAEOLOGICAL SITE	3,310
	29	MAGNESİA ARCHAEOLOGICAL SITE	5,719
	30	ALABANDA ARCHAEOLOGICAL SITE	2,796
	31	AFRODISIAS MUSEUM AND ARCHAEOLOGICAL SITE	92,400
	32	MILET MUSEUM AND ARCHAEOLOGICAL SITE	48,645
	33	DIDYMA ARCHAEOLOGICAL SITE	82,414
	34	PRIENE ARCHAEOLOGICAL SITE	29,181

Province	Nr	Archaeological Site	Visitor Number
BİTLİS	35	SELÇUKLU CEMETERY ARCHAEOLOGICAL SITE	68,161
BURDUR	36	SAGALASSOS ARCHAEOLOGICAL SITE	77,645
ÇANAKKALE	37	TROIA ARCHAEOLOGICAL SITE	583,491
	38	ASSOS ARCHAEOLOGICAL SITE	142,109
	39	ALEXANDRIA TROIAS ARCHAEOLOGICAL SITE	11,721
	40	APOLLON SMINTHEION ARCHAEOLOGICAL SITE	10,460
ÇORUM	41	ALACAHÖYÜK MUSEUM AND ARCHAEOLOGICAL SITE	40,955
	42	BOĞAZKÖY ARCHAEOLOGICAL SITE	40,832
DENİZLİ	43	HIERAPOLIS (PAMUKKALE) ARCHAEOLOGICAL SITE	2,557,868
	44	LAODIKEIA ARCHAEOLOGICAL SITE	86,064
ERZURUM	45	ERZURUM CASTLE	75,178
ESKİŞEHİR	46	PESSINUS ARCHAEOLOGICAL SITE	5,789
	47	MIDAS (YAZILIKAYA) ARCHAEOLOGICAL SITE	8,139
GAZİANTEP	48	YESEMEK ARCHAEOLOGICAL SITE	13,661
HATAY	49	ÇEVLİK ARCHAEOLOGICAL SITE	53,804
ISPARTA	50	ANTIOCHEIA ARCHAEOLOGICAL SITE	21,312
İZMİR	51	AGORA ARCHAEOLOGICAL SITE	67,179
	52	BERGAMA ACROPOLIS ARCHAEOLOGICAL SITE	203,984
	53	BERGAMA ASCLEPEION ARCHAEOLOGICAL SITE	119,434
	54	BERGAMA RED BASILICA ARCHAEOLOGICAL SITE	42,814
	55	EPHESUS ARCHAEOLOGICAL SITE	1,855,694
	56	EPHESUS TERRACE HOUSES	79,334
	57	ST. JEAN ARCHAEOLOGICAL SITE	165,151
	58	TEOS ARCHAEOLOGICAL SITE	29,950
	59	METROPOLIS ARCHAEOLOGICAL SITE	11,557
KARS	60	ANI ARCHAEOLOGICAL SITE	175,968
KAYSERİ	61	YEŞİLHİSAR SOĞANLI ARCHAEOLOGICAL SITE	16,148
	62	KÜLTEPE ARCHAEOLOGICAL SITE	39,212
KIRŞEHİR	63	MUCUR UNDERGROUND CITY	7,469
KONYA	64	ÇATALHÖYÜK ARCHAEOLOGICAL SITE	30,964
KÜTAHYA	65	AİZONAİ ARCHAEOLOGICAL SITE	30,087
MALATYA	66	ASLANTEPE ARCHAEOLOGICAL SITE	30,162
MANİSA	67	SARDES ARCHAEOLOGICAL SITE AND ARTEMIS TEMPLE	87,968
	68	AIGAI ARCHAEOLOGICAL SITE	6,791
	69	AKHİSAR MUSEUM AND AKHİSAR TEPE TOMB	18,084
	70	ALAŞEHİR ARCHAEOLOGICAL SITE	23,283

Province	Nr	Archaeological Site	Visitor Number
MERSİN	71	KIZ CASTLE	47,829
	72	KANLI DİVANE ARCHAEOLOGICAL SITE	37,112
	73	GÖZNE CASTLE	9,510
	74	SİLİFKE CENNET CEHENNEM ARCHAEOLOGICAL SITE	87,636
	75	SİLİFKE AYATEKLA ARCHAEOLOGICAL SITE	5,065
	76	SİLİFKE UZUNCABURÇ ARCHAEOLOGICAL SITE	13,255
	77	SİLİFKE ALAHAN MONASTERY	10,312
	78	TARSUS ST. PAUL WELL	29,536
	79	ANAMORIUM ARCHAEOLOGICAL SITE	26,216
	80	SİLİFKE ASTIM CAVE	170,722
MUĞLA	81	LAGINA ARCHAEOLOGICAL SITE	6,644
	82	SEDİR ISLAND (KEDRAI) ARCHAEOLOGICAL SITE	189,093
	83	STRATONIKEIA ARCHAEOLOGICAL SITE	24,518
	84	BODRUM MAUSOLEUM	29,986
	85	BODRUM ANCIENT THEATRE	13,673
	86	FETHİYE GEMİLE ISLAND	26,958
	87	FETHİYE LETOON ARCHAEOLOGICAL SITE	14,883
	88	FETHİYE PINARA ARCHAEOLOGICAL SITE	3,807
	89	FETHİYE TLOS ARCHAEOLOGICAL SITE	33,309
	90	FETHİYE AMINTAS ROCK TOMB	38,656
	91	FETHİYE KAYAKÖY ARCHAEOLOGICAL SITE	93,405
	92	FETHİYE KAUNOS ARCHAEOLOGICAL SITE AND ROCK TOMBS	54,235
	93	FETHİYE KADYANDA ARCHAEOLOGICAL SITE	6,313
	94	MİLAS IASSOS ARCHAEOLOGICAL SITE	2,210
	95	MİLAS LABRANDA ARCHAEOLOGICAL SITE	2,599
	96	MİLAS BEÇİN CASTLE AND ARCHAEOLOGICAL SITE	5,395
	97	MİLAS EUROMOS ARCHAEOLOGICAL SITE	4,839
	98	MARMARİS KNIDOS ARCHAEOLOGICAL SITE	56,746
NEVŞEHİR	99	DERİNKUYU UNDERGROUND CITY	456,369
	100	KAYMAKLI UNDERGROUND CITY	632,970
	101	ZELVE-PAŞABAĞLAR ARCHAEOLOGICAL SITE	279,296
	102	GÖREME ARCHAEOLOGICAL SITE	1,403,444
	103	KARANLIK CHURCH	121,978
	104	ÖZKONAK UNDERGROUND CITY	209,319

Province	Nr	Archaeological Site	Visitor Number
NEVŞEHİR cont.	105	TATLARİN UNDERGROUND CITY	6,294
	106	GÜLŞEHİR ST. JEAN CHURCH	8,905
	107	EL NAZAR CHURCH	9,898
	108	GÜLŞEHİR AÇIK SARAY ARCHAEOLOGICAL SITE	10,299
	109	MAZI UNDERGROUND CITY	11,830
NİĞDE	110	GÜMÜŞLER ARCHAEOLOGICAL SITE	24,606
	111	ANDAVAL ARCHAEOLOGICAL SITE	638
OSMANİYE	112	KARATEPE ASLANTAŞ MUSEUM AND ARCHAEOLOGICAL SITE	22,150
ŞANLIURFA	113	HARRAN ARCHAEOLOGICAL SITE	78,906
	114	GÖBEKLİTEPE ARCHAEOLOGICAL SITE	400,195
TRABZON	115	SÜMELA MONASTERY	201,474
VAN	116	VAN CASTLE	60,581
ZONGULDAK	117	CEHENNEMAĞZI CAVES	34,898

Source: DÖSİMM, 2019.

APPENDIX B

Multicolinearity matrix of the independent variables

		1 Cost-City	2 Dis-tance	3 Cost-Site	5 IPC	6 Muse-um	7 Popula-tion	8 Nat-Park	9 Tempe-rature	10 WHL
1	CostCity	1.00	0.19	0.66	0.53	0.03	0.38	-0.08	0.49	-0.09
2	Distance	0.19	1.00	0.21	0.09	0.18	0.10	-0.01	0.03	0.08
3	CostSite	0.66	0.21	1.00	0.41	0.11	0.22	0.01	0.26	-0.08
5	IPC	0.53	0.09	0.41	1.00	0.13	0.66	-0.06	0.25	0.06
6	Museum	0.03	0.18	0.11	0.13	1.00	0.04	0.22	0.05	0.06
7	Population	0.38	0.10	0.22	0.66	0.04	1.00	-0.10	0.49	0.19
8	NatPark	-0.08	-0.01	0.01	-0.06	0.22	-0.10	1.00	-0.11	0.14
9	Temperature	0.49	0.03	0.26	0.25	0.05	0.49	-0.11	1.00	0.02
10	WHL	-0.09	0.08	-0.08	0.06	0.06	0.19	0.14	0.02	1.00

Source: own work.

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Richard leBRASSEUR *

FROM GREEN FINGERS AND GREEN RING TO GREEN MITTEN: HELSINKI'S POLYCENTRIC URBANISATION AND ITS IMPACT ON GREEN STRUCTURE

Abstract. Urbanisation changes the landscape and fragments spatial structures including greenspaces across much of the world and Europe. The resultant impacts and morphological characteristics are understudied within peri-urban regions of cities. This study analysed the spatial qualities and relationship among peri-urban greenspaces, green structure, and urban form within the Greater Helsinki Region of Finland. Results illustrate how the existing 'Green Fingers' have impacted urban development patterns. Though the region includes many fragmented greenspaces, an overall interconnected and coherent intermixed green structure remains. This spatial component faces continued threats; managing the growth of peri-urban regions is critical to maintaining a green structure's functional and morphological benefits.
Key words: spatial planning, green structure, peri-urban greenspaces, landscape fragmentation.

1. INTRODUCTION

Transitional land uses produced through urbanisation continue to modify the landscape and green structures across the globe (Nilsson *et al.*, 2013). Landscape fragmentation is most noticeable within the periphery of urban areas where greenspaces, of varied shapes, sizes, land uses, and context, provide a diversity of ecosystem services, including benefits to human wellbeing.

* Richard leBRASSEUR, Green Infrastructure Performance Lab, Dalhousie University, 20 Rock Garden Road, EE Building, Truro, Nova Scotia, Canada B2N 5E3; e-mail: r.leBrasseur@dal.ca, ORCID: https://orcid.org/0000-0003-2489-1541

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The pressures and drivers of urbanisation are well documented, however, the 0resultant morphological impacts to greenspaces is understudied, specifically those surrounding cities. Often viewed separately, urban greenspace, rural greenspace, preserves, housing allotments, conservation areas, etc. must be viewed as a comprehensive interconnected whole and a spatial entity into itself − beyond ownership, management, and policy − in order to maximise ecosystem service provision and the multi-functional benefits to humans and nature. This research considers greenspace, inclusive of varied frameworks, as a biophysical element within the landscape. This paper will focus on the morphological analysis of greenspaces within urbanising regions and the spatial relationships of peri-urban greenspaces (PUGS) in order to gather insight on their impacts on one another in generating urban form.

This research utilised the Greater Helsinki Region (GHR) in Finland as the case study area focusing on the relationship between green structure and urban form. The research examines the quantity and qualities of greenspace fragmentation within the process of urbanisation including its morphology, land cover, and regional green structure. For example, how the spatial planning and polycentric morphological form of the GHR has affected and been affected by the existing green structure of Helsinki and the larger region. What are the specific morphological attributes and spatial characteristics of greenspaces and green structures within a peri-urban region in a fragmented state? How is the greenspace distributed? Is the green structure comprised of large reserves or is it a series of smaller, integrated greenspaces? It is these characteristics that make them distinct from rural or urban landscapes and express the qualities of a peri-urban landscape, allowing them to be comprehensively viewed as a spatial entity. Lastly, how planning and sustainable development practices can be more cognizant of the important factors of a regional green structure. Such knowledge has implications across the globe for planners and policy.

In order to answer these questions and fill important research gaps, this study will:

1. Review planning and urbanisation literature, and identify specific landscape fragmentation measures most applicable to greenspaces within peri-urban landscapes, specifically approaches that can best integrate spatial and aspatial data;
2. Analyse and document the existing polycentric morphological structure of greenspace within a case study area, focusing on peri-urban greenspaces (PUGS) measures and indicators;
3. Synthesize the spatio-temporal dynamics of PUGS transition and built-environment surface expansion; and
4. Critically examine and frame the results in the context of the Greater Helsinki Region's existing green structure and planning policy in order to inform manage future urban growth and promote sustainable development.

The structure of this paper is as follows: first, a literature review frames the important concepts of urbanisation patterns within peri-urban regions, including

landscape fragmentation, spatial morphology, and green structure. The selected case study area, i.e., the Greater Helsinki Region in Finland, is contextualised for these key concepts including an historic overview of the spatial development history and urbanisation of the city of Helsinki and the larger region, inclusive of its prominent green structure − the 'Green Fingers' and existing polycentric urban development pattern. Next, the methodology applies a series of multi-scalar and multi-method analyses, which qualitatively and quantitatively assesses landscape fragmentation and the geospatial characteristics of the Greater Helsinki Region, including its greenspaces. The results, at multiple scales and landscape typologies, provide a comprehensive description of the physical characteristics of fragmented greenspaces and their morphological structure. The discussion section summarises and contextualises the results highlighting the relationship of urban form, green structure, and current policy objectives. Lastly, the conclusion provides critical reflection to complement urbanisation discourse and implications for policy and regional planning within the Greater Helsinki Region, its 'Green Fingers,' and elsewhere.

1.1. Urbanisation patterns, peri-urban landscapes, and polycentricity

Humans have modified the landscape for centuries in order to meet their needs and goals. The last two hundred years, however, have brought a particularly significant change to the landscape, most notably through population increase and the requisite infrastructure to meet human demands – referred to simply as urbanisation. Urbanisation is a complex social, economic, political, and technological process, and there are no uniform patterns of urbanisation from which to draw sound conclusions or definitions. The process of urbanisation comprises the physical conversion of open, non-built areas for human settlement purposes. It is primarily the outcome of demographic transition – whether (net) migration from rural to urban areas or from urban cities to rural areas; it can include the formation of new urban centres or the spatial expansion of existing ones. Urbanisation, however, is not invariably predicated upon urban expansion, it can also occur through decentralisation.

Although the increase in urban populations is an important driving factor of urbanisation globally, in Europe, it is not the main one. More significant is the trend for European cities to become less compact. Since the mid-1950s, European cities have expanded on average by 78%, whereas the population has grown by just 33% (Nillson *et al.*, 2014). Over the last few decades, continuous urban expansion at rates much higher than population growth has resulted in a massive extension of the urban footprint on Europe's landscape (Wandl, 2012).

Urbanisation results, though, in population increase and infrastructure requirements and has significant affect upon the landscape; it creates more urban areas

and is often measured through changes to land use and/or land cover. A common output of the urbanisation process and urban expansion is the creation of peri-urban areas (PUA). These areas are the transitional area between urban and rural landscapes; they exist at the intersection of rural and urban zones, often where such infrastructure as roads and economic centres exist, just beyond the existing urban areas. A PUA is commonly defined as a "zone of transition from urban to rural land uses" existing between the outer limits of the urban area and the beginning of the rural area (Davis *et al.*, 1994, p. 46). PUAs have been defined in literature in relation to a nearby urban area on their inner boundary, a rural area on their outer boundary, or as the land in between these two boundaries – a 'middle landscape.' Sometimes referred to as the 'peri-urban interface' in literature, PUAs, simply, are urbanising land adjacent to the edge of an urban area into which it physically and functionally expands (Iaquinta and Drescher, 2000). In terms of shape rather than processes, peri-urbanisation results in a landscape that is compositionally more heterogeneous, geometrically more complex, and ecologically more fragmented than non-urban or rural lands (Paudel and Yuan, 2012; Leitão *et al.*, 2012).

As urban areas expand outwards from the more central urban areas or cities, they eventually form their own unique city-centres with smaller yet similar services and functions as the larger urban centre from which they grew (Piorr, 2013). As these new peri-urban centres continue to expand and grow, this process of urbanisation creates a distinct urban form and pattern upon the landscape, referred to as polycentric development (e.g., Sýkora *et al.*, 2009). Unlike monocentric urbanisation patterns which exhibit continuous expanded growth around a single urban centre, polycentric urban regions are most often defined through their spatial structure and include various sub-centres or multiple-nuclei structure. Overall, the concept of polycentricity is a principle of spatial organisation and refers to patterns of concentration and dispersal within the process of urbanisation (Finka and Kluvánková, 2015). The morphological or spatial aspect of polycentricity focuses on the size and distribution of urban-centres across space. This dimension is often associated with the extent to which landscape is characterised by a more even and balanced development. The functional aspect of polycentricity focuses less on the internal characteristics (e.g., size or density) of the urban-centres and more on the way these urban-centres organise the region spatially by supplying the functions that shape the region's relationships. (De Goei *et al.*, 2010).

Polycentrism has evolved as a spatial form for many reasons. Either the mega-city has grown beyond its original, contained borders − expanding its monocentric form to many smaller and newer 'satellite cities' or urban conglomerations. Or, smaller cities have grown but never to a larger (mega) scale and, when viewed regionally, present a series of relatively evenly-populated and spatially-similar cities. Although polycentric urbanisation has occurred out of physical necessity in Europe (e.g., population migration, resource dispersion), planning policies view polycentrism as a more efficient, economically viable, and even human-scaled urban spa-

tial form (Finka and Kluvánková, 2015). Beer and Clower (2019) have noted that metropolitan areas drive the economic development of Europe and planning strategies seek to combine the strengths of multiple urban-centres in order to be globally competitive. Kloosterman and Lambregts (2001) referred to polycentric regions as an assemblage of historically distinct and both administratively and politically independent cities located in close proximity and well connected through infrastructure. This is the specific spatial characteristic found within Europe currently and the goal for EU policy – many clusters of medium-sized, close-by cities in which functions and spatial polycentricity can be readily achieved with proper conditions.

Polycentrism, thus, as a multi-scalar spatial planning concept, has become the preferred spatial form to accommodate urban growth in much of Europe (EPSON, 2017) for many reasons, including benefits to humans (Cole, 2015) and economies (Meijers *et al.*, 2018). As with most urban expansion, however, the non-urbanised landscape (e.g., rural lands, agriculture, forests/woodlands, open spaces, and greenspaces) is affected; polycentric urbanisation entails land cover change and landscape fragmentation (He *et al.*, 2022; Barros *et al.*, 2018; Grigonis, 2013). But it is the spatial characteristics of polycentric landscape fragmentation that is unique to other forms of landscape fragmentation (Nilsson *et al.*, 2014; Ranalli and Salvati, 2015).

1.2. Polycentric landscape fragmentation and peri-urban greenspaces

Polycentric landscape fragmentation occurs within and between the new nodes or urban-centres, primarily due to the transportation infrastructural links. And despite the features that make polycentrism favourable (e.g., increased services, improved public health access, and integrated transportation and infrastructure), landscape fragmentation is an inadvertent result that requires further analysis.

Landscape fragmentation can be explained through the spatial and temporal dynamics of land use change (Shi *et al.*, 2020), it is the result of transforming large areas or spaces into smaller, more isolated ones (i.e., patches) that lack physical connectivity. Landscape fragmentation impacts both ecological systems and human activities (Zambrano *et al.*, 2019; Bogaert *et al.*, 2005). The ecological effects of landscape fragmentation are mostly negative and are well documented (e.g., Haddad *et al.*, 2015); a primary result is reduced ecosystem services provision (Mitchell *et al.*, 2015; MEA, 2005;) and ecological resilience (Schewenius *et al.*, 2014), including biodiversity and cultural ecosystem services (MEA, 2005) such as human wellbeing (leBrasseur, 2022a; Bertram *et al.*, 2022). However, not all impacts of landscape fragmentation are ecologically negative. Small patches provide habitat niches (Ashrafzadeh *et al.*, 2020). Additionally, spatial diversity and numerous edges increase species richness (Dorph *et al.*, 2021).

Landscape fragmentation, much like urbanisation, is most noticeable in the peri-urban and rural landscape. In the context of urbanising landscapes, landscape

fragmentation creates larger, more connected, anthropic land uses and land covers while creating smaller, less connected biophysical or natural spaces and patches, often greenspaces. Thus, the polycentric morphological structure is exhibited through the development pattern of polycentric regions and their various urban-centres that illustrate, spatially, significant rural or green spaces between these urban-centres (i.e., small and medium-sized) (Hall and Pain, 2006); referred to as peri-urban greenspaces (PUGS).

Landscape fragmentation creates more PUGS patches or parcels, but, overall, they are of a smaller average size (Robinson, 2012), often creating isolated remnants (Mullu, 2016) and exhibit a diverse set of characteristics, including their shape, size, and edge qualities. Many measures and methods have been applied to analyse landscape fragmentation in the greenspaces in polycentric regions (e.g., Pan *et al.*, 2022; Xu *et al.*, 2018; La Rosa and Privitera, 2013; Kupfer, 2006). The synthesised literature provides measures to the identify and quantify landscape fragmentation within PUGS through three distinct yet interconnected spatial characteristics:

1. PUGS heterogeneity;
2. PUGS diversity; and
3. PUGS edge quantity.

Spatial heterogeneity is a standard characteristic of greenspace fragmentation (e.g., McGarigal and Cushman, 2002). Whereas landscape fragmentation often implies rural lands fragmented by urban land uses, spatial heterogeneity is a more comprehensive measure of physical characteristics that may have both natural and human sources (Liao *et al.*, 2021). Spatial heterogeneity includes physical spaces of mixed concentrations and of multiple sizes and shapes, and encompasses diverse land covers and/or land uses. Landscape fragmentation increases not only the number of patches (i.e., spatial heterogeneity and spatial diversity) but the overall number of edges associated with those patches. Landscape fragmentation causes PUGS to become smaller as their edge-to area ratio increases. Total edge increase is a common occurrence in PUAs (Recanatesi, 2015; Hardt *et al.*, 2013) where anthropogenic modifications to the landscape such as road and infrastructure construction, residential housing, and other human development practices exist.

Overall, the three noted spatial characteristics serve as straightforward, physical, and morphological features to identify and analyse greenspace fragmentation within PUAs. They provide specific insight to not only landscape-based urban development research, but also fragmented characteristics found within PUGS and their overall green structure (Kowe *et al.*, 2021; Pior, 2013). Two primary PUGS fragmentation measurement methodologies dominate the literature: visual analysis approaches and geospatial analysis approaches.

The identification of the spatial morphology of a landscape, particularly a fragmented landscape including its PUGS, is assisted through the use of photographic imagery within a visual analysis. The ready availability of satellite imagery, orthophotos, infra-red imagery, and other remotely sensed images have

progressed the study of urbanisation and landscape fragmentation (Gao, 2020; Herold *et al.*, 2005). Spatial morphology can also be assessed through GIS and geospatial techniques such as land cover analysis. The analysis of landscape level and class level metrics has provided a strong conceptual and theoretical basis for understanding landscape structure, function, and change (Singh *et al.*, 2014). There is a variety of landscape metrics to allow quantitative assessment of a landscape, its green structure, and its level of fragmentation (Naikoo *et al.*, 2022; McGarigal and Marks, 1995).

1.3. Peri-urban greenspaces and green structure

The term 'green structure' provides a framework for viewing and conceptualising greenspaces within the peri-urban landscape. Green structure, like greenspace, is a spatial entity (Sandström, 2002). The concept builds on that of greenspace to include physical interconnectivity. Green structures are more than a sum of their individual greenspaces, however. They are the spatial network of the landscape. The COST C11 Memorandum of Understanding describes the concept of green structure: "*... is concerned with the spatial structure of green areas in the urban landscape and with all planning activities that are essential to create conditions for green areas to perform their vital role for the quality of urban life*." Green structure embodies the contemporary view of the peri-urban landscape as an interconnected system of varied anthropic and biophysical greenspaces (Arnaiz-Schmitz *et al.*, 2018). Greenspaces are an important aspect of the peri-urban landscape, referred to as peri-urban greenspace (PUGS). The key concept of a green structure is that it is not only the individual elements (e.g., vegetation, water, etc.) but how these individual greenspace elements fit into a whole – the distribution and interconnectivity and organisation of green elements form a system and pattern of greenspace. Green structure, therefore, is a basic and dominant spatial entity found within the landscape.

2. METHODOLOGY

2.1. Case study area

Helsinki is located on the shore of the Gulf of Finland. It forms the core of the Greater Helsinki Region (GHR) and has a total population of 1,747,340 (2015) inhabitants, land area of 6,623 sq. km and a population density of 264/sq. km. At almost 1.8 million people in the population, the GHR encompasses almost 1/3 of

Finland's total population (Official Statistics of Finland – OSF, 2018). The spatial form of the GHR is distinctly polycentric, or multi-nucleic (Granqvist *et al.*, 2019; Söderström, *et al.*, 2015). The GHR contains the following two (2) sub-centres within its conurbation: Espoo and Vantaa (see Fig. 1). Both are integral to the region, both functionally and morphologically.

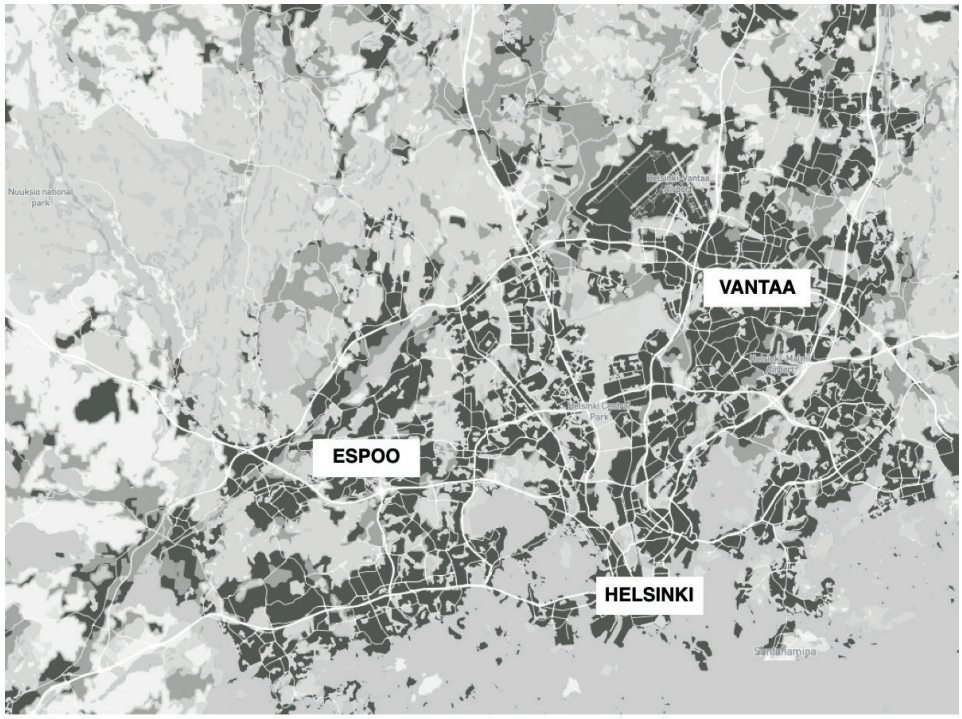

Fig. 1. The Greater Helsinki Region. Darker areas indicate urban population density, lighter areas are less densely populated areas. No density metrics are known, this is a diagram only to show the morphological spatial relationship between the urban areas only

Source: own work.

Helsinki is one of the greenest cities in Europe with greenspaces covering over 40% of the city's land surface (216.5 sq. km). Urban expansion focused northward and created the basis for the 'Green Finger' morphological structure of Helsinki (Fig. 2). The 'Green Fingers' include a mixture of former agricultural river valleys, rocky forested ridges, and wetlands that have proved difficult for construction (Vähä-Piikkiö and Maijala, 2003). These 'Green Fingers' or linear green structures were established along either a natural corridor and form the backbone of the GHR's greenspace system.

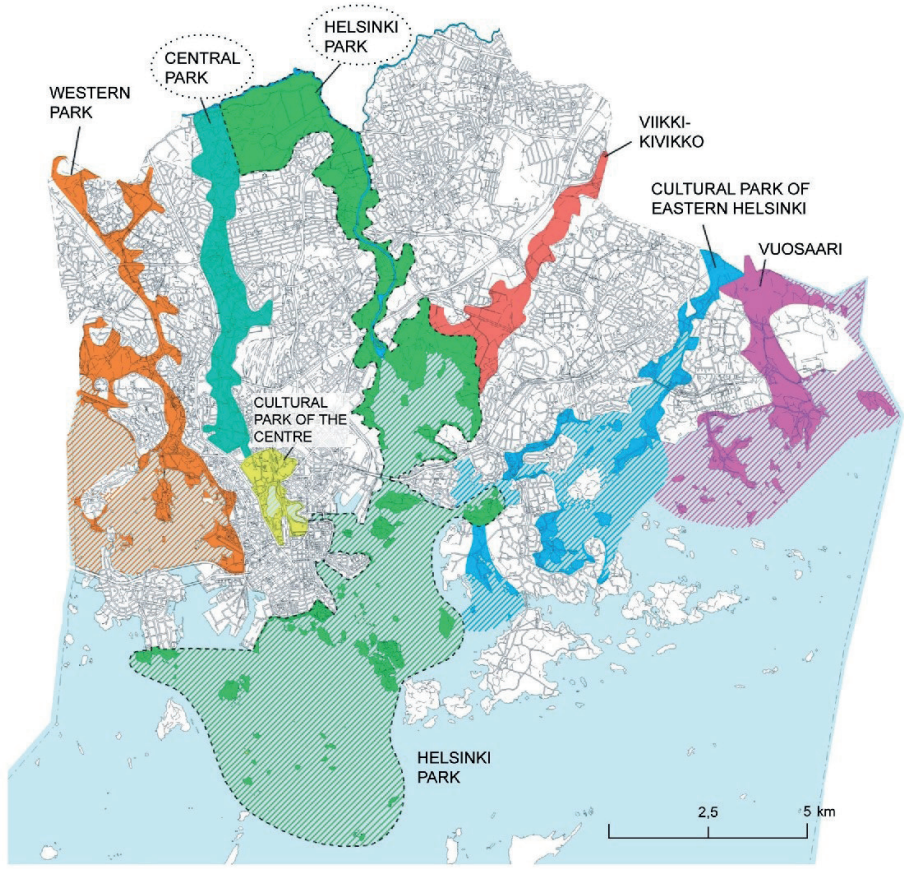

Fig. 2. Diagrammatic plan of the Green Fingers. The Green Fingers' structure of the Helsinki showing six finger-like parks radiating out from the city centre into surrounding rural areas.

Source: City of Helsinki, 2016.

The interaction of natural and human processes over time has led to the GHR's landscape fragmentation and development of its distinct green structure, its 'Green Fingers,' and the existing spatial characteristic of PUGS, including aspects of connectivity and fragmentation. This study will further qualify and quantify those PUGS spatial characteristics.

2.2. Spatial landscape analysis

Spatial contexts are studied in order to understand an urban region's morphology and characteristics, including greenspaces. Thus, the term morphology refers to the area of a study's spatial form and spatial pattern, i.e., spatial structure. This

morphological approach is common in landscape analysis (Denis and Marius--Gnanou, 2010; Lynch, 1960).

Two multi-scalar analyses were completed that qualitatively and quantitatively assessed landscape fragmentation and the PUGS spatial characteristics of the GHR:

1. a visual analysis of multi-scalar orthophotos; and
2. a geospatial or GIS-based land cover analysis.

These two spatial analytical methods complement one another and provide a comprehensive identification of PUGS heterogeneity, diversity, and edge quantity.

2.2.1. Visual analysis

A visual analysis was completed through a remote-sensed review at varied scales of the GHR's peri-urban areas to identify landscape fragmentation primarily assessing spatial heterogeneity, PUGS Diversity, and PUGS edge quantity. This visual analysis was completed by the author, considered an expert in the field of visual landscape analysis, including landscape and greenspace fragmentation characteristics.

2.2.2. Geospatial land cover analysis

A 10 km extension was created around the urban core of Helsinki. This included the 'Green Fingers', the GHR, and the polycentric centres of Vantaa and Espoo (see Fig. 3). This area is 974.58 sq. km (974,577,371 sq. m). It served as the study area for data collection, operation, and analysis.

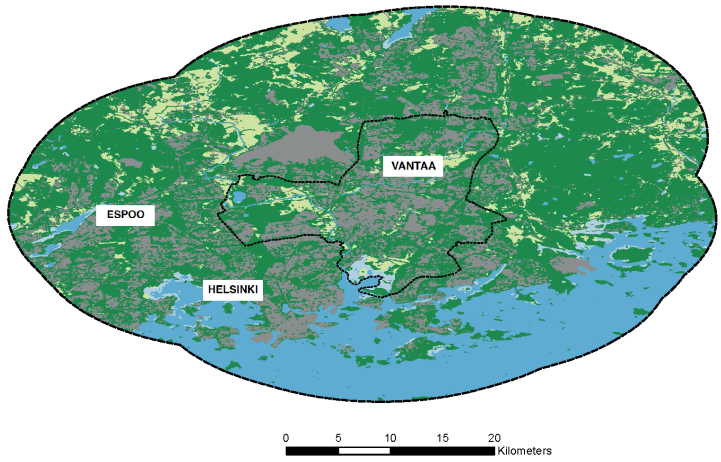

Fig. 3. The Greater Helsinki Region with the two polycentric sub-centres, Espoo and Vantaa. This Figure is for illustrative purposes only. Urban areas of varying densities are illustrated in grey whereas greenspaces of varying types are illustrated in green and yellow-green

Source: EEA CORINE Land Cover Data 2018.

The data collection included CORINE Land Cover (CLC 2018). It consisted of an inventory of land cover in 44 classes. CLC uses a Minimum Mapping Unit (MMU) of 25 hectares (ha) for areal phenomena and a minimum width of 100 m for linear phenomena. The Eionet network National Reference Centres Land Cover (NRC/LC) produces national CLC databases, which are coordinated and integrated by the European Environment Agency (EEA). Finland's CLC was produced through high-resolution satellite imagery and is regarded as equal to other global land-cover datasets such as Urban Atlas.

The land cover analysis examined the physical characteristics of the landscape through GIS-based data using ArcGIS 10.4; this served as an efficient and effective means to illustrate the three peri-urban fragmentation characteristics of diversity, heterogeneity, and edge quantity. The Level I and Level II land cover classes were analysed in this study. Class I provided a general overview of the various land covers for the region and Class II focussed on the greenspace land cover typologies. All water typologies such as wetlands and inland water bodies were not considered part of the total land area analyses.

It is important to note that the application of a specific landscape fragmentation tool, i.e., FRAGSTATS (McGarigal *et al.*, 2002), was not employed in this multi-method analysis. The GHR's landscape and its PUGS are already fragmented and facing pressures for further fragmentation; academic and scientific literature has already determined that the Greater Helsinki Region exists in a fragmented state (e.g., Council of Europe, 2000; European Commission, 1999; Kotavaara *et al.*, 2013). The goal for the land cover analysis was to identify the specific PUGS typologies and generate simple statistics in regards to the overall green structure of the GHR.

3. RESULTS

3.1. Visual analysis results

A visual spatial analysis confirmed that the GHR's PUGS exhibited the three key landscape fragmentation spatial characteristics of heterogeneity, diversity, and high edge quantity. These multi-scalar results provided not only an overview of the landscape's PUGS distribution and composition, but their diversity of physical characteristics such as size, shape, edge conditions, composition, as well as varied PUGS typologies – parks, sports facilities, playgrounds, gardens, plazas, etc. Specifically, orthophotos at multiple scales illustrate the PUGS green structure characteristics of interconnection, separation, and overall green structure pattern (see Fig.4 thru 6).

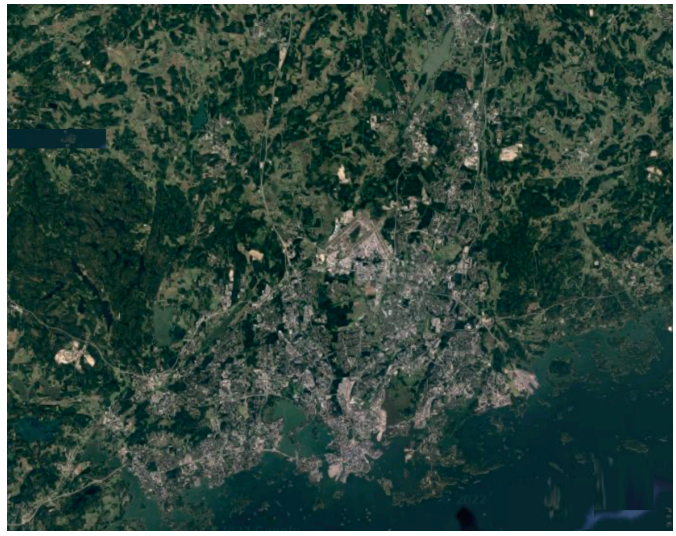

Fig. 4. Green structure interconnection. The GHR's urbanised areas are separated by large and interconnected PUGS

Scale: Metropolitan Scale (1:200,000)

Source: Google Earth, Digital Globe 2021.

Fig. 5. Green structure separation. PUGS of various and unique sizes, shapes, and typologies are distinct from one another yet also contiguous

Scale: City Scale (1:100,000) (near Vantaa)

Source: Google Earth, Digital Globe 2021.

Fig. 6. Morphological Form Impacted through Green Structure Pattern. The GHR's larger PUGS are often located adjacent to housing developments

Scale: Local Scale (1:20,000) (near Vantaa)

Source: Google Earth, Digital Globe 2021.

3.2. Land cover analysis results

The Level I land cover data illustrates green structure and land cover patterns while the Level II land cover data illustrates overall spatial heterogeneity, PUGS diversity, and edge increase. The Class Level I land cover map (see Fig. 7) and results (Table 1) illustrate a simplistic and clear organisation to land cover analysis. The 'Artificial surfaces' Class Level I Land Cover is 285,734,892 sq. m. This totals 36.5% for the total land area. These land cover percentages illustrate that the GHR is primarily urbanised within the Helsinki core area and less so as it moves outward. The total Class Level I greenspace areas (Agriculture + Forests and semi-natural) are 496,598,572 sq. m or 63.5% of the total land area. These land cover percentages illustrate that the case study area is primarily 'green' in its land cover.

The Class Level II land cover map (see Fig. 8) illustrates the morphology of the GHR, qualitatively and quantitatively documenting overall spatial heterogeneity and landscape fragmentation in its land uses within the region's three largest land cover areas of Forests, Urban Fabric, and the Industrial, Commercial and Transportation Units. The purpose of this map was to offer an interim step to generally visualise the various land cover typologies before focusing on greenspaces. No land cover totals were provided as they are documented in the other maps and tables within this section.

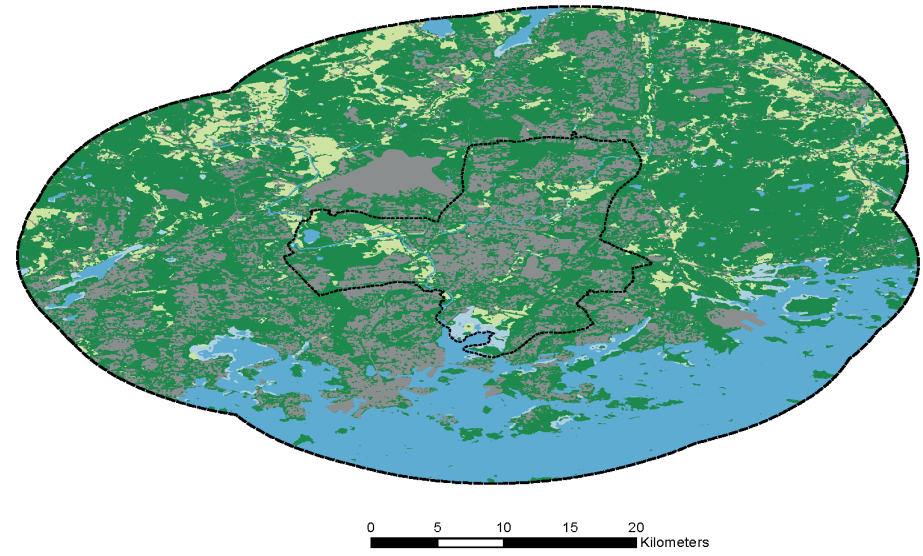

Fig. 7. Class Level I Land Cover
Source: EEA CORINE Land Cover Data 2018.

Table 1. Class Level I land cover

LAND COVER	AREA [sq m]
Artificial surfaces	285,734,892
Agricultural areas	110,764,250
Forests and semi-natural areas	385,834,322
Wetlands	9,927,819
Water bodies	182,316,088

Source: own work.

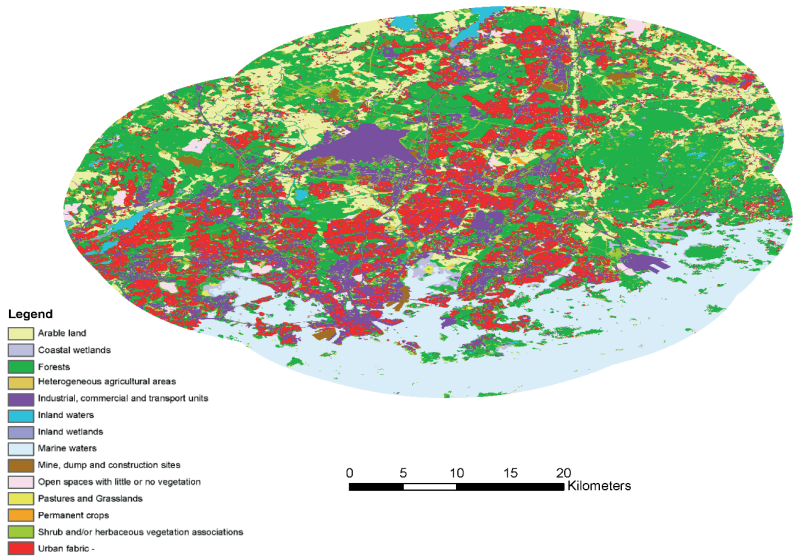

Fig. 8. Class Level II Land Cover
Source: EEA CORINE Land Cover Data 2018.

The Class Level II greenspace land cover map (see Fig. 9) and results (Table 2) analyse greenspace typologies at a finer detail of classification. This map's Class Level colours were revised to highlight the region's land cover diversity more clearly.

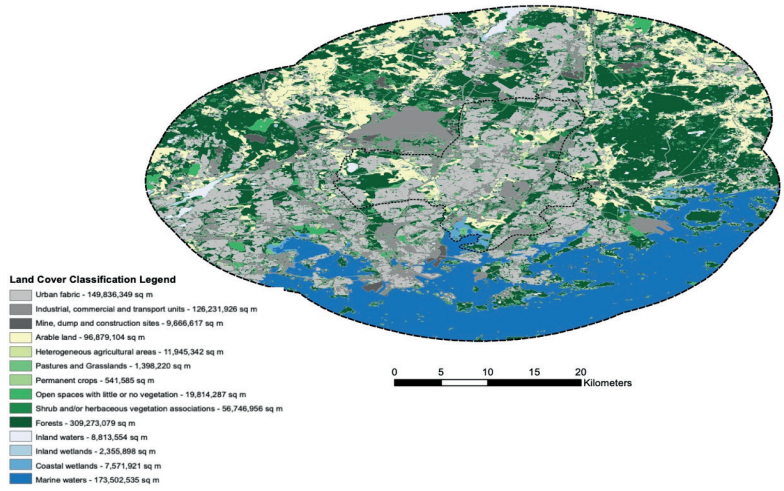

Fig. 9. Class Level II Land Cover – Greenspace Classes
Source: EEA CORINE Land Cover Data 2018.

Table 2. Class Level II land cover – greenspace classes

LAND COVER	AREA [sq m]
ARTIFICIAL SURFACES	285,734,892
Urban fabric	149,836,349
Industrial, commercial and transport units	126,231,926
Mine, dump and construction sites	9,666,617
GREEN SURFACES	496,598,572
Arable land	96,879,104
Heterogeneous agricultural areas	11,945,342
Pastures and Grasslands	1,398,220
Permanent crops	541,585
Open spaces with little or no vegetation	19,814,287
Shrub and/or herbaceous vegetation associations	56,746,956
Forests	309,273,079
WATER SURFACES	192,243,907
Inland waters	8,813,554
Inland wetlands	2,355,898
Coastal wetlands	7,571,921
Marine waters	173,502,535

Source: own work.

For the Class Level II greenspace land cover data, the landscape is dominated by Forests (309,273,079 sq. m – 30,927 ha) which is almost 40% of the total land area, followed by Arable Land (96,879,104 sq. m – 9,687 ha) then Shrub and/or Herbaceous Vegetation Associations (56,746,956 sq. m − 5,674 ha). The least amount of greenspace land cover types were Permanent Crops (541,585 sq. m − 541 ha), Pastures and Grasslands (1,398,220 sq. m – 1,398 ha), Heterogeneous agricultural areas (11,945,342 sq. m – 1,945 ha), and Open spaces with little or no vegetation (19,814,287 sq. m – 1,981 ha). Clearly, the most prevalent GS landcover in the GHR is Forests. Overall, the highest number of individual GS patches or polygons were Shrub and Herbaceous Vegetation Associations (n=26,400) and Forest (n=16,500). This map illustrates greenspace diversity and edge increase. Qualitatively, the 'Green Finger' structure is visible in all Figures of the land cover analysis. It is also noted that there are more naturalistic land covers (Forests, Arable Land, and Vegetation Associations) as the study area expands to the 10 km limit around the urban core.

4. DISCUSSION

The results of this study indicate a distinct green structure to the GHR. The two largest fragmented greenspace types, Forest and Arable Land, are interconnected and contiguous to one another and other greenspaces, indicating a green structure pattern and form to its fragmented greenspace. PUGS fragmentation cannot be analysed solely through individual measures or GIS indices; a region's morphological structure must be understood in order to place its larger spatial context within a perspective, particularly its greenspaces. Though the GHR has large-sized PUGS patches such as Forests, it also has a high number of smaller, compact, complex shaped greenspaces – particularly its Open Space and Shrub and Herbaceous Vegetation parcels, indicating a diffused pattern to its overall greenspace. The GHR's overall high proximity and less separated greenspaces illustrate a more distinct green structure – those interconnected, contiguous greenspaces – within the region. These results signify that the GHR has fragmented forests and agricultural lands. However, the qualities of this fragmentation are important to note. Though the Forests are fragmented, they are large in size and also connected or proximal often to other large Forest patches. The GHR's urbanisation and green structure relationship is associated with human development occurring from the urban core of Helsinki to the rural areas. It is these transitional zones where fragmentation (i.e., spatial heterogeneity; Cushman and McGarigal, 2002) is most acute (PLUREL, 2013). It is also in this spatial zone where urban conglomerations arise, here the GHR's polycentric sub-centres of Espoo and Vantaa.

4.1. The Greater Helsinki Region, green structure, and polycentric morphology

The historical and existing green structure form has and continues to impact the morphology of the GHR through two distinct characteristics: separation and scale. The GHR's urbanised areas – their housing and commercial centres – are clearly separated by somewhat large and interconnected greenspaces, often the 'Green Fingers.' These characteristics are evident at many spatial scales. The GHR's larger and more interconnected greenspaces (e.g., forests) often border housing developments and spatially extend for great lengths within the region.

Another significant spatial framework emerges when looking at the region. The hundreds of recreational areas and reserves surrounding Helsinki in a large radius form what has been referred to as the Viherkehä or 'the Green Ring' (see Fig. 10). The 'Green Fingers,' individually and collectively, serve as a green corridor to the larger regional landscape and the 'Green Ring,' linking urban and rural landscape morphologies and land covers.

Fig. 10. Diagrammatic plan of the Green Ring. The Green Ring structure of the Region showing large contiguous greenspaces beyond the Green Fingers

Source: Susanna Suvanto, Juha Oksanen, Geodeettinen laitos, Maastotietokanta, Dem ja Maanmittauslaitos.

Within the GHR's overall fragmented, smaller-sized, more complex, and irregularly shaped greenspaces, the greenspaces still maintain a close proximity and physical connectedness to other greenspaces. The GHR's smaller, individually-fragmented greenspaces exist within a larger, interconnected context (see Fig. 11).

Fig. 11. Orthophoto of GHR showing individually fragmented greenspaces within an interconnected context Within a more fragmented context of smaller-sized and irregularly-shaped greenspaces, the GHR's greenspaces still maintain a close proximity and physical connectedness to other greenspaces. This is primarily due to the Helsinki 'Green Finger' Concept

Source: Google Earth, Digital Globe 2021.

Overall, the GHR has a distinct greenspace composition of connectivity and coherence. The structural composition illustrates a distinct, continuous PUGS surrounding the outer edges of its peri-urban growth. When one considers the water spaces, the typical 'green belt' structure ensues. The GHR's 'Green Fingers' extend beyond its boundary designation to create a physical connection from the urban centre of Helsinki to the larger green belt beyond the peri-urban areas and polycentric sub-centres. This greenspace relationship creates a larger 'Green Mitten' as an extension of the 'Green Fingers' (see Fig. 12).

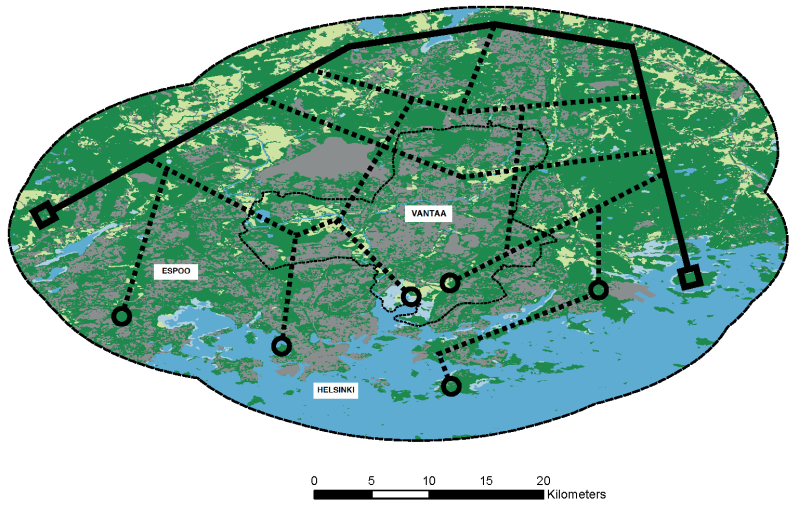

Fig. 12. The Greater Helsinki Region's 'Green Mitten.' The diagram illustrates an extension of the 'Green Fingers' into the regional landscape and existing greenbelt

Source: own work.

4.2. The Greater Helsinki Region's green structure planning and policy

The 'Green Fingers' is a simple concept used for defining the core structure of 'green'and the PUGS within the GHR. Surprisingly, it does not contain any specific policy instruments to maintain and strengthen the status of this basic structure as it essentially is a group of various municipally-managed greenspaces within a larger, conceptual spatial form (Ahern, 2013). As urbanisation increased, the need for transportation infrastructure bisected the fingers. Ring roads connecting cities and new urban developments along transportation corridors and at the periphery of the sub-centres of Vantaa and Espoo have crossed through large parcels of forest and agriculture (Joutsiniemi, 2010).

The geographical expansion of the GHR has resulted in the fragmentation and isolation of the greenspaces from the larger regional rural green areas (Söderström *et al.*, 2015; Vare and Rekola, 2007), including the 'Green Ring.' Spatial planning has not required the greenspace to be a key concept in Finland; typological limitations and unclear definitions of greenspace remain. The term 'Green Ring' is not present in any planning or policy documents nor is it prevalent in literature; it has been used only within tourism marketing material.

Finland's Land Use and Building Act by the Ministry of the Environment (2000) only encourages 'sustainable development.' As evidenced, current plans present no clear or definable policy or method to preserve the core areas of the existing public greenspace. Polycentric development patterns have proven beneficial for humans, particularly in their functional and economic basis. For example, greenspace fragmentation occurs within any urbanisation pattern. However, greenspace fragmentation in Helsinki has certain benefits to humans such as increased social interaction (leBrasseur, 2022a) and more opportunities for access (Wandl, 2017). Managing the growth of peri-urban regions is critical to maintaining the inherent benefits, functional and morphological-based, of any regional development concept.

4.3. Implications

Although most parts of the world, especially in developing countries (e.g., India, China, South America), will see significant urbanisation in emerging megacities and their larger metropolitan conurbations, the European region will continue to accommodate human development predominately through polycentric urban development (Purkarthofer, 2020; EPSON, 2017) within and among its metropolitan regions, a development arrangement which redistributes Europe's traditionally compact city forms.

The results of this study have implications for other polycentric, peri-urban regions, as well as policy towards meeting sustainable development goals through spatial planning (leBrasseur, 2022b). In a recent study of Stockholm (Sweden) greenspaces, the results indicated pathways to future polycentric development based on current green structure and land cover (Xiu *et al.*, 2016). The study focused on meeting both ecological and social requirements, key to sustainable development. Furthermore, Stockholm's City Plan (Översiktsplan för Stockholm) considers greenspaces, and how the need for ecosystem services is to be met on the basis of planning directions and strategies in the City Plan and the Environment Programme (Stockholms Stad, 2018). Stockholm's distinct polycentric urban form includes green wedges and green linkages (Schmitt *et al.*, 2015) and the policy's aim is that public urban greenspaces have protection and enhancement of biodiversity and green network

connectivity. To date (2023), such a policy to prevent urban sprawl and maintain the green structure has been mostly successful; urban densification has been the primary means for accommodating population increase (Hopkins, 2021), similar to the GHR.

Both Beijing and Mexico City are predominately monocentric but their emerging regions are separated by large green structures, thus providing a polycentric urban form at a city scale, and thus the larger regions are considered hybrid (Liu and Liu, 2018; Bautista-Hernández, 2020). In Beijing, China, greenspace fragmentation from 1998 to 2006 followed urbanisation to the north and south, resulting in an overall loss to greenspace with more complex or heterogenous and smaller patches, though several parks were developed (Li *et al.*, 2019). Importantly, the two regional greenbelts underwent fragmentation during different phases of urbanisation; this occurred even with the city's greenspace planning policies. Similarly, the Mexican government promotes compact growth, mixed land use, and polycentric urban structures. However, in Mexico City, Mexico, this policy has been ineffective (Aguilar *et al.*, 2022) as development has occurred in conservation areas at the urban periphery. Reasons for this are unknown, however, literature has noted the economic benefits of urbanisation are strong, and urban compactness is not associated with economic productivity in Mexico (Montejano *et al.*, 2019). This indicates a need for a better analysis of the relationships between urban growth, green structure, and socio-economic benefits.

Changes to urban form and urban planning policy are a multi-faceted and dynamic exchange. Yet research clearly documents the myriad of benefits greenspaces, and particularly PUGS, provide. Though the pathways to ecosystem services and sustainable development are varied and diverse, this study places PUGS and overall green structure as a component of those goals, not as a valuation tool, within urban development. Future studies can explore these unique relationships in further detail, both from an ecological and human perspective.

5. CONCLUSION

This paper has provided a complementary framework for assessing peri-urban greenspace characteristics of fragmentation within the Greater Helsinki Region. It's multi-method spatial landscape analysis presented a means to assess the morphology of the GHR's peri-urban regions and their greenspaces, particularly its overall green structure. This paper produced spatial and non-spatial information about the quantity and qualities of landscape fragmentation characteristics within the GHR. The results demonstrated notable spatial heterogeneity, edge increase,

and diversity within the GHR's greenspaces. This research clarified the spatial context and morphological characteristics of the GHR, and its greenspaces, specifically landscape fragmentation and green structure. This research's operationalisation of green structure focused on its spatial attributes, including separation and interconnectivity.

This study's conclusions follow the critical analysis of the GHR's physical and structural change over time and coalesced the many drivers and pressures of spatial landscape change and impacts such as fragmentation on the landscape, all from a distinctly spatial and morphological perspective. The morphologically polycentric GHR has some important PUGS fragmentation characteristics which place its overall greenspace spatial context into perspective: even though the GHR's Forest and Arable Land greenspaces are the two most fragmented greenspace classes, when reviewing other spatial morphological information, the GHR illustrates greenspaces which are interconnected and contiguous, indicating a green structure pattern and form to its set of peri-urban fragmented greenspaces. Furthermore, the polycentric morphology of the GHR's urban sub-centres and the 'Green Fingers' enable the 'Green Mitten' concept to spatially evolve, uniquely creating a coherent intermixed structure. This paper provides the integrated perspective required to view a landscape's green structure as an evolving regional planning entity in itself – a spatial component – not simply an approach for greenspace connectivity.

The GHR's spatially interconnected greenspaces are actively facing fragmentation pressures to meet continued human development requirements. There is currently (2022) no policy to maintain the existing structure (e.g., 'Green Fingers') of greenspace interconnectivity and coherence within the GHR. As a result of urbanisation, development adjacent to the 'Green Fingers', i.e., wedge development, is expected to continue. The evolution and integration of green structure in the GHR continues to balance between the aims of creating a compact region and that of preserving greenspace. Infill development and density offer pathways to sustainable development, but each have their physical limits. Current policy seems not equipped well to objectively manage greenspace from a regional or multi-city perspective. Helsinki and its growing region offer an opportunity to observe how it will engage in sustainable development while maintaining its strong green structure identity.

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Daniela AMORIM [*], **Ana Elisa SOUSA** [*], **Paulo ALMEIDA** [*], **Tânia GUERRA** [*]

TOURIST´S MOTIVATIONS TO VISIT THE WESTERN REGION OF PORTUGAL

Abstract. The Western Region, located in the Central Region of Portugal, has a vast and rich natural and cultural heritage allowing a wide range of tourist experiences. Consequently, the aim of this study is to analyse the tourist interests and motivations that lead tourists to visit the Western Region of mainland Portugal. In 2021, 355 individuals were surveyed through a questionnaire survey, mostly living in mainland Portugal. The results reveal that the preferences of respondents for the types of tourism they most like or would like to undergo in the Western Region are Sun and Sea Tourism, Leisure Tourism, Cultural Tourism, Adventure and Nature Tourism, and Gastronomic Tourism. This study may contribute to a better understanding of the tourists' motivations to visit the Western Region, and may be an important contribution to the tourism management entities, in order for them to enhance and/or improve their offers in this region of Portugal.
Key words: Western Region of Portugal, types of tourism, tourist offers, tourist motivations.

1. INTRODUCTION

The tourism market evolves according to tourists' needs and interests, also influenced by the socio-economic and political environment in which the society is. It highlights the importance of a destination tourist services and products in the

[*] Daniela AMORIM, Ana Elisa SOUSA, Paulo ALMEIDA, Tânia GUERRA, Polytechnic of Leiria, School of Tourism and Maritime Technology, Campus 4 – Rua do Conhecimento, nº 4, 2520-614 Peniche, Portugal; e-mails: daniela.amorim@ipleiria.pt, ana.c.sousa@ipleiria.pt, palmeida@ipleiria.pt, tania.guerra@ipleiria.pt, ORCIDs: https://orcid.org/0000-0003-0391-7554, https://orcid.org/0000-0002-0710-8829, https://orcid.org/0000-0002-4797-2128, https://orcid.org/0000-0002-7266-9374

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growth of tourism, primarily intended to meet the needs and demands of tourists (Cunha, 2013; Jiménez and Martín, 2004; Smith, 1989). The factors influencing tourism demand are closely related to the models of consumer behaviour, such as attitudes, perceptions, images and motivations, the preponderant variables in the decision making regarding the choice to visit touristic destination (Amorim *et al.*, 2019, 2020; Cooper *et al.*, 2007; López-Guzmán *et al.*, 2019; Yoo, *et al.*, 2018).

The main objective of the present study is to analyse the motivations behind tourists visiting the Western Region of Portugal and to explore its attractions and potential for both internal and external promotion. The findings of this study will enable Destination Management Organizations (DMOs), municipalities, and other tourism-related entities to formulate strategies that create more enriching and satisfying experiences for tourists. These strategies will be informed by an understanding of the region's potential and align with the interests and motivations of tourists.

To achieve this objective, the literature review will focus on exploring the predominant types of tourism in the western region, which include cultural tourism, leisure tourism, creative tourism, nature tourism, sun and sea tourism, and food tourism. Additionally, several models of tourism consumer behaviour will be examined to gain insights into demand patterns and the evolutionary trajectory of tourism from the perspective of the tourist consumer.

The sample of this study consisted of 355 individuals, mostly residents in mainland Portugal, and a questionnaire survey was applied in 2021. The data obtained was analysed and interpreted using the statistical software Statistical Package for Social Science (SPSS) version 26. It is intended that this study may contribute to a better understanding of the needs and motivations of tourists in the western region of Portugal and may be an added value for the communication and intervention action strategies of the tourism sector management entities of this Portuguese region.

2. LITERATURE REVIEW

2.1. Types of tourism and their products

Tourism development must consider the space and resources existing in the destinations. Also, tourism promotion should consider the territorial specificities, properly planned and structured according to the product-space perspective and articulated with the involvement of all public and private agents (Leiper, 1979; Mathieson and Wall, 1982).

Tourism products and offers originate various types of tourism, leading to a variety of interests and motivations by visitor and/or tourist. Oliveira (2003) defends, thus, the following tourism typology: leisure tourism, events tourism, thermal water tourism, sports tourism, religious tourism, youth tourism, social tourism, cultural tourism, ecological tourism, shopping tourism, nature and adventure tourism, food tourism, incentive tourism, tourism for the elderly, rural tourism, exchange tourism, cruise tourism, business tourism, gay tourism, health tourism, and ethnic and nostalgic tourism.

Culture is the central element in tourism and takes different forms over time and space. The tourism consumption of heritage assets, both tangible and intangible, serves as a lever for creating different types of cultural tourism (Declaration on Cultural Diversity, OECD, 2009). Cultural Tourism has been one of the tourism segments with great focus (Oliveira, 2003) considered by Guerreiro *et al.* (2014) a promising market segment, with a higher growth trend than other niches.

According to the United Nation World Tourism Organization (UNWTO, 2018), in cultural tourism, the visitor's essential motivation is to learn, discover, experience, and consume the attractions or tangible and intangible cultural products in a destination. These attractions and products encompass a diverse array of material, intellectual, spiritual, and emotional characteristics that are deeply rooted in society. They embody such elements as arts and architecture, historical and cultural heritage, culinary heritage, literature, music, creative industries and peoples with their lifestyle, value systems, beliefs and traditions. Preserving this rich heritage and its cultural practices is of the utmost importance throughout the entire process. As pertinently argued by Richards (2010), it is through culture, tourism, and leisure that it is possible do convey economic growth and enhance the image of a destination.

Leisure tourism encompasses a wide range of tourism segments and is primarily characterised by trips undertaken for the purpose of pleasure, discovering new destinations, seeking a change of environment, seeking rest and relaxation, reconnecting with friends or visiting relatives, and indulging in the beauty of landscapes while enjoying a holiday with family. This form of tourism can be pursued anywhere, and the desire to explore new attractions and landscapes consistently is the primary motivation for leisure tourists. As a rule, they select places according to the tourism product that best suits their needs (Oliveira, 2003).

Carvalho (2017) presented a cataloguing of tourist strands that integrate the type of cultural tourism, namely: heritage tourism, art tourism, ethnic tourism, literary tourism, gastronomic tourism, indigenous tourism, archaeological tourism, musical tourism, film tourism, festival tourism, historical tourism, military tourism, dark tourism, among others.

The diverse tourism segments mentioned above contribute to the development of alternative tourism destinations, fostering fresh perspectives and new opportunities for various regions. This leads to the emergence of innovative tourism

models and the rejuvenation of existing destinations, offering tourists an array of novel experiences and captivating attractions. These transformations enable tourists to actively participate in co-creating their travel experiences, as explored by Neuhofer, Buhalis, and Ladkin (2014). This interactive process of experience co-creation significantly impacts tourists' decision-making and overall satisfaction with their journeys.

Considering this, in recent years, a new form of tourism known as creative tourism has emerged, stemming from cultural tourism. This evolving trend, often referred to as the "third wave of tourism" by various authors (Carvalho, 2011; Richards, 2010; Santos *et al.*, 2012; UNESCO, 2006), builds upon the progression from beach tourism to cultural tourism. Creative tourism represents a fresh wave of tourism experiences that integrate cultural elements and actively engage tourists in participatory and creative activities.

Creative tourism is based on a growing emphasis on intangible resources (such as traditions, legends, cuisine, among others), enhancing, whenever possible, the historical areas of the regions, helping destinations to differentiate through originality, an essential factor to capture and attract tourists with increasingly demanding needs and interests in what concerns the tourist experiences they want to achieve. Novelty, surprise, excitement, and experience are crucial in tourist choice and motivations, and, therefore, higher levels of quality and satisfaction are achieved, which in turn influence the tourist loyalty towards the destination and/or experienced tourist product (Amorim *et al.*, 2019).

In addition, nature tourism has experienced remarkable growth and increasing demand, both nationally and internationally. The COVID-19 pandemic has further reinforced the appeal of this particular tourism segment as it provides individuals with the opportunity to engage with natural surroundings, seek seclusion, and relish the freedom that comes from being away from densely populated areas prone to virus transmission (Sousa and Joukes, 2022).

This tourism product, based on the immersive experience of the environment, is recognised by the World Tourism Organization (WTO) as an important, dynamic and attractive tourism segment. It can also be effectively combined with other types of tourism, such as sports tourism, business tourism, cultural tourism and rural tourism (WTO, 2002). In line with this, Wang *et al.* (2019) conducted an investigative study focusing on the determinants of tourism demand specifically within the realm of rural tourism. Their findings highlighted a range of influential factors, including natural resources, cultural heritage, accessibility, government support, and marketing efforts, which significantly shape tourists' decision-making processes and ultimately impact the overall demand for rural tourism destinations.

Over the years, many definitions of nature tourism have appeared in the literature (Valentine, 1992; Lang and O'Leary, 1997; Cunha, 2007; Bryden *et al.*, 2010; Macouin and Pierre, 2003; Turismo de Portugal, 2023; Tisdell and Wilson, 2012). According to Turismo de Portugal (2023), nature tourism activities fall within the

scope of tourist entertainment activities taking place in areas that are part of the National System of Classified Areas (SNAC). To be recognised, these areas must be approved by the Institute for Nature Conservation and Forests, I.P. (ICNF).

The National Nature Tourism Program (PNTN), which was approved by Resolução do Conselho de Ministros (RCM) no. 51/2015, on 21 July, is an integral part of the strategy for promoting nature tourism. Its main objectives include promoting and highlighting the values and potential of classified areas, as well as other areas with natural and cultural significance. Additionally, the program aims to foster the creation of innovative and sustainable tourism products and services. It also seeks to ensure integration and sustainability in various domains, namely nature conservation, local development, enhancement of the tourism offerings, diversification of tourism activities, and dissemination and enhancement of cultural heritage (Turismo de Portugal, 2021).

Nature tourism can be distinguished into two categories: soft nature tourism and hard nature tourism. The former includes lower-risk activities such as walks, excursions, hiking and wildlife watching. Hard nature tourism refers to more radical activities for the tourist, such as rafting, kayaking, hiking, climbing, among others, which require a high degree of concentration or knowledge (for example, birdwatching) (Turismo de Portugal, 2006).

In the case of hard nature consumers, they are generally young people between 20 and 35 years old, students and liberal professionals, practicing/involved in sports or activities of special interest. This type of consumer gathers information in specialised magazines, clubs/associations, and online, where they also buy activities and trips related to the Nature product. The type of accommodation where they stay is Bed and Breakfast, accommodation integrated in nature (country houses, camping...), and mountain refuges. The period when they most look for this type of tourism is spring and summer, normally up to 5 times a year. The activities they do are related to the practice of sports or special interest activities, to deepen the knowledge of nature and about environmental education.

Cunha (2007) has indicated that sun and sea tourism is also one of the types of tourism that maintains high levels of demand, continuing to have quite significant numbers of visitors and income generated. This type of tourism is present in tourist destinations that enable bathing activities on attractive beaches in a natural environment and is therefore a type of tourism that is limited only to the coastal areas of a given territory.

This type of tourism product faces several significant challenges, particularly in relation to spatial planning. These challenges manifest in the form of high levels of tourist concentration, environmental and landscape degradation, especially in coastal areas due to excessive development, pronounced seasonality, and issues of tourist overcrowding. As a consequence, the quality of tourist services can be compromised, with challenges such as precarious employment, inadequately trained human resources, and high turnover rates among staff members, among

other concerns (Cunha, 2007). In response to these challenges, continuous efforts have been made over the years to promote innovation, requalification, and reorganisation. Additionally, strategic alliances have been formed with complementary tourism products, including golf tourism, sports tourism, and nautical tourism, among others, while maintaining sun and sea tourism as the primary focus (Cunha, 2007).

Cuisine tourism has also been in the spotlight in recent years, positively influencing the competitive strength and sustainability of a destination, the local economy and regional development (UNWTO, 2017). In 2027, the Strategic Plan for Tourism advocated for cuisine as a "priority strategic asset" (Andrade-Suarez and Caamano-Franco, 2020).

This type of tourism refers to all tourism activities related to the visitor's experience with food and beverages in destinations that stand out for cuisine (UNWTO, 2012). Hall and Mitchell (2001) have argued that food tourism can include food festivals, food fairs, restaurants, farmers' markets, food fairs, visits to food-related sites, and food tours.

For Tikkanen (2007), cuisine is considered part of local culture and a tool for local economic development; furthermore, it encourages tourism in the area. According to Kivela and Crotts (2005), food tourism plays an important role in tourists' decision to revisit a place, in the destinations choice and in destination advertising. It is also one of the main factors that determine the attractiveness of a destination (Aydoğdu *et al.*, 2016).

There are also authors who argue that cuisine may not be considered an essential part of the tourist trip, but it can also lead to the satisfaction of the tourist experience and needs (Björk and Kauppinen-Räisänen, 2019), being an element that may influence the tourist when choosing a destination (Levitt *et al.*, 2019).

2.2. Factors influencing tourism demand

The field of tourism has witnessed a multitude of studies exploring the diverse range of factors that drive tourism demand (Wu *et al.*, 2017). According to the comprehensive analysis conducted by Cooper *et al.* (2007), the factors that significantly influence tourism demand are closely related to models of consumer behaviour. The dimensions of attitudes, perceptions, images, and motivations emerge as preponderant variables in the decision-making process when choosing tourist destinations to visit.

Attitudes reflect individuals' perceptions of the world, while perceptions involve the mental impressions that shape attitudes and behaviours towards products. Images encompass beliefs, ideas, and impressions associated with tourist destinations and products. Motivations are the inner needs that drive individuals to travel and initiate the demand for tourism.

Considering these dimensions, it becomes possible to gain insights into tourism consumption by:

1) Understanding consumer behaviour and decision-making processes related to tourism products, driven by needs, motivations, and decision processes.

2) Analysing the impact of promotional strategies on consumer behavior.

3) Identifying different market segments based on consumption behaviour.

4) Exploring ways for managers to enhance marketing effectiveness.

Figure 1 provides a simplified representation of the main influences affecting consumer decision-making.

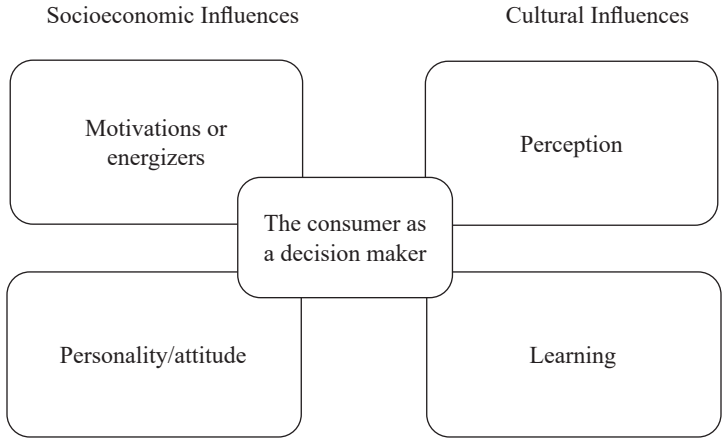


Fig. 1. Framework of consumer decision-making

Source: Copper *et al.* (2007, p. 79).

Cooper *et al.* (2007) have proposed a system for analysing the tourism consumer's decision-making process, consisting of four key elements. These elements include energisers of demand, which are the motivational forces that drive tourists to visit attractions or go on holidays. Demand enhancers involve the influence of learning processes, attitudes, and associations that shape consumers' perception of a destination or tourism product. The roles and decision-making process highlight the involvement of family members in the various stages of acquiring and finalising decisions about when, where, and how to consume the tourism product. Lastly, determinants of demand play a crucial role in filtering and shaping consumer decisions, considering economic, sociological, and psychological factors that impact travel choices.

Tourist demand is driven by various motivational factors, encompassing sociological and psychological aspects that shape individuals' norms, attitudes, culture, and perceptions. McIntosh *et al.* (1995) and Mathieson and Wall (1996) identified four categories of tourists' motivations.

1) Physical motivators encompass rest, health, sports, and pleasure, providing activities that alleviate tension.

2) Cultural motivators reflect a desire to explore other cultures, learn about local lifestyles, music, art, folklore, dance, and other cultural aspects.

3) Interpersonal motivators involve the motivation to meet new people, visit friends or relatives, and seek unique experiences, offering an escape from routine relationships and satisfying spiritual motives.

4) Status and prestige motivators revolve around personal development, education, ego elevation, and recognition from others, enhancing one's self-esteem. This category also includes personal growth through hobbies and education.

Regarding the effectors of demand, it is found that the image of a tourist destination is important for the individual because the image a tourist has is part of a general image of a tourist destination, and these two are closely interrelated. It is unlikely that if a tourist does not have a positive image about a destination, they will visit that same destination (Gunn, 1972). The presentation of the image of a tourist destination must be built on an existing image. The notion of image is closely related to the individual's behaviour and attitudes, which are established based on the image internalised by the person, which will only change if there is the acquisition of new information or experiences. Mayo (1973) has argued that even more important than the image of a place in the choice of a tourist destination is the image that the tourist brings when returning from holiday.

Regarding roles and the decision-making process, the family plays a key role in the tourist destinations choice. According to Cooper *et al.* (2007), the family exerts influences on the individual since childhood, each element has a special role, and may represent the husband/father, wife/mother, son/brother, and daughter/sister. Decision-making within the family thus has its impact on certain family members and this decision-making can be shared or led by one person, with one family member being the facilitator. The family thus functions as organised purchasing unit whose different role patterns are directed towards particular formats of obtaining tourism products.

Consumer behaviour in the tourism decision-making process is intentional and goal-oriented, with individuals making free choices in their consumption decisions. According to Cooper *et al.* (2007), who referenced Ajzen and Fishbein (1975), individuals consider the implications of their actions before deciding to engage in a particular behaviour. This decision-making process involves several stages: the emergence and recognition of a need, the level of involvement in the decision process, the identification and evaluation of alternatives, the ultimate choice, the act of purchase, and post-purchase behaviour. In the context of travel, post-purchase behaviour often involves the need for reassurance and confidence renewal, which can be addressed through guarantees, access to customer service, or seeking recommendations from those who have already experienced a similar trip.

Schmoll (1977), as cited by Cooper *et al.* (2007), presented a model that outlined four fields influencing the final travel decision. These fields include triggers to travel, personal and social determinants, external variables, and the touristic destination itself. Triggers to travel involve external stimuli such as promotional communication and recommendations. Personal and social determinants are linked to travel-related needs, desires, expectations, and perceived risks. External variables encompass factors like trust in service providers, the destination's image, acquired experiences, and practical constraints. Finally, the touristic destination's characteristics play a significant role in the decision-making process and its outcome.

In a related model, Mathieson and Wall (1982) focussed on the system of travel buying behaviour, which built upon Schmoll's model by emphasising external factors and the consumer's active information-seeking intention. However, this model overlooks key aspects such as perception, memory, personality, and information processing. It primarily takes a product-cantered perspective rather than a comprehensive consumer behavioural perspective. The model consists of five stages, as summarized in Table 1.

Table 1. Travel-buying behaviour model

First stage	Feeling the need/desire to travel	A desire to travel arises, analysing the reasons for and against that desire.
Second stage	Information and evaluation	Prospective tourists obtain information with the help of intermediaries, brochures, travel advertisements, friends, family members with experience in travel. The evaluation of this information is confronted with the economic and time constraints, as well as the evaluation of factors such as accessibility and other options.
Third Stage	Decision to travel	This stage occurs after the selection of the tourist destination, mode of travel, accommodations and activities.
Fourth Stage	Preparing for the trip and travel experience	The trip takes place after confirming reservations, approving budgets, arranging clothes and equipment.
Fifth stage	Satisfaction evaluation with the trip	The experience is evaluated as a whole, during and after the trip and the results will have an influence on future travel activities.

Source: Mathieson and Wall (1982).

These steps are influenced by four interrelated factors, namely:

1) Tourist profile: age, education, income attitudes, experience, and inner motivations;

2) Trip awareness: facilities and services of a tourist destination, considering the credibility of the source;

3) Features and characteristics of the tourist destination: attractions, and aspects of a tourist destination;

4) Travel aspects: distance, duration, and risk perception of the area visited.

Considering the fact that activities are also a fundamental link between the trip and the choice of the tourist destination, Moscardo *et al.* (1996, in Cooper *et al.*, 2007) presented a different perspective for consumer behaviour, in which the choice of the tourist destination was made according to the activities offered. These authors supported the idea that segments of people who make their trips based on activities could be linked to the activities of tourist destinations through communication strategies and product development.

2.2.1. Tourist motivation

According to Gutiérrez and Bosque (2010) there is a set of attraction factors, comprising various destination attributes that possess motivational power leading the individuals to desire travel. Considering Abraham Maslow (1970) and the most classical theory on motivation, this concept focuses on universal human needs that span one's life. Maslow's hierarchy presents five types of needs (physiological needs, safety needs, love and belonging needs, esteem needs, and self-actualization needs), with higher level needs being fulfilled once the preceding lower-level ones have been satisfied. It is at the third level, where social needs arise, that Puertas (2004) has suggested the conditions are met for tourism to become a part of an individual´s life, as a form of social and cultural attainment, and enabling access to the two upper levels of Maslow's pyramid, namely esteem and self-actualisation.

Additionally, Puertas (2004) has considered that the realisation of the tourist experience serves as a facilitator for achieving these latter two levels, and tourism motivations correspond to the answers that a tourist will give to the question "Why do I enjoy travelling?"

Undoubtedly, motivation plays a vital role in driving tourist activity (López-Guzmán *et al.*, 2019; Yoo *et al.*, 2018). Tourists embark on their journeys drawn by external forces that extend beyond the destination itself (Yoo *et al.*, 2018). Heritage, cultural and natural resources are the determining factors influencing the tourism development and attractiveness of destinations (Amorim, 2019).

Tourism managers must possess knowledge and awareness of visitors' and tourists, as well as their decision-making processes, as these factors are integral to the development of tourism in regions. Accordingly, marketing and communication strategies of destinations should be tailored to meet the needs and demands of participants, effectively motivating visitors and tourists to choose the destination (Amorim, 2019; Amorim *et al.*, 2019; Cao *et al.*, 2021; Humagain and Singleton, 2023; Kitterlin and Yoo, 2014).

3. METHODOLOGY

Our study started from the research question: What motivates and interests tourists to visit the western region of Portugal? Based on this question, the following objectives were outlined:

1) To understand the preferred types of tourism practiced in the western region of Portugal.

2) To examine the factors influencing travel decisions in Portugal and identify the primary reasons for not visiting the region.

3) To identify he most appealing activities and attractions in the region, focusing on the key points of interest in the western of Portugal.

4) To understand the region's potential for both internal and external promotion.

To address the initial question and meet the established objectives, the following hypotheses were formulated: Hypothesis 1: Sun and sea tourism, along with cultural tourism, are the preferred choices among tourists visiting the western region; Hypothesis 2: The lack of time is the predominant reason cited by tourists for not visiting the western region, despite their interest in exploring the region; Hypothesis 3: In addition to sun and sea tourism, cuisine emerges as a tourism offering with significant potential in the western region; Hypothesis 4: The western region demonstrates substantial potential for promoting integrated activities in creative tourism.

By investigating these hypotheses, we aim to gain valuable insights into the motivations and interests of tourists visiting the western region of Portugal, thus contributing to a deeper understanding of its tourism dynamics.

The methodology employed in this study is quantitative, as it aims to test the formulated hypotheses using structured and statistical quantitative data.

To gather data for this study, a questionnaire survey was applied from January to April 2021. The survey was distributed online, through social networks, and email. A non-probability convenience sample was used, which involved selecting individuals from the population who were easily accessible and willing to answer the questionnaire. The structure of the questionnaire was based on the literature review, as well as on the formulated research question and relevant constructs identified in the literature review. A mixed questionnaire was chosen, which includes open-ended, closed-ended and multiple-choice questions.

This approach enabled a comprehensive exploration of the research topic, enabling respondents to provide qualitative insights while also facilitating quantitative analysis of the collected data.

The initial version of the research instrument underwent analysis by four higher education teachers. Additionally, it was tested with two individuals from the same respondent universe as the study. The purpose of this testing phase was to identify any issues, collect feedback, and address any challenges encountered during the completion of the instrument.

Based on the suggestions and feedback received, necessary changes were made to refine the questionnaire. This iterative process ensured that the instrument was improved and tailored to effectively capture the required data from the respondents.

Once all questionnaires were collected, the data was analysed and interpreted using the Statistical Package for Social Science (SPSS) version 26. A descriptive analysis of the data was conducted, providing an overview and summary of the collected information.

Regarding the study's focus on the western region, here is a brief background: The region is part of the statistical territorial unit of level III (NUTS III), and is situated within the Central Region of Portugal. It encompasses the northern part of the Lisbon district and the southern part of the Leiria district. Geographically, the region spans an area of 2,486 square kilometres and borders the Lisbon Metropolitan Area to the south, the Lezíria do Tejo to the east, the Leiria region to the north, and the Atlantic Ocean to the west.

The region is widely recognised for its diverse natural and cultural attractions, making it an appealing destination for tourists. It boasts picturesque mountains and vineyards, offering scenic landscapes and opportunities for wine tourism. The region's stunning cliffs and vibrant blue sea create an ideal setting for nature-based and sun-sea activities. Moreover, the region is home to golf courses, castles, theme parks, and faience, adding to its allure and attracting a wide range of visitors. The rich cultural and natural heritage of the western region enables the creation of customised tourist itineraries that cater to the preferences of tourists. With such a variety of activities and attractions available, tourists can engage in different experiences and explore the region's unique offerings. This diversity further enhances the appeal of the region as a sought-after destination for travellers. (Turismo de Portugal, 2019).

The western region is highly recognised for its abundant natural resources, which include beaches, mountains, cliffs, and lagoons. In addition to its natural landscapes, the region boasts a rich cultural and historical heritage, with notable landmarks such as castles, churches, convents, and monasteries that contribute to its unique character.

The region also takes pride in preserving its socio-cultural traditions, and historical heritage exemplified through folkloric ranches, thematic events, festivals, and local celebrations. Moreover, it is known for its agricultural products, such as Alcobaça apple, rock pear, wines, and Ginginha de Óbidos (Região Oeste, 2022). This region is composed of 12 municipalities spanning the districts of Lisbon and Leiria. These municipalities are Alcobaça, Alenquer, Arruda dos Vinhos, Bombarral, Cadaval, Caldas da Rainha, Lourinhã, Nazaré, Óbidos, Peniche, Sobral de Monte Agraço, and Torres Vedras.

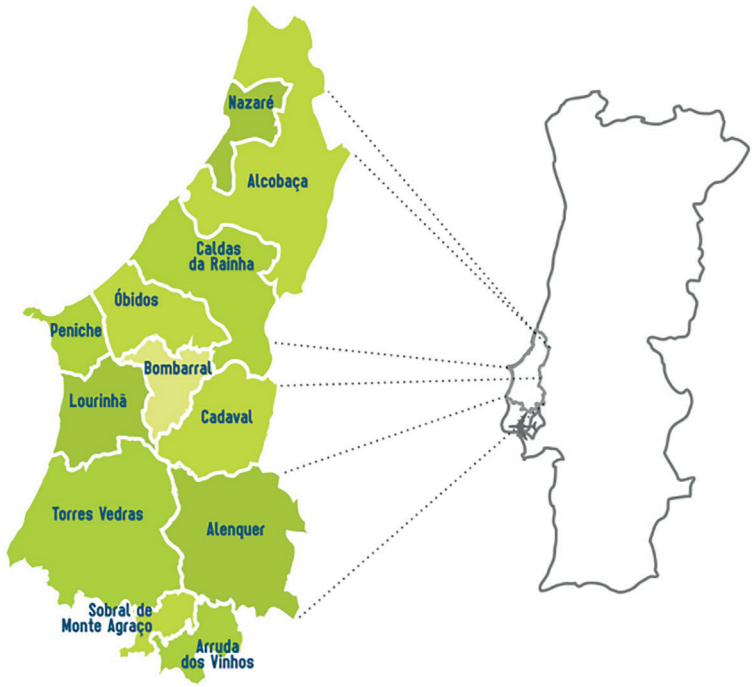


Fig. 2. Map of West region
Source: multisector.pt.

4. RESULTS AND DISCUSSION

This section presents the findings of the study on the motivations and interests of tourists visiting the western region of mainland Portugal. According to Table 2, the sample of this study consisted of 355 individuals, 24% male and 76% female. Most of the respondents (63.7%) were married/living together and aged between 31 and 50. Regarding their education, 40.5% had a degree and 34.3% completed secondary education. As for the monthly household income, most individuals have between less than 1000 € and 2000 €.

The main motivations for travelling within the country were leisure (68.2%), family (17%), and work (9.1%), as shown in Figure 3. Also McIntosh *et al.* (1995) and Mathieson and Wall (1996) identified leisure as one of the main motivations for tourists to travel, as this way people could rest and practice activities that allowed them to reduce tension.

Table 2. Characterisation of the sample

Variables	Options	Absolut frequency (n)	Relative frequency (%)
Gender	Male	85	24
	Female	270	76
Marital Status	Single	98	27.6
	Married/ Living together	226	63.7
	Divorced	25	7
	Widowed	6	1.7
Age	Under 20	10	2.8
	21-30	56	15.8
	31-40	110	31.1
	41-50	99	28
	51-60	51	14.4
	Over 60	28	7.9
Academic Qualifications	Basic School	18	5.1
	Secondary School	122	34.3
	Undergraduation	16	4.5
	Graduation	144	40.5
	Master`s	47	13.3
	Ph.D.	8	2.3
Monthly Household Income	Under 1000€	79	22.1
	1,001−1,500 €	94	26.4
	1,501−2,000 €	82	23.2
	2,001−2,500 €	42	11.7
	2,501−3,000 €	19	5.4
	3,001−3,500 €	15	4.3
	3,501−4,000 €	7	2
	Over 4,000€	17	4.9

Source: own work.

The survey results indicate that the individuals surveyed expressed a strong preference for certain types of tourism in the western region of mainland Portugal. The most favoured types of tourism among the respondents were beach tourism (77.8%), leisure tourism was the second most popular choice (64.8%). Cultural tourism also ranked high (58.2%), and adventure and nature tourism garnered significant attention as well (56.3%). The least preferred types of tourism among the respondents were black tourism (0.6%), senior tourism (0.9%), industrial tourism

(1.4%), and religious tourism (6.8%), as shown in Fig. 4. These findings provide insights into the specific tourism preferences of the surveyed individuals, where resting, enjoying the sun and sea, contact with culture and exploring nature were the respondents' main motivations.

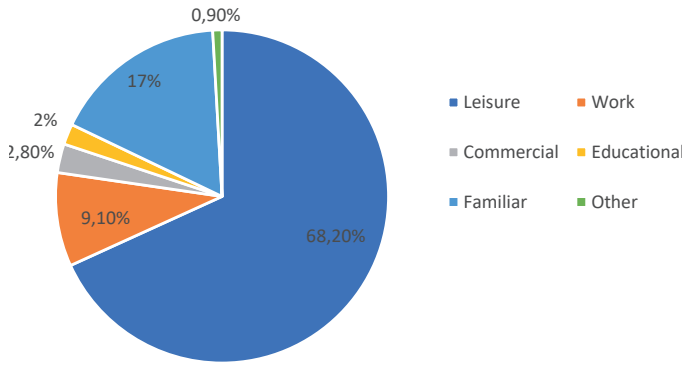


Fig. 3. Factors responsible for trips within Portugal

Source: own work.

This data also reveals that the sample of this study aligns with two of the four categories of tourists' motivations proposed by McIntosh *et al.* (1995) and Mathieson and Wall (1996), namely: physical motivators, which encompass activities aimed at resting the body and mind, addressing health concerns, engaging in sports, and seeking pleasure as a means to reduce tension; and cultural motivators, which reflect the desire to explore and learn about other cultures, local lifestyles, music, art, folklore, dance, and various cultural aspects (McIntosh *et al.*, 1995; Mathieson and Wall, 1996).

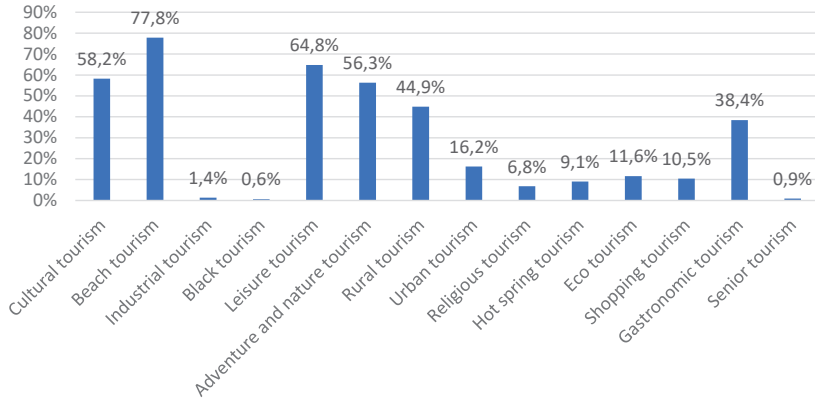


Fig. 4. What type of tourism would you like to practice in the western region

Source: own work.

The western region has already been visited by most of the respondents (94.5%). Those who had not done so indicated as the main reasons the lack of time (33%) and the lack of tourist offers (itineraries, activity programs, among others) (31.6%). Figure 5 shows that the lack of interest in visiting the region is not a predominant reason, but it is important to invest in attractions to attract tourists to the region and disseminate more information about it. This data suggests that there may be some weaknesses in the communication strategies, and as Moscardo *et al.* (1996, in Cooper *et al.*, 2007) argued that consumer behaviour in the choice of a tourist destination was influenced according to the activities offered, being the communication and product development strategies crucial in the decision-making process.

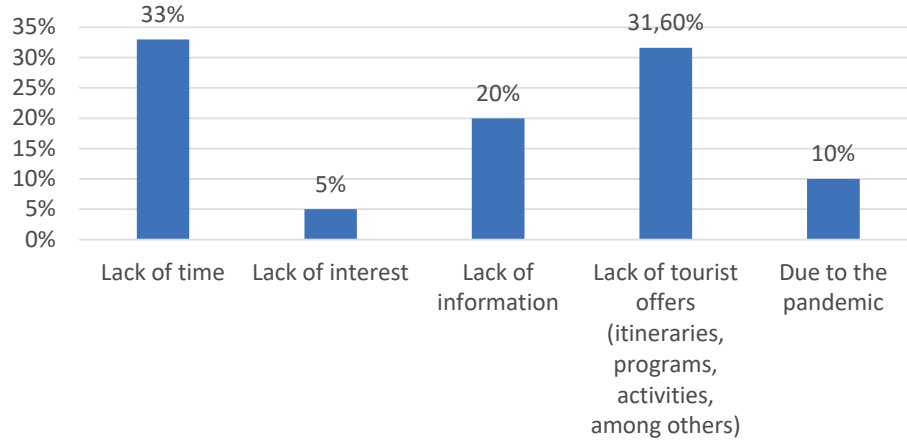


Fig. 5. Reasons for not visiting the western region

Source: own work.

The previous premise was confirmed when the respondents were asked directly about their interest in visiting the western region, where it could be seen that more than half (59.1%) said they were interested and 40.9% said they could be, and none of the respondents said they were not interested in getting to know the region. With these results one can induce that the region gathers tourist products and offers that motivate the displacement of many visitors and tourists to the region, considered by the Tourism of Portugal and by many who visit it one of the most fascinating and diversified tourist destinations of the Centre of Portugal.

According to Fig. 6, the most popular attractions in the western region are the beaches (85.7%), the fauna and flora (61.9%), the mountains (57.1%), the caves (47.6%), and the gastronomy (42.9%). In contrast, the region is less known for its fishing (4.8%), its winemaking (9.5%), and the preparation of food products such as honey, cheese, jams (19.2%), etc. There were also 4.8% of those who said they

did not know at all about the attributes of the region. This data may suggest that it is crucial to invest in the promotion and dissemination of the western region's attractions, also reflected in the results obtained according to Fig. 6, also revealing that this region is known, essentially and mostly, for its most visible natural elements, such as its beaches.

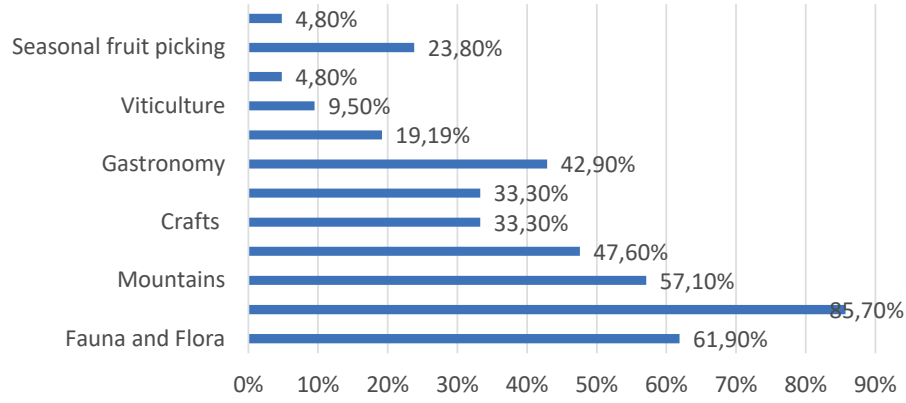
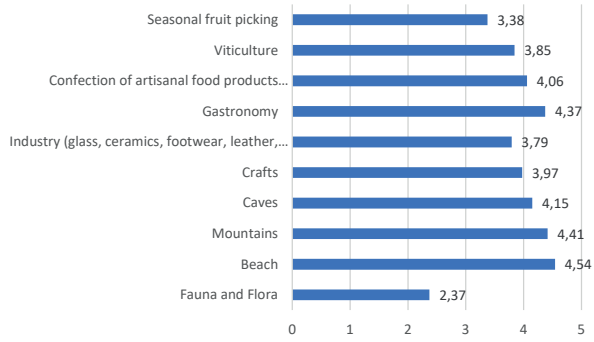


Fig. 6. Attractions you know in the western region

Source: own work.

Considering Fig. 7, the most desired tourist offerings in the western region, as indicated by the respondents, are the beach (4.54), mountains (4.41), cuisine (4.37), and caves (4.15). These are also the most well-known offerings. However, it is important to shed light on the remaining tourist offerings that the region has, which may not be as promoted and thus still unfamiliar to the majority of respondents. Considering that tourists often prioritise personalised and experiential visits to destinations (Borlido and Kastenholz, 2021), this calls for a reflection on the need for increased investment in communication and dissemination strategies in the region.

As Cooper *et al.* (2007) have argued, the decision-making process of the tourism consumer is integrated into a system consisting of four basic elements: demand energisers, demand effectors, the roles and process of decision making, and the determinants of demand. Furthermore, the choices made by tourists when selecting destinations are influenced by both their personal preferences and the characteristics of the destination itself (Yoo *et al.*, 2018). These results highlight the importance for tourism agents and stakeholders to focus on demand energisers, which are the motivational forces that drive tourists to visit attractions or go on holidays, and the demand effectors, which shape the consumer's perception through learning processes, attitudes, and associations influenced by promotional messages and information. These two interrelated factors are essential and influence the increase or decrease of consumer attitudes.



Scale: 1 – I would not like it at all; 5 – I would like it a lot

Fig. 7. Tourist attractions I would like to explore in the western region (average)

Source: own work.

87% of the respondents have already stayed overnight in the western region and 72.4% said they had access to information about the region. However, 27.6% of respondents said they had never received information about the region, which suggests the need for more information about the region, which could be an attraction to interest more tourists in the region.

As shown in Fig. 8, the activities that respondents would most like to experience in the region are rural tourism farms (4.35), walking trails (4.31), tasting typical food products (4.30), and spas (4.21). The preference for these activities corresponds to the type of tourism that respondents also revealed they prefer. The least appealing activities were hang gliding (2.99) and cycling (3.16), i.e., activities that involve more physical exercise and adventure. However, the majority of the individuals surveyed were willing to try most of the activities.

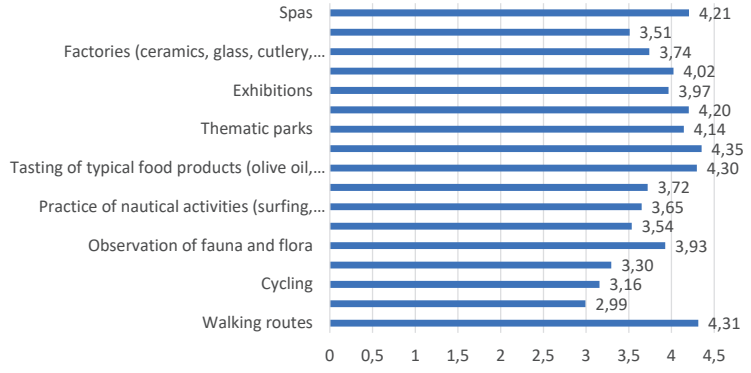


Fig. 8. Activities I would like to do in the western region (average)

Source: own work.

Figure 9 reveals that more than half of the respondents (56.2%) if they participated in a tourist itinerary they would prefer to travel by car, followed by public transport (20.9%), and walking (12.7%). These results give an indication to the tourism agents, such as, for example, travel agencies that conduct this type of program and tourist offer, that the planning of tourist itineraries may consider this travel preference indicated by the study sample.

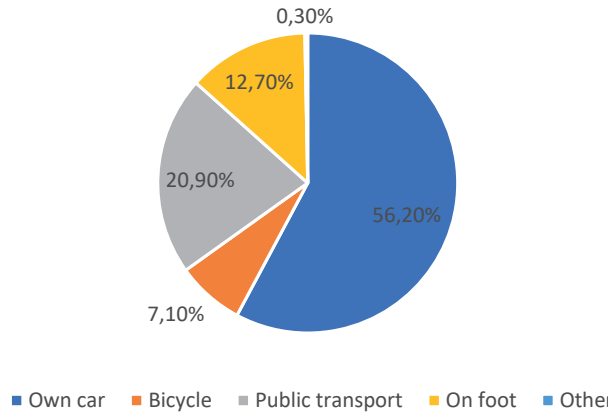


Fig. 9. How would you like to get around if you participated in a tourist itinerary

Source: own work.

5. CONCLUSIONS

The western region of Portugal is rich in natural and cultural resources, making it essential for tourism managers to identify the main motivations of tourists to strategically promote the various attractions of the destination.

The study results have confirmed three out of the four research hypotheses formulated for this study. In hypothesis 1, which suggested that tourists in the region preferred sun and sea tourism and cultural tourism, was confirmed. The survey results revealed that the highest percentages were indeed for sun and sea tourism (77.8%) and cultural tourism (58.2%). Additionally, leisure tourism (64.8%), and adventure and nature tourism (56.3%) were also preferred by the respondents. Rural tourism (44.9%) and food tourism (38.4%) were also highlighted as significant preferences among the respondents.

Hypothesis 2, proposing that the main reason for tourists not visiting the western region was a lack of time despite their interest, was not confirmed. Instead, the data indicated that the main reasons for not visiting the region were attributed to a lack of

tourist offers (31.6%), and a lack of information (20%). These findings suggest the need for tourism managers to reconsider their communication and marketing strategies while also enhancing the attractiveness of their tourism offerings to generate greater motivation and interest among tourists capturing their visit and/or stay.

Hypothesis 3, which stated that one of the touristic offers in the western region with a lot of potential and tourist demand, besides tourism sun and sea, would be cuisine, was confirmed. Cuisine emerged as a preferred demand among tourists, following beach tourism, with 42.9% of respondents expressing their interest.

Hypothesis 4, proposing that the region has a strong potential for promoting integrated activities in creative tourism, was confirmed. The survey revealed that the activities with the highest interest among respondents were visits to crafts and handicrafts, picking of seasonal fruit, and participating in the preparation of handmade food products. These findings suggest that creative tourism has potential in the tourism development in the western region. The data obtained and the touristic activities indicated are integrated in creative tourism practices. This data can constitute important indicators for tourism managers to explore the practices of creative tourism and, thus, redefine their lines of action in the products promotion and tourist offers that are under their responsibility. In summary, the study's findings highlight the main motivations of the surveyed individuals in the region, with preferences for sun and sea tourism (77.8%), leisure tourism (64.8%), cultural tourism (58.2%), adventure and nature tourism (56.3%), and food tourism (38.4%).

According to McIntosh *et al.* (1995) and Mathieson and Wall (1996) tourists' motivations can be categorised into four main categories: physical motivators, cultural motivators, interpersonal motivators and status and prestige. In this research, the most prominent motivational factors (energisers of demand, Cooper *et al.*, 2007) are physical motivators, which encompass the desire to rest the body and mind, engage in health-related activities, participate in sports, and seek pleasure. Cultural motivators, though, revolve around the curiosity to explore and understand the cultural aspects of the region.

These findings underscore the significance of cultural tourism, and creative and experiential tourism, where visitors interact and engage with the social environment of the destination, leading to unique and authentic experiences (Amorim, 2019; Campos *et al*., 2018; Long and Morpeth, 2016). This information is crucial for mayors and tourism agents in order to invest in and enhance tourism offerings in these specific areas.

From a theoretical perspective, the implications of this research affirm that motivation is a key driving force behind tourism activity (López-Guzmán *et al.*, 2019; Yoo *et al.*, 2018). Tourists are attracted to destinations by external forces (Yoo *et al.*, 2018), and the attractions of a destination are pivotal factors in its tourism development and attractiveness (Amorim, 2019, 2020).

For tourism managers, it is vital to understand the participants' tourism and recognise the essential role of decision-making processes. The marketing strategy must consider the participants' needs and demands (Amorim, 2019; Humagain and Sin-

gleton, 2023; Kitterlin and Yoo, 2014). A well-defined plan based on touristic motivations can also influence the motivation to revisit the same destination or explore neighbouring destinations in order to continue to achieve satisfying experiences, thus contributing to touristic loyalty (Amorim *et al.*, 2019; Cao *et al.*, 2021).

The practical implications of the research are related to the contribution to a better understanding of tourists' interests and motivations to visit the western region. This knowledge provides added value for tourism management entities, enabling them to improve and enhance their tourism products while recognising the importance of effective communication strategies. Therefore, by utilising the research findings, these entities can create enriching tourism experiences that capitalise on the region's potential and align with the interests and motivations of tourists, ultimately attracting more visitors.

This study has some limitations that should be acknowledge. Firstly, considering the nature of the research, it focused solely on the western region of Portugal, which has its own unique characteristics and attractions. Therefore, the findings may not be generalisable to other regions or destinations.

Additionally, the sample size could have been larger, but it was constrained due to the data collection period coinciding with the COVID-19 pandemic. The pandemic likely had an impact on the number of responses obtained, potentially limiting the representativeness of the sample.

Furthermore, as with any survey-based research, there is a possibility of response bias or self-selection bias. The respondents who chose to participate in the study may not fully represent the entire population of tourists visiting the region.

It is important to consider these limitations when interpreting the results of the study and to exercise caution in generalising the findings beyond the specific context of this region of Portugal. Future research could aim for larger and more diverse samples, encompassing multiple regions, to provide a more comprehensive understanding of tourists' motivations and interests in Portugal also considering differences of tourists living in large cities compared to those living in rural areas.

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Anton MICHÁLEK *

INCOME INEQUALITIES AND POVERTY IN SLOVAKIA: DEVELOPMENT AND CHANGES

Abstract. Slovakia is a suitable object for the study of income inequalities. The dynamic development of the country in recent years has significantly changed the social situation of its inhabitants. This development made visible the already considerable inequalities of income and wealth at the regional level (rich West and poor East), between the city and the countryside (richer cities and poorer lagging countryside), but also among the considerably wealthy elite and marginalised populations. This contribution has three objectives. The first is to capture the development of income inequality and poverty in Slovakia, the second is to capture the distribution of income at different geographic scales, and the third is to identify low-income regions.
Key words: income inequalities, at risk of poverty, income profile of regional societies.

1. INTRODUCTION

Income is an important phenomenon that is currently significantly affecting several spheres of the life of the individual and society, particularly the level of income inequality. Motivation through income is the driving force of social development or decline. Income inequality should not be too high, because extreme and unfair income inequality causes dissatisfaction, frustrations, and various forms of deprivation among the population. However, it should not be very low either, because an "egalitarian" reward system (income egalitarianism) is demotivating.

* Anton MICHÁLEK, Institute of Geography of the Slovak Academy of Sciences, Bratislava, Slovakia; e-mail: geogami@savba.sk, ORCID: https://orcid.org/0000-0002-1894-155X

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The combination of these two measures (level and inequality of income) differs between countries; in any case, a very low level of income and its high inequality are pessimistic, undesirable, and socially unacceptable in the long term. In the historical context, a prime example of this state was the situation in the socialist countries of the former Eastern bloc (Central and Eastern European countries) before 1989. Very low income together with a very low level of income inequality was typical for the majority of their populations (Michálek and Výbošťok, 2019). The situation was different in countries with a social model in which income egalitarianism at a higher level of income, together with the benefits of full social security, created motivational assumptions and pointed to the efficiency of, for example, the Scandinavian model of the social state. While little income inequality sometimes produces "the poverty of society," very high levels of income inequality tend to produce poverty "in" society.

This contribution pursues several objectives: it captures in detail the level and development of income and income inequality in Slovakia over the past 17 years (2004–2020), because relevant longitudinal data exists. It tracks the differentiation of income inequalities with the help of the three relevant and most used measures of income inequality. Significant attention is devoted to the development, level, and depth of poverty to determine the degree of the risk of poverty or social exclusion, the degree of the risk of income poverty, and its differences from the aspect of selected population structures, households, and degree of urbanisation. The differentiation of poverty is monitored using the eight most significant and widely used measures of poverty. A very important part of the contribution is the monitoring of income, income inequality, and poverty at all spatial levels, from regional to local. This study monitors income inequality and poverty at the level of eight regions of Slovakia. Income profiles of regional societies were created at the spatial level of 49 functional urban regions (FUR). These represent a rigorously defined reference framework for the spatial organisation of the country. Significantly differentiated income levels were monitored at the local level in 2,927 municipalities in Slovakia. All analyses and results led to a relatively detailed picture of income distribution, quantification of income inequality, and poverty in Slovakia.

2. INCOME AND POVERTY RESEARCH IN THE LITERATURE

In the former socialist states of Central and Eastern Europe, the topics of income inequality and poverty were taboo until 1990. Since significant income inequalities and poverty "did not officially exist" in most of these countries, there were no data based on which the phenomena could be investigated. The situation changed only in 2004, after the admission of eight post-socialist countries to the EU. New-

ly acceded countries adopted common statistics for various social and economic development areas. The primary source for the income and poverty analyses was the EU SILC sample survey (EU Statistics on Income and Living Conditions). Moreover, the EU SILC database has become the main source for income and poverty analyses in this paper. With the help of longitudinal income data, it is possible to identify changes, dynamics, and trends in the development of incomes and income inequalities, as well as movements in the structure of incomes, income, and social groups. Longitudinal poverty data can be used to identify cycles of poverty, time profiles of poverty, risk groups, vulnerable populations, quantify changes in stratification, depth and severity of poverty, as well as other significant temporal aspects of poverty.

The advantage of older EU member countries is that they have longer EU SILC time series and other data sources with which they can analyse and investigate various aspects and connections of income and poverty in their countries and regions. Based on the level and development of income inequalities in Denmark (1980−1995), Pedersen and Smith (1998) reported that income was very evenly distributed throughout the period. They used the time series of data to examine whether low income was mainly a short-term or long-term problem of the identified vulnerable population groups. Muffels *et al.* (2000) analysed and compared the situation in Germany, the Netherlands and the United Kingdom based on longitudinal data on income and poverty. Using the Gini coefficient and the inequality of income distribution S80/S20 and S90/S10, they examined the differences between countries in income inequality before and after social transfers. Based on the analysis of the duration of poverty, they identified four "temporal" poverty profiles and estimated the probability of belonging to each of the poverty profiles using multinominal regression models. Piketty and Saez (2003) focused their attention on the top earners, examining their development and changes in the USA over the long period of 1913−1998. They found that the top earners changed significantly over almost a century and that crises, recessions, wars, and other turning events significantly impacted the highest incomes or their distribution in society. Gray *et al.* (2004), examining household incomes in Canada from 1991 to 1997 found that while household income inequalities between provinces were insignificant, within-province household income inequalities were significant. Förster *et al.* (2005) reported that although national-level surveys contributed significantly to understanding the dynamics of the income distribution, they simultaneously masked differences in the level of income inequality within a country. Ezcurra *et al.* (2007), who focused on the distribution of income inequality between EU regions (in the years 1993−2000), found that despite significant differences in the level of inequality between regions, the process of regional income convergence prevailed during the observed period. Using time-based data, Dorling and Pritchard (2010) found that the poverty level in Britain changed much less than they expected. Changes in the development of poverty of selected demographic

groups in the period after the financial crisis are pointed out by the ASPE report (2013), which states that poverty increased in most demographic groups after the crisis (2008). Duiella and Turrini (2014) noted post-crisis increases in poverty mainly in connection with severe material deprivation and a low level of work intensity, especially in the countries most affected by the crisis (Greece, Spain, Ireland and Italy). Based on spatial decomposition, Paredes *et al.* (2014) reported that high and persistent income inequality in Chile (for 1992 and 2009) was largely the result of geographic heterogeneity of inequality. An interesting use of longitudinal data on poverty can also be found in the work of Chaudry *et al.* (2016), who examined the impact of social networks on the development of poverty rates in at-risk populations in the USA. They found that government programmes' impact on reducing the poverty rate was particularly significant between 1967 and 2012. Interesting results were found in the work of the Joseph Rowntree Foundation (JRF, 2017), which reported that changes in benefits and tax credits for working-age families reduced household incomes with low incomes, high housing costs have significantly reduced the incomes of the poor, and rising inflation has been higher for people with lower incomes than for higher earners. The report also found that most low-income people had no savings, were not building up enough retirement income, and that the proportion of working-age residents buying their own homes was falling. The contribution of Francis-Devine *et al.* (2019) provides information on long-term trends in income levels and poverty rates in the UK. The data structure allowed them to track overall trends for the entire population and by age, economic activity, and region. Turečková (2015) investigated income inequality in 11 countries of Central and Eastern Europe. Based on the determination of income inequality, she performed an analysis of the development of income inequality, including a subsequent interregional comparison. She was able to map changes in income inequality using the alternative method of non-weighted average absolute deviation.

3. METHODS

Income inequality refers to the unequal distribution of household or individual incomes within the entire society. It is often expressed as a percentage of income in proportion to a percentage of the population. The number of methods for measuring income inequality and poverty is ever-expanding. Analyses have focused on standard indicators and measures of income inequality and poverty research (e.g., Gini coefficient, the inequality of income distribution S80/S20, the rate of risk of poverty or social exclusion, the rate of severe material deprivation), but also on less frequent (specific) indicators of their measurements (e.g., the Palma ratio,

the rate of poverty risk anchored in time, the rate of poverty risk according to the degree of urbanization, the relative decline of the median income in the risk of poverty, and dispersion around the poverty risk line).

Among the most frequently used and most telling indicators of income inequality are the Gini coefficient, the inequality of income distribution S80/S20, and the Palma index. ***The Gini coefficient (Gk)*** is one of the most well-known indicators of income inequality, which considers the income of the entire society. Gk expresses the relationship of the cumulative shares of the population divided by the amount of equivalent disposable income to the cumulative shares of their total equivalent disposable income. Theoretically, it can take on values from 0 to 1, or from 0% to 100% in percentage terms. If there was absolute income equality in society, the coefficient would take on the value of 0%. Conversely, if all income in a company belonged to only one person, the coefficient would have the value of 100%. A higher coefficient indicates greater income inequality. ***Income quintile share ratio S80/S20 (ISR-80)*** expresses the ratio/share of the amount of equivalent disposable income of 20% of the population with the highest incomes (upper quintile) and the amount of equivalent disposable income of 20% of the population with the lowest incomes (lower quintile). It can theoretically take on values from 1 to infinity, and the higher its value, the higher the total income of the richest 20% of people in society relative to the total income of the poorest 20%. ***Income share ratio S10/S40 (Palma ratio),*** or the inequality of income distribution S10/S40 (hereinafter referred to as ISR-10), is defined as the ratio of the share of the richest 10% of the population in the gross national income divided by the share of the poorest 40% (Cobham and Sumner, 2013). It builds on the work of a Chilean economist Gabriel Palma, who found that middle-class incomes almost always represent roughly half of the gross national income, while the other half is shared between the richest 10% and the poorest 40%. The ratio/share of these two income groups is what differs significantly in individual countries (Palma, 2011). The Palma ratio solves the excessive sensitivity of Gk to changes in the middle of the distribution and insensitivity to changes in the upper and lower parts. More precisely, it reflects the economic impact of income inequality on society as a whole. Palma has suggested that distributional politics is mainly about the struggle between the rich and the poor and on whose side the middle class is.

The contribution is based on the definition of poverty for developed countries, where the population whose disposable income is below the poverty risk threshold (less than 60 percent of the median disposable income of the country) is considered poor. In the article, social exclusion is understood as social disadvantage and relegation to the margins of society. Social exclusion is the process in which individuals are blocked from various rights, opportunities, and resources that are normally available to members of a different group, and which are fundamental to social integration and observance of human rights within that particular group.

People at risk of poverty or social exclusion. The indicator of the rate of risk of poverty or social exclusion (AROPE) is the main indicator for monitoring the EU 2030 goal in the area of poverty and social exclusion. In addition to the concept of income poverty, the indicator considers two other dimensions: material and social deprivation and exclusion from the labour market. This aggregate poverty indicator is based on a combination of three sub-indicators: the rate of risk of income poverty (RIP), the rate of severe material and social deprivation, and the rate of very low work intensity. The RIP rate represents the share of persons (in percentages) in the total population whose equivalent disposable income is below the poverty risk threshold. The poverty risk threshold is set as 60% of the median national equivalent disposable income. The rate of severe material and social deprivation expresses the share of the population (in percentages) that faces a forced shortage in at least four items of the list of nine items of material and social need (Statistical Office of the Slovak Republic, 2022a). The rate of very low work intensity expresses the share of all persons aged 0–64 living in households in which members of working age worked less than 20% of their annual work potential during the previous year. The AROPE indicator is defined as the number of people who are at risk of income poverty and/or are severely materially and socially depressed and/or live in a household with very low work intensity. The AROPE rate is expressed as the proportion of people at risk of poverty or social exclusion.

At-risk-of-poverty rate by poverty threshold. Of the three dimensions of AROPE, the most people in Slovakia are at risk of the so-called income poverty (RIP). This type of poverty mainly concerns unemployed, multiple or incomplete households, and people with a risky socio-demographic profile. These are residents in households with incomes below the national poverty line. ***Severe material deprivation rate.*** The rate of severe material deprivation (SMD) expresses the share of the population (in percentage) that faces a forced shortage in at least four of the nine deprivation items belonging to the dimension of financial burden and ownership of durable goods. ***Very low work intensity rate.*** The rate of low work intensity (LWI) expresses the share of persons who live in households with very low work intensity (less than 20%) among the population aged 0–59. The work intensity of the household represents the ratio between the number of months that all household members of working age worked during the income reference period and the total number of months that could theoretically be worked by these household members. The definition of working age refers to persons aged 18–59, excluding persons who are students aged 18–24.

At-risk-of-poverty rate anchored at a fixed moment in time (2008). The rate of poverty risk anchored in time (RPT) for the given year t-2008 is the share of persons whose equivalent disposable income that year was below the poverty risk threshold, calculated in the standard way for the earlier year t−3 and then overestimated by inflation. ***At-risk-of-poverty rate by degree of urbanization.*** The rate of risk of poverty according to the degree of urbanisation (RPdU) expresses the share

of persons at risk of poverty who live in households in the environment of cities, suburbs, and rural areas. ***Relative median at-risk-of-poverty gap.*** The relative drop in median income at risk of poverty (MRPG) expresses the degree of severity/depth of poverty, which means the extent to which people below the poverty line are poor. It represents the difference between the median equivalent disposable income of persons below the poverty risk threshold and the poverty threshold itself, expressed as a percentage. This indicator can be considered a direct indicator of the severity of poverty—that is, the fall of the population's income below the poverty line. It compares the median income of people below the poverty line with the at-risk-of-poverty line. The further below the poverty line this value is, the greater the depth of poverty and the more difficult it is for people to get out of the risk of poverty. The MRPG determines how poor the people below the poverty line really are. Thus, the MRPG determines the intensity of poverty. ***Dispersion around the at-risk-of-poverty threshold.*** The dispersion around the risk of poverty line (DRP) is another very important direct indicator of the severity of poverty. It expresses the share of persons (in percentage) in the total population whose equivalent disposable income is below the line of risk of poverty, which is set as 40%, 50%, and 70% of the national median equivalent disposable income (ŠÚ SR, 2022a).

In addition to the mentioned standard and specific indicators, selected methods (decomposition, stratification, spatial analysis) are also used to monitor structural characteristics and the horizontal (spatial) and vertical (hierarchical) stratification of income and poverty in Slovakia. Decomposition represents an important partial method for investigating the differentiated level of income and poverty. Its main contribution lies in the fact that it can penetrate into their structural characteristics—that is, quantify their level according to various signs. With its help, it is possible to identify at-risk and vulnerable population groups. In this sense, decomposition represents a suitable and desirable complement to the traditional analyses of income inequality and poverty research. Another important method and specific type of measurement for defining income inequalities and poverty is income stratification. Conceptually and technically, it is a relatively more complex measurement of the stratification of the population according to income. There are several ways to define income stratification that include criteria of a socio-economic nature (e.g., ownership, property, income, standard of living, and housing) to reveal inequalities and stratification of incomes, what main income groups (layers) the population consists of and their ratio. The basis for the creation of a system of income stratification of the population is the determination of the criteria/parameters of wealth (e.g., property, salary, and income) and indicators (averages, ratios, and indices) with the help of which individual layers will be defined. The fundamental question on the basis of which we can stratify regional societies is the choice of criteria, or the determination of parameters and their measurement. The third important partial method for researching the level of income and poverty are spatial analyses, which provide significant information

about the differentiated level of income, their inequalities, and poverty at different geographical scales. They can determine where, in which territories, regions, or localities the mentioned phenomena are concentrated, as well as which groups are most threatened by them. Using the standard and specific measures and the selected methods (decomposition, stratification, spatial analysis) has made it possible to monitor all significant aspects of income inequality and poverty in Slovakia.

4. RESULTS

4.1. Development of income inequalities in Slovakia

In Slovakia, the Gk value was only 21.8% in 2020, up to 8.3 p.p. lower than the EU value. The highest Gk value in Slovakia was reached in 2005: 28.1%. The average value of Gk for the entire monitored period (2004–2020) was 24.2%. Figure 1 shows that the Gk curve fluctuated considerably, which was a consequence of several dynamic changes in the economy, but also in the area of social policy. While before the financial crisis (except for 2005) Gk values fell to a value of 23.7%, in the years after the financial crisis up to 2013 they rose to 26.1%. From 2015, the values started to fall again, while in 2017 and 2019, the lowest values appeared, exactly 20.9%.

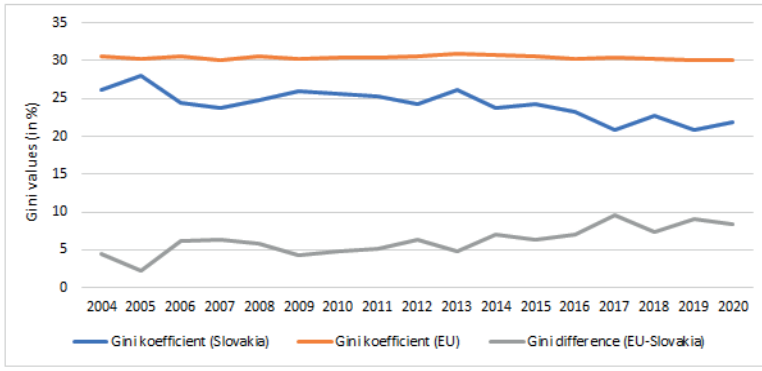

Fig. 1. Development of the Gini coefficient in the EU and Slovakia in the years 2004–2020
Source: own work based on Statistical Office of the Slovak Republic (2022b), Eurostat (2022).

ISR-80 in Slovakia in the monitored period showed a fairly even development, with a decrease since 2013. The variance of the achieved values between the year with the highest value of 4.1 (2005) and the lowest value of 3.0 (2017) was relatively small: only 1.1. Only in one year (2005) did ISR-80 exceed the value of 4.0 (Fig. 2).

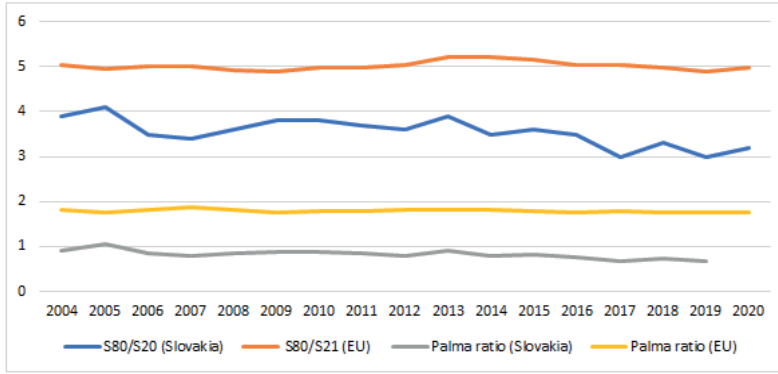

Fig. 2. Development of the rate of income inequality (S80/S20 and Palma ratio)
Source: own work based on Statistical Office of the Slovak Republic (2022a), Eurostat (2022).

During the entire period (except for 2005, when the ISR-10 barely exceeded the value of one), the Palma ratio values in Slovakia were below 1 (Fig. 2). This means that the income of the poorest 40% of the population was higher than the income of the top 10%. The average ISR-10 value in Slovakia (0.82) was much lower than the EU average value (1.12), which indicates a more favourable development for the lower income groups of the population.

4.2. Development of poverty in Slovakia

Based on the EU SILC 2021 survey, more than 800,000 people in Slovakia were in AROPE in 2020, which represented 15.6% of the total population of the Slovak Republic. As shown in the graphic representation (Fig. 3), this is the sum of all the mutual penetration of the four above-mentioned sub-indicators, which means that some households and individuals were at risk of income poverty (12.3%), severe material and social deprivation (5.7%), or very low work intensity (3.9%). Among the three dimensions of poverty and social exclusion, people in Slovakia were most at risk of the so-called income poverty. Income poverty primarily concerns persons with a vulnerable position on the labour market and especially persons outside the labour market, as well as persons with a specific household composition and a risky socio-demographic profile. These are residents who live in households with lower incomes than the national poverty line. Social exclusion means having unequal access to the basic resources of society (e.g., employment, education, housing, health care, and social protection), and the impossibility of engaging in normal relationships and activities in which the majority of people in society engage (e.g., economic, social, cultural or political relations) that ensure integration in society. To an individual who does not have access to normal goods

and services, this means that even his or her basic life needs are not covered. At the same time, he or she is excluded from the events and a relationships in which most of the society in which he or she lives is involved.

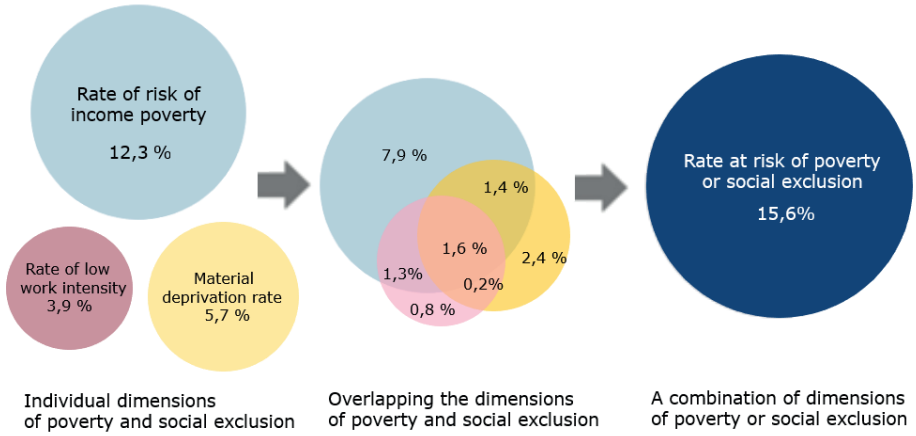

Fig. 3. Share of persons at risk of poverty and social exclusion (AROPE) in 2020
Source: own work based on Statistical Office of the Slovak Republic 2022a (EU SILC, 2021).

In 2020, 12.3% of people lived below the income poverty line, which was approximately 660,000 inhabitants (45,000 more than in the previous year, 2019). The rate of severe material and social deprivation in Slovakia was rather lower and followed a downward trend in the long term. In 2020, 5.7% of the population was depressed (306,000 inhabitants). The rate of very low work intensity was 3.9%. This is the share of people living in households who worked less than a fifth of the annual working potential of its members. For this group, the risk of poverty increased over time, and there was a risk that they would become dependent on various forms of social assistance.

From the percentage representation of persons in AROPE, according to the penetration of individual sub-indicators, it is clear that the largest share was made up of persons who were only at risk of income poverty (7.9%). Through the mutual penetration of all three sub-indicators, we extracted the most endangered group of people, where all risks were cumulative. In 2020, they made up 1.6% of Slovakia's population and represented the most vulnerable group in terms of poverty.

Looking at changes over time, the share of residents in AROPE in Slovakia decreased since 2004 from 32.0% to 15.6% in 2020. Thus, in the monitored period, the number of residents in AROPE decreased by more than half (Fig. 4). For the years 2004–2020, the average value for AROPE was 19.4%. The values for the monitored years ranged from 32.0% to 13.8% and decreased throughout the study period.

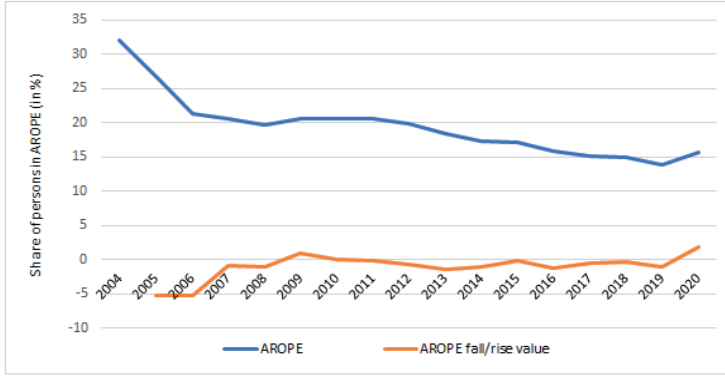

Fig. 4. Development of the share of persons at risk of poverty or social exclusion (AROPE) in the Slovak Republic

Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

Of the three dimensions of AROPE, the most people in Slovakia were at risk of the so-called income poverty (RIP). This type of poverty mainly concerns unemployed, multiple or incomplete households, and people with a risky socio-demographic profile. These were residents in households with incomes below the national poverty line. Figure 5 illustrates the development of RIP in the monitored years. After the initial decline even before the crisis (2006), the curve began to rise and rose until 2011, when it reached 13.2%. With the improvement of the economic situation, income poverty began to gradually decrease until 2019, when it reached 11.4%. The relatively significant increase in the RIP value in 2020 to 13.2% was related to the pandemic crisis, especially to the situation on the labour market (reduced income in some sectors of the economy most affected by the crisis).

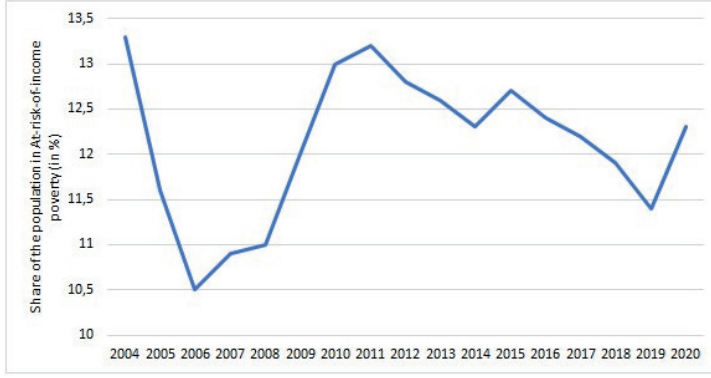

Fig. 5. Development of the rate of risk of income poverty (RIP) in the years 2004–2020

Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

4.3. Risk of income poverty based on selected population and household structures

The rate of RIP shows significantly different values for selected population structures. In terms of age, children in Slovakia were exposed to higher RIP than adults or older residents. The RIP reached an annual value of 17.6% in the 0–17 age group in 2020, which was 1.43 times more than that for the total population. With increasing age, the share of persons in RIP decreased. While the population aged 65 and older (7.7%) was least at risk of RIP during the entire observed period, in 2020 it was the population of productive age (50–64). RIP was only 9.7% in 2020, while it was 10.3% for residents aged 65 and older. Figure 6 illustrates the development of RIP by age. It is obvious that, even in the long term, children (age group 0–17) are most at risk and older residents (50–64 and 65+) are least at risk. While the average value of RIP for children was 19.0%, it reached 7.7% in the senior population (over 65 years). This difference of 11.3 p.p. is significant, although it was significantly decreasing since 2017 (in 2020, this difference was 7.3 p.p.)

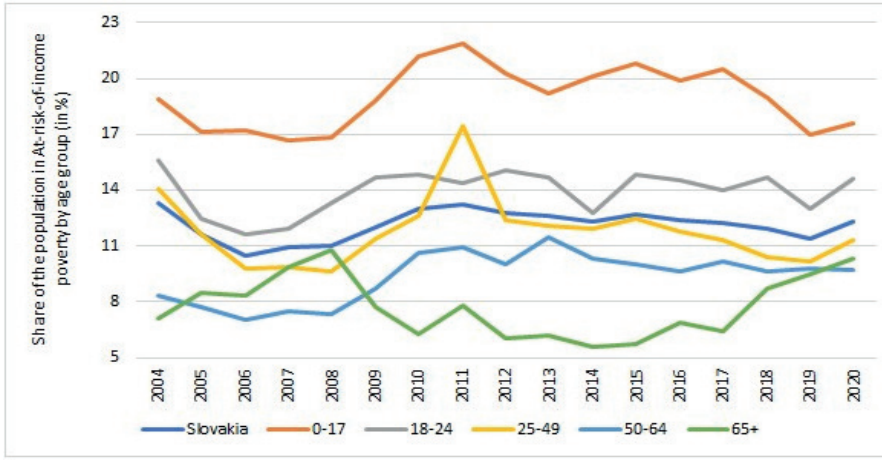

Fig. 6. Development of the rate of risk of income poverty (RIP) by age, 2004–2020

Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

Another important factor affecting RIP is household type and size. In 2020, households with dependent children were 1.2 times more at risk than households without children. While the RIP was 9.2% for households without dependent children, it was 14.6% for households with children. This means that households that take care of dependent children were significantly more at risk of poverty than households without children. Among households with dependent children, households with a higher number of children were most at risk, that is, two adults with

three or more dependent children (36.3%): this was almost three times greater than the rate for the total population. A higher risk also appeared in single-parent households (one parent with one dependent child), where the RIP was 33.6%. Among households without dependent children, single-member households consisting of a person aged 65 and over (28.5%) were most at risk of RIP. Higher vulnerability was related to a poorer ability of households to mobilise resources (especially its workforce, which is the most important source of income), but also to the number of children in the household.

Figure 7 illustrates the development of the RIP rate by household type. It is obvious that, even in the long term, households with three or more dependent children and single-parent families were most at risk, and households without children were least at risk. The average RIP value of households with three or more dependent children reached 31.9%, while for single-parent families it was 29.9%. In a household without dependent children, the RIP value was only 7.9%. The average RIP value for all households was 18.6%. In a household with three or more dependent children, the RIP was 13.3 p.p. than average; for single-parent families, it was 11.3 p.p. higher. These differences were so marked that households with three or more dependent children and single-parent households can be referred to as households with a high RIP. A common feature of both types of households was an increase in their share in RIP, as well as an increase in values in the last monitored year (2020) compared to the starting year 2004. While the increase in RIP for single-parent households was relatively low (only 1.8 p.p.), in large households (three or more children) it was very high–up to 12.1 p.p.

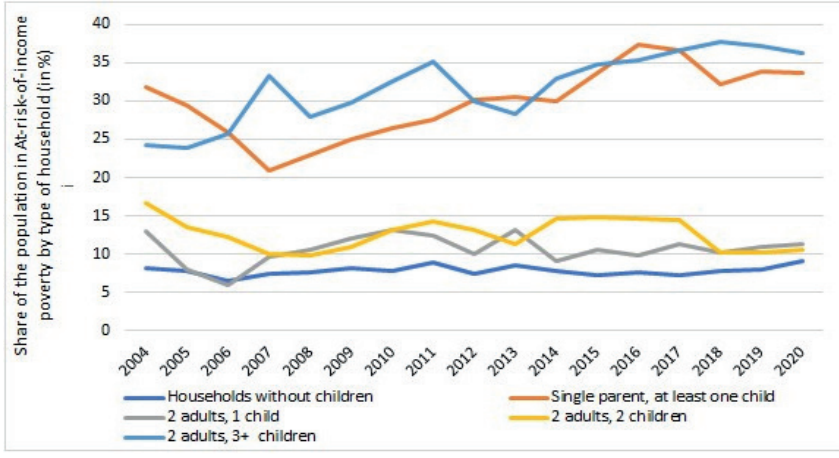

Fig. 7. Development of the rate of risk of income poverty (RIP) by household type in 2004–2020
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

In terms of economic activity, the unemployed were exposed to the highest RIP in Slovakia. In 2020, the RIP value reached 52.6% among the unemployed–that is, more than half of the unemployed suffered from RIP. Conversely, the lowest RIP appeared among the economically active, where only 6.7% of the population suffered from RIP; this was primarily the group that is often referred to as the working poor. This group recorded RIP value up to 45.9 p.p. lower than those among the unemployed. Figure 8 illustrates the development of the unemployed according to economic activity. It is obvious that, even in the long term, RIP appears in the most threatened group of the unemployed and the least employed. While the average RIP value of the unemployed was 46.8%, it was only 6.0% for the employed. The difference in RIP between the mentioned groups has been increasing in recent years, mainly due to the rapidly growing share of RIP among the unemployed.

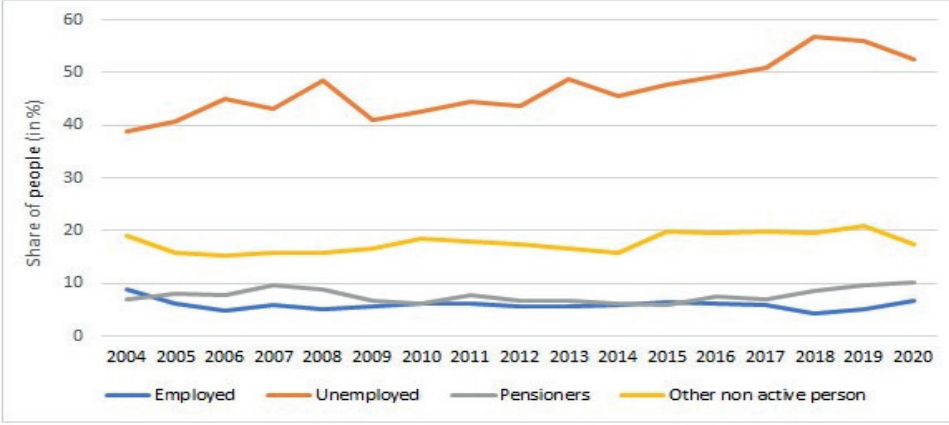

Fig. 8. Development of the rate of risk of income poverty (RIP) according to economic activity in 2004–2020

Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

If we look at the development of severe material deprivation rate (SMD) in Slovakia, it appears to have shown the greatest progress of all poverty indicators. In the observed period, the share of people who felt deprivation/lack in the financial burden dimensions decreased significantly. While in the first year of monitoring (2004) around a fifth of people (21.7%) showed serious material deprivation, in the last monitored year (2020) it was only 5.9% (Fig. 9). In 2020, the most people, 35%, said they could not afford to pay for a week's holiday away from home once a year. The second most common problem was the inability to face unexpected expenses (27%). Almost 23% of people in Slovakia stated they could not afford to replace worn-out furniture with new items.

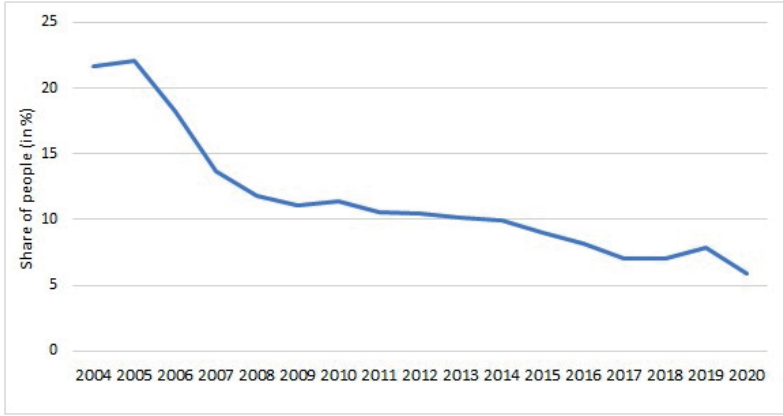

Fig. 9. Development of the rate of severe material deprivation in Slovakia in the years 2004–2020
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

A total of 4.3% of the population aged 18–59 lived in households with LWI in Slovakia in 2020. Compared to the previous year, 2019, the rate of LWI decreased significantly by 1.9 p.p. In Fig. 10, we can see the development of LWI over the monitored period. The decrease in values indicates an improvement in the situation on the labour market and more opportunities for full-fledged economic activity. For the years 2005–2020, the average LWI rate was 6.4%, which gradually decreased. In 2010, the indicator reached a value of 7.9%, while in 2020 it reached a value of only 4.3% (a decrease of 3.6 p.p.).

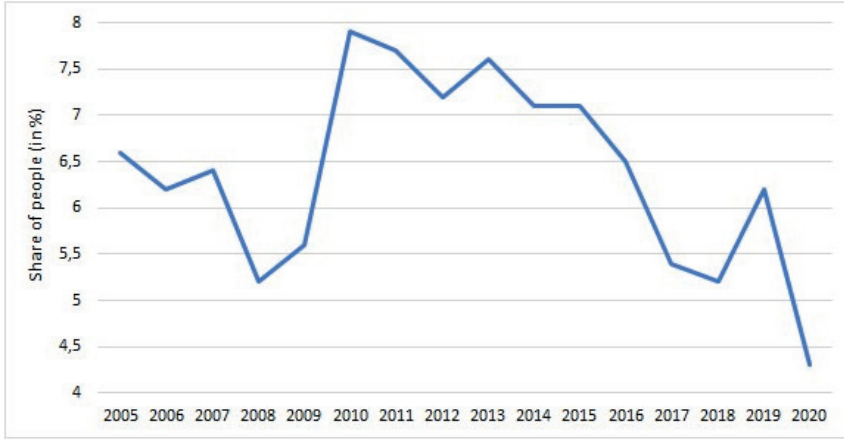

Fig. 10. Development of the share of persons in households with very low work intensity (LWI)
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

Figure 11 captures the development of RPT for all persons. Until 2011, RPT decreased to 6.0%; it then grew for two years (after the financial crisis) and in 2013 reached 8.1%. It then decreased rather steeply until 2020 to 4.3%, and as a result of the health crisis (the COVID-19 pandemic), it rose again to 5.0%.

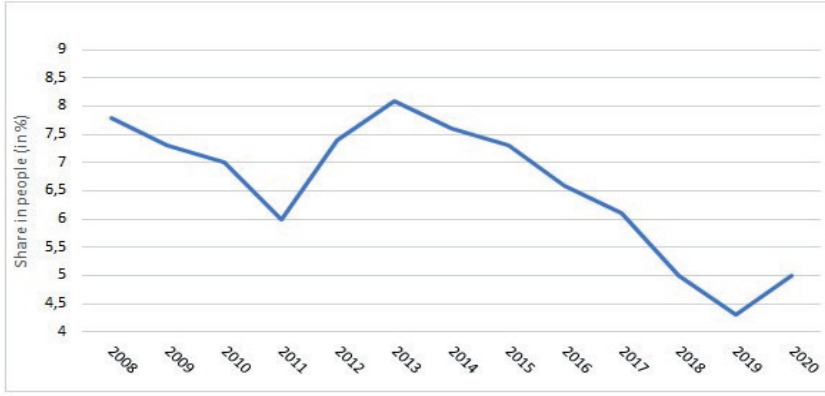

Fig. 11. Development of the rate of poverty anchored in time (RPT; as of 2008)
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

The rate of risk of poverty according to the degree of urbanisation (RPdU) expresses the share of persons at risk of poverty who live in households in the environment of cities, suburbs, and rural areas. As is clear from Figure 12, persons in rural areas showed a higher share in the risk of poverty throughout the monitored period, ranging from 14.6% to 17.9%. This growth was influenced by the financial crisis, which caused their share to increase relatively significantly until 2012. It then decreased and showed an alternation of growth and decrease in values, while the highest value was recorded in 2018 (17.9%). The share in the risk of poverty in cities and suburbs showed lower values in the interval from 10.6% to 15.1% throughout the monitored period. The curve of the development of the share of persons in RPdU in cities recorded a significant decrease, almost halving, from 14.0% to 7.5% in the years 2015–2020. This decrease of 6.5 p.p. indicates a significant improvement in the situation in cities, but at the same time a significant deterioration in the suburbs (increase in the share of persons in RPdU by 3.8 p.p.).

In 2020, the total value of the relative difference between the median income of persons at risk of poverty and the threshold of the risk of poverty was 27.7% and increased by 4.0 p.p. compared to the year prior. The most vulnerable age group consisted of persons aged 0–17 years, where the relative drop in the median income at risk of poverty was the highest (28.7%), or 1.0 p.p. higher than the share of persons in the entire population. In Fig. 13 we can see the development of

MRPG over the observed period. The share of residents in MRPG showed values ranging from 18.1% to 29.0% throughout the monitored period.

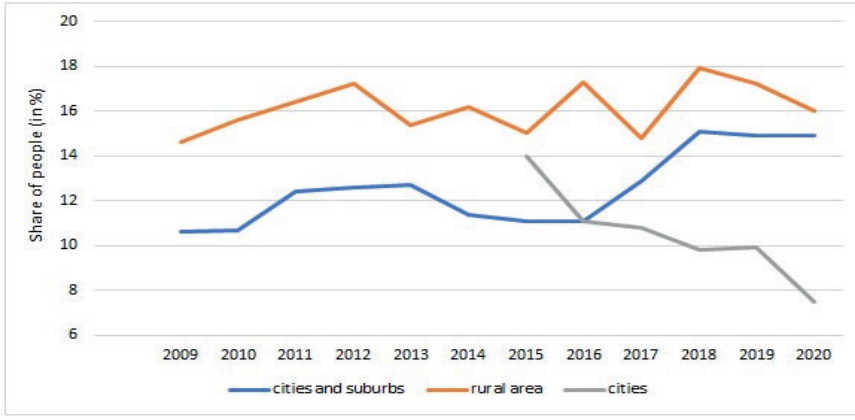

Fig. 12. Persons at risk of poverty or social exclusion according to the degree of urbanization (RPdU)
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

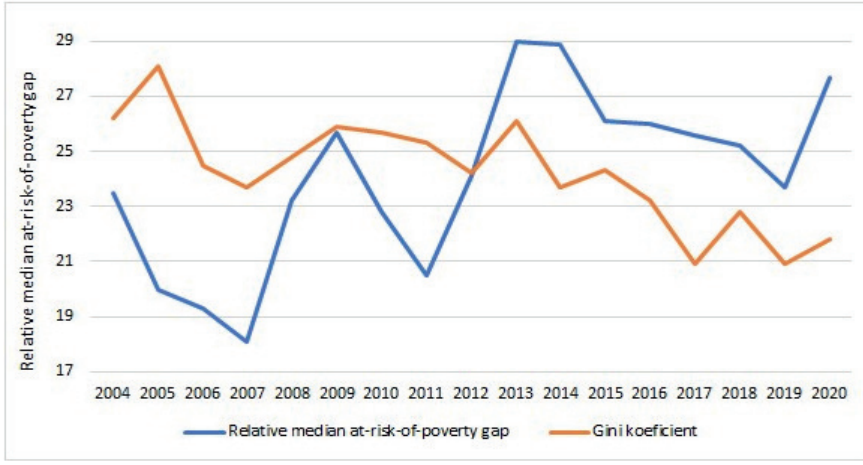

Fig. 13. Development of the relative drop in the median income (poverty depth) of persons at risk of poverty
Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

The MRPG development curve was characterised by three significant decreases and increases (peaks) in values. Its decreased in the first three years indicates a favourable development–a decrease in the severity of poverty. The declines represented isolated years 2007, 2011, and 2019. The value peaks are

also interesting. The peak in 2009 could be considered a consequence of the financial crisis, while the causes of the peaks in 2013 and 2014 are still unexplored and deserve deeper analysis. The MRPG peak in 2020 could be considered a consequence of the COVID-19 pandemic. MRPG appears to be largely related to the development of the asperities captured by Gk, with the similar course of the curves showing that the higher level MRPG reflects the growth of these asperities. In other words, the growth of inequalities significantly conditions the decline/fall in the median income of the poor. It can thus be concluded that this indicator is very sensitive to the development of income inequalities, so it is necessary to approach changes (growth of inequalities) with regards to the poorest sections of the population.

In connection with capturing the dispersion of poverty around the poverty line, in 2020 in Slovakia, 3.4% of persons had an income below 40% of the median equivalent disposable income, 9.7% of persons below 50% of the median, and up to 19.9% below 70% of the median persons. In Fig. 14, we can see the development of DRP for the monitored period. There are four curves with almost identical development, although at different value levels, with the DRP of 40% and 50% showing different development. While the 40% curve in the monitored period had a positive trend and the values in the monitored period fell from 4.8% to 3.4% − that is, by 1.4 p.p. − the 50% curve, conversely, increased by almost the same value (1.5 p.p.). This can be considered a slightly positive shift among the poor (the situation of poorest has thus slightly improved). As for the DRP of 70%, it underwent a fluctuating development, while the starting year values (20.0%) at the end of the period were almost identical (19.9%).

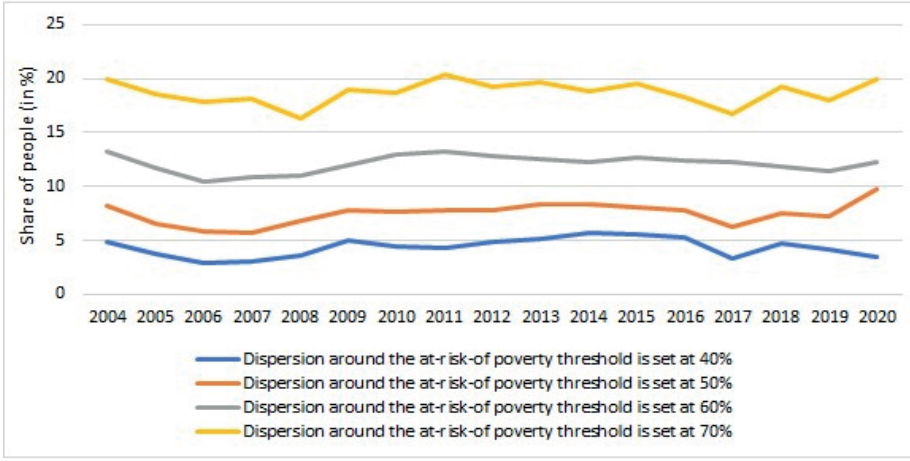

Fig. 14. Development of dispersion around the poverty risk line (DRP)

Source: own work based on Statistical Office of the Slovak Republic (2022a) and EU SILC (2021).

5. INCOME INEQUALITIES AND POVERTY: SPATIAL FRAMEWORK

One of the most striking and observable signs of income inequality in poverty is space, which is the bearer of these inequalities through the population. Geographical analyses of these horizontal income inequalities and poverty provide much information not only about the income and poverty of the population in the regions, but also about the regions (or examined spatial units) themselves. At the same time, the growth and widening of income inequalities between regions further increases poverty in some regions. In many, the increase in income inequality and simultaneous very low income from employment leads to the refusal to work by employees and the non-utilisation of the economically active population by the state or employers. The interregional increase, as well as the increase in income inequalities and the concentration of poverty, is a consequence of differentiated economic conditions, social inequalities, and the opportunities for the regions and their ability to restructure. Low monetary income and poverty, whether of individuals or households, conditions the dissatisfaction of residents, especially in the area of income and material security.

The level of (low) income and poverty in regions is influenced by various external and internal factors. External factors mainly include a lack of financial and development resources, low (state or foreign) investments, various risks for the business, and weak and underdeveloped economic ties, relations, and connections with other regions. Internal factors include, among others, economic lagging, the region's development potential and possibilities, the low level of human resources, and weak management. Individual factors are also important, such as people's position on the labour market, education, age, and social or health handicaps. These factors, as well as others that have not been mentioned, multiply regional problems and have a very unfavourable effect, especially in economically weaker regions, which also show a higher degree of vulnerability. They intensify regions' unfavourable position and negatively affect multiple aspects of residents' quality of life. In these regions, low income and poverty are accompanied by many undesirable negative phenomena, such as low purchasing power, social dependence, poverty, social exclusion, and the emergence of subcultures. Low income and poverty are particularly characteristic features of the inhabitants of the lagging and marginal territories, regions, and localities of Slovakia. Relatively significant spatial income disparities and the related concentration of poverty in certain areas, regions, or settlements increases the marginalisation of these territories and causes financial problems for their populations.

The wide-ranging problems associated with the spatial dimension of income and poverty include the differentiation and concentration monitoring of income, identification of regions with low population income, regional income disparities, income stratification of the population, creation of income profiles of regional societies, identification of poor regions, and typification of poverty

regions and poverty parameters (character, depth, duration, transmission, type). This points to the relevance of examining the issue of geographical income inequalities and poverty. Empirical findings can help positively shape social policy and improve the distribution of the effects of economic growth in regions.

6. REGIONAL LEVEL ANALYSES

6.1. Income inequalities and poverty at the county level

Like other socio-economic phenomena, income and poverty in Slovakia are significantly spatially differentiated. Income inequality and poverty are mostly influenced by the significantly different demographic and socioeconomic levels (Gajdoš and Pašiak, 2006; Matlovič *et al.*, 2008; Matlovič and Matlovičová, 2011; Madajová *et al.*, 2014; Korec *et al.*, 2016; Pauhofová *et al.*, 2016; Michálek *et al.*, 2020) of individual regions and are most often observed at the regional level in the spatial units of the territorial administrative organisation (i.e., at the NUTS 3 level). In Slovakia, NUTS 3 represents eight regions for which data on the income and poverty of the population are available. Figure 15 captures the values of the available indicators for both phenomena in the mentioned spatial units (regions) of Slovakia.

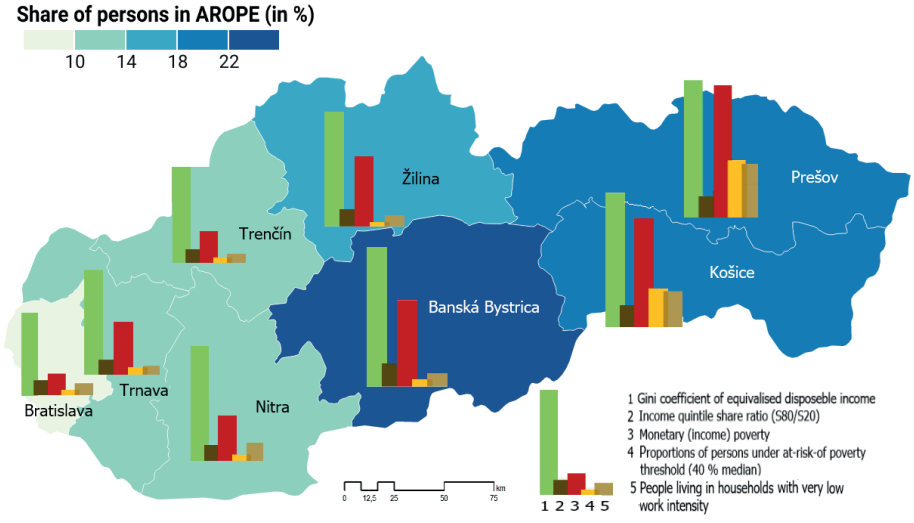

Fig. 15. Income inequality and poverty in eight regions of Slovakia in 2020

Source: own work based on Statistical Office of the Slovak Republic (2022b) and EU SILC (2021).

6.2. Income inequalities and poverty at the FUR level

FURs were the most suitable regional level for monitoring the spatial stratification of incomes and their inequalities, as well as for creating a regional profile of residents' incomes (regional income societies). The analysis of residents' incomes by FUR eliminates not only the incorrect comparison of urban districts with other districts, but also excludes districts that do not belong to the set of evaluated units due to their size and internal structure from the comparison. In total, 49 FURs were thus used as the basic territorial units of income stratification in Slovakia; stratification was based on the representation (number) of the population in individual income categories.

A simple graphical model was used to capture the income distribution of regional societies. The income profile of a company was expressed by the number of inhabitants in 10 income intervals of the same range. The visual construction of regional societies profiles based on differentiated income can be seen in Figure 16. The map provides a detailed picture of income stratification and its differentiation at the FUR level. According to the representation of the individual income groups, five types of regional communities were classified. The two extreme types were the groups of the population with the highest (rich) and the lowest (poor) income. Due to the predominance of the poor over the rich, most of the studied regions had a pyramidal or pseudo-pyramidal arrangement of income. Pyramidal distribution is characterised when the share of income of the region's inhabitants in the first three (lowest) income categories constitutes more than half of the income. A pseudo-pyramidal arrangement/income distribution is also pyramid-shaped, but the income distribution is shifted slightly upwards, meaning incomes are slightly higher; in Slovakia, 20 regional populations with such stratification were identified.

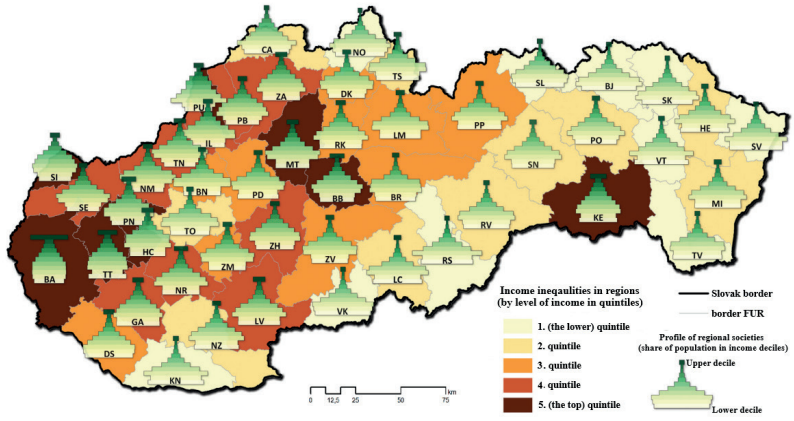

Fig. 16. Income inequality and stratification (profile) of the population in the regions of Slovakia in 2012–2016

Source: own work based on Social Insurance Agency of the Slovak Republic (2021).

The remaining three types of regional income communities had a pear-shaped profile, with each of the stratification types based on the predominance of middle-income groups. The first stratification type, a wide pear (with a wider lower part), was characteristic of a group of 15 regions with a majority of the population in the third to fifth income interval. The second and third pear-shaped types were represented by a group of 14 regions. Their common feature was a relatively higher representation of residents in the three highest income bands (they constituted more than 7%). We can talk about an extremely rich stratification type in connection with only one FUR–the metropolitan Bratislava region. The profile of this region has a significantly different shape (an inverted pear) from the other regions. This specific profile indicates that, in this region (the only one in Slovakia), the population with income from the highest income interval is most represented (up to 13.2% of the population). At the same time, the region is characterised by the most even income distribution due to the greater/more significant representation of residents with higher incomes. The used characteristic of income stratification of regional societies thus provides relatively detailed and quick information about incomes and income inequalities in the studied spatial units.

6.3. Income inequality and poverty at the municipal level

In Slovakia, incomes and their inequality are most differentiated at the municipal level. Figure 17, as in the previous figures shows significant income disparities, this time at the local level. It can be seen that most municipalities in north-western Slovakia are characterised by above-average incomes, while these are the highest in municipalities located in the western part of Slovakia and in larger cities.

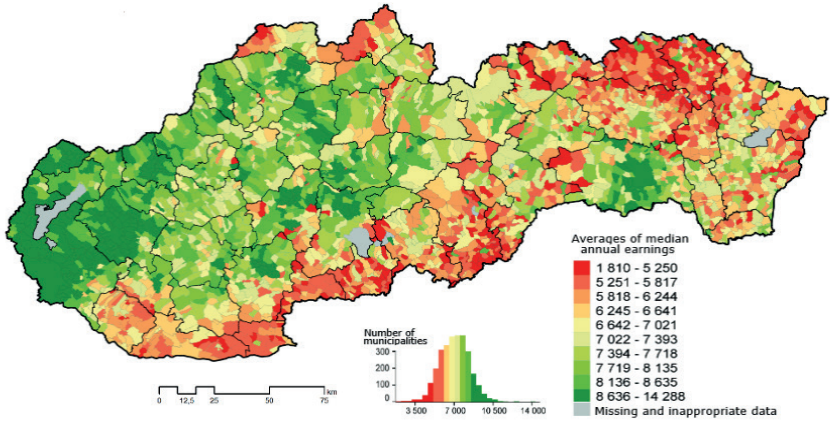

Fig. 17. Municipal income levels in Slovakia in 2014–2017

Source: Výbošťok (2020).

Conversely, municipalities in the south and northeast of Slovakia are characterised by below-average incomes (orange-red shades). While low-income municipalities occur only sporadically in the northwest, one atypical region can be seen in the territory of low-income municipalities (south and northeast). It is a region with different, significantly higher incomes among its inhabitants; the centre of this island is Košice, which is the second largest city in Slovakia and the metropolis of eastern Slovakia. It is this city, especially its industrial sector and services, that creates opportunities for higher earnings for its inhabitants, as well as its infrastructure.

7. DISCUSSION

The contribution using (so far the only) longitudinal data on income and poverty in Slovakia provided important insights into their development, changes, and differentiated spatial level. It proved that from the aspect of income distribution in the monitored years, income development in Slovakia was similar (albeit at a different level) to that in Denmark (Pedersen and Smith 1998). The paper also confirmed the findings of Förster *et al.* (2005) that national-level results significantly obscure/mask differences in income inequality across regions. The knowledge obtained is also in agreement with the findings of Piketty and Saez (2003) that the distribution and changes of incomes are significantly influenced by extraordinary events (crises, recessions, wars), which dynamise them and mostly negatively affect them (they reduce the incomes of the majority of the population, lead to concentrations/ accumulation of incomes for a narrow group, increase income inequalities, etc.). The results of the study of income inequality at the regional and local level showed that while household income inequality at the local level of municipalities was insignificant in Slovakia, household income inequality between districts, FUR and regions was significant. These are completely opposite results to those achieved by Gray *et al.* (2004) when examining household income in Canada.

Most of the findings and knowledge about the development and changes in poverty in Slovakia were more or less aligned with the results and conclusions of research from other EU countries. For example, the development of overall poverty, or changes in its level, were relatively slow, inconspicuous and similar to those in Great Britain (Dorling and Pritchard 2010). In agreement with ASPE (2013), post-crisis increases in poverty (after 2008) were also recorded in Slovakia, while poverty increased in most demographic groups. Like Francis-Devine *et al.* (2019), the results of this study confirmed that even in Slovakia, children, households with multiple children and single-parent households, and the unemployed were most

at risk of poverty. Despite that, the results of Duiella and Turrini (2014), who noted post-crisis increases in poverty in EU countries, especially in connection with severe material deprivation, were not confirmed. In Slovakia, the increase in post-crisis poverty was most evident in the increased share of people at risk of income poverty.

8. CONCLUSION

Political-economic stabilisation and the calming of the social situation at the turn of the millennium changed the trajectory of development, with favourable effects on incomes (their increase) and poverty (its decrease). Looking at development in Slovakia, the share of the population in AROPE has decreased significantly—by more than half from 2004 to 2020 (from 32.0% to 15.6%). In the monitored period, Slovakia achieved the greatest progress in reducing severe material deprivation, while in 2020 the value of SMD equalled the EU value. Slovakia also recorded a decrease in poverty values in terms of LWI, which indicates an improvement in the situation on the labour market and more opportunities for full-fledged economic activity. The favourable development of poverty is also documented by the RPT, which fell steeply until 2019 to a value of 4.3%. In 2020—as a result of the health crisis (the COVID-19 pandemic)—it rose again. The results also showed that poverty is much more prevalent in rural areas than in cities. However, its significant increase in recent years (since 2016) in the suburbs is worrying. The growth of inequalities in Slovakia is significantly conditioned by the drop in the median income of the poor. This increases the severity (depth) of poverty, so it is necessary to approach the growth of income inequalities with respect to the poorest sections of the population. Changes in the dispersion around the poverty risk threshold, which is another very important direct indicator of the severity of poverty, must be treated equally seriously, especially for the group of residents with an income lower than 40% or 50% of the median equivalent disposable income. While the 40% curve in the monitored period had a positive trend (values decreased in the monitored period), the 50% curve, on the contrary, increased by almost the same value. This can only be considered as a transfer of income between the poor (the poorest have slightly improved, and the slightly less poor, on the contrary, have slightly worsened).

The analysis at the regional level confirmed large regional differences between the five regions of north-western Slovakia and the three regions located in the south and east of Slovakia. It is clear from the achieved results that the system of income stratification of the population was also significantly differentiated at the regional level in Slovakia. Low-income regions, which make up more than half of the set

of 49 examined FURs in Slovakia, have been significantly predominant for a long time. Only eight regions were characterised by a higher or high income, which indicates not only the already mentioned significant income differentiation between regions, but, concurrently, points to a high regional concentration of income. The difference between the income richest and poorest regions was more than double. Municipalities with a slightly above-average income predominated in the territory of north-western Slovakia, while the lowest incomes appeared in the municipalities in the south and northeast of Slovakia, which are characterised by a high representation of elderly residents (dependent on relatively low pensions) or with a high proportion of the ethnic minority Roma. Some municipalities of this territory are even marked simultaneously by both threatened groups of inhabitants.

The obtained results represent the starting point for further investigation of the issue in question. Understanding of the development trends of income inequality and poverty and the identification of vulnerable regions is a necessary prerequisite for reducing income inequality and poverty in Slovakia. The obtained results and knowledge can be a significant contribution especially in decision-making in economic and social policy, but also inspirational in the academic sphere. Decision-making sphere is provided with clear information on which income and poverty parameters should be focused on.

It is obvious that the current global energy crisis and the internal political-economic situation in Slovakia will have a significant negative impact on the social development of the population. This is already apparent in the significant and rapid growth of inflation, the drop in real incomes, and the increase in income inequality and poverty, but also in the growth of social tension in Slovakia. The country, as shown by the latest data (as well as the real deteriorating living conditions of the inhabitants), is facing difficult times. It can be expected that, in the current crises (health, energy, and inflation), as in other crises, the most vulnerable will again lose the most—and not only in Slovakia.

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Monika Maria CYSEK-PAWLAK[*], Jakub MISIAK[**], Agata HOŚCIŁO[***], Geir-Harald STRAND[****], Sebastian EITER[*****]

SPATIAL PLANNING NEEDS TOWARDS COPERNICUS LAND MONITORING SERVICES: CASE STUDIES FROM POLAND AND NORWAY

Abstract. The objective of this study is to identify the needs related to geospatial LC, LU, and LCLUC information for spatial planning in Poland and Norway, and examine the usefulness of CLMS products in the context of these planning systems. The research has conducted based on a comparative analysis of two planning systems, to indicate areas where CLMS can improve or supplement national spatial data. The study shows that CLMS can provide information on up-to-date spatial data showing actual LC/LU/LCLUC, but that the degree of detail and the accuracy may be insufficient. CLMS data is harmonised across Europe and thus meets the need expressed by international organisations, for data that are consistent at a continental level. This is not a requirement in national planning systems in Poland and Norway, where the needs are regulated by national legislation. The thematic and geometric accuracy of national data sources are usually better than the data provided by CLMS, but CLMS might fill gaps when specific topics are missing in national mapping programs.
Key words: CLMS, spatial planning, Poland, Norway.

[*] Monika Maria CYSEK-PAWLAK, Institute of Architecture and Urban Planning, Faculty of Civil Engineering, Architecture and Environmental Engineering, Lodz University of Technology, Poland; e-mail: monika.cysek@p.lodz.pl, ORCID: https://orcid.org/0000-0002-8175-6779
[**] Jakub MISIAK, Institute of Architecture and Urban Planning, Faculty of Civil Engineering, Architecture and Environmental Engineering, Lodz University of Technology, Poland; e-mail: jakub.misiak@p.lodz.pl, ORCID: https://orcid.org/0000-0003-2843-8752
[***] Agata HOŚCIŁO, Institute of Geodesy and Cartography, Poland; e-mail: agata.hoscilo@igik.edu.pl ORCID: https://orcid.org/0000-0003-3304-2445
[****] Geir-Harald STRAND, NIBIO – Norwegian Institute of Bioeconomy Research, Division of Survey and Statistics, PO Box 115, 1431 Ås, Norway; geir.harald.strand@nibio.no, ORCID: https://orcid.org/0000-0002-7516-0282
[*****] Sebastian EITER, NIBIO – Norwegian Institute of Bioeconomy Research, Department of Landscape Monitoring, PO Box 115, 1431 Ås, Norway; sebastian.eiter@nibio.no

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1. INTRODUCTION

Copernicus is the European Union's Earth Observation Programme, which provides information aiming to improve the management of the environment, understanding, mitigation, and adaptation to climate change and addressing security issues (Aschbacher, 2016; Jutz and Milagro-Pérez, 2020). The programme consists of a space segment and a ground segment. Copernicus provides services focused on six thematic areas: land, marine, atmosphere, climate change, emergency management, and security.

The Copernicus Land Monitoring Service (CLMS) provides information on land cover, land use, and several variables related to vegetation status at the global, European, and national scales (Apicella *et al.*, 2022). The aim of CLMS is to address the needs of a wide range of users and to support various applications related to environmental protection, management of urban areas, regional and urban planning, climate change, and agriculture and forestry, as well as water management, transport, energy or neighbourhood policy.

The CLMS provides a set of pan-European and local products.[1] The pan-European products comprise the Corine Land Cover (CLC) database, a few similar land cover datasets for urban areas ('Urban Atlas'), riparian zones and coastal areas, and a number of High Resolution Layers (HRL) providing the land cover characteristics and biophysical parameters complementing the land cover datasets (Probeck *et al.*, 2021). The HRLs have been derived from satellite images through semi-automated classification. There are currently five HRLs available: degree of imperviousness, tree cover density and dominant leaf type, grasslands, water and wetness, and small woody features (Kleinewillinghöfer *et al.*, 2022) but the number is growing. The CLMS products focused on areas that are prone to specific environmental challenges and problems, for example Urban Atlas, Riparian Zones, Natura2000, and Coastal Zones, are referred to as the local component of CLMS. The local component products are derived from a combination of a very high and medium resolution satellite images.[2]

Considering that almost three quarters (72.5%) of EU inhabitants live in cities (Eurostat, 2006) and more than a quarter of the EU territory is covered by urban land use, the management of urban areas is clearly important. One of the CLMS objectives is, therefore, to support regional and urban planning at the local level through provision of accurate, up-to-date, and reliable information about land cover, land use, and changes within the urban structure (Lefebvre *et al.*, 2016).

CLMS contributions to spatial planning were first developed as part of the Geoland project (Evans, 2007). The aim was to develop better quality data and applications than had been previously available. The expedient action was to establish an observatory for spatial planning (OSP). It aimed to combine earth observation

[1] https://land.copernicus.eu/ [accessed on: 16.10.2023].
[2] https://land.copernicus.eu/local [accessed on: 16.10.2023].

with socio-economic data in order to meet the information needs of spatial planning (Kasanko *et al.*, 2007). The OBS was terminated together with the Geoland project, but it is still an expressed aim of CLMS to support spatial planning.

Several CLMS products have a potential to directly or indirectly support urban planning. However, European countries, municipalities, and regions face different planning challenges, and requirements, and spatial planning is regulated by national legislation. Therefore, it is important to study the user uptake of CLMS products and the usefulness of the data provided by CLMS with regards to the needs and requirements in the spatial planning sector (Apicella *et al.*, 2021).

The primary purpose of this study is to identify the needs related to geospatial Land Cover, Land Use, and Land Cover and Land Use-Change information for urban and spatial planning in Poland and Norway, and to examine the usefulness of CLMS products in the planning systems. Our hypothesis is that CLMS provides data that can support spatial planning, especially decision-making, and can provide accurate, reliable, and up-to-date spatial data on actual land use and land cover.

Where other studies mainly focus on what kind of data is currently used in spatial planning, our attention is equally given to what type of data spatial planning systems would require to make better-informed decisions (Hersperger *et al.*, 2018; Sörensen *et al.*, 2021). The broader context is to explore the preconditions for an increased use of data from the CLMS in spatial planning in these two countries. We have assumed that a better understanding of metadata, ownership, and data management requirements will have universal relevance.

The specific objectives of the study are:

– Identification of similarities, differences, best practices, challenges, and requirements of spatial planning systems in Poland and Norway in terms of geospatial data;

– Examine the availability of data for urban and spatial planning regarding Land Cover, Land Use, and Land Cover and Land Use change information in Poland and Norway, and evaluate CLMS as an alternative or supplementary data source.

A comparative analysis of geospatial information requirements for spatial planning in Poland and Norway has been prepared based on a literature review concerning Land Cover (LC), Land Use (LU), and Land Cover and Land Use Change (LCLUC) monitoring. The consistency of spatial planning terminology with definitions used in the CLMS products is discussed.

2. DATA, MATERIALS AND METHODS

The research was conducted based on a comparative analysis of two European planning systems, making comparisons, and looking for conclusions and common recommendations. For research purposes, the following steps were conducted:

a comprehensive literature review, an examination of spatial planning practice, and an analysis of national and international databases on LC, LU, and LCLUC. Fig. 1 presents an overview of the research process. Cross-validation was applied through cooperation with scientists, experts, and practitioners in spatial planning; spatial databases were also explored. We have compared to what extent national planning systems and local data bases require CLMS support and to what extent CLMS data is currently used in legislative and operational urban planning. The comparative method used has been to determine to what extent national planning systems and local data bases require CLMS support and to what extent it is currently used in legislative and operational urban planning in European countries.

Firstly, international regulations, European acts, national legislation, and planning strategies were reviewed. Secondly, the spatial planning systems in Poland and Norway were described systematically to enable comparison. The map databases used in spatial planning were analysed in order to define similarities, discrepancies, and challenges in applying the existing geospatial information on land cover and land use in Poland and Norway.

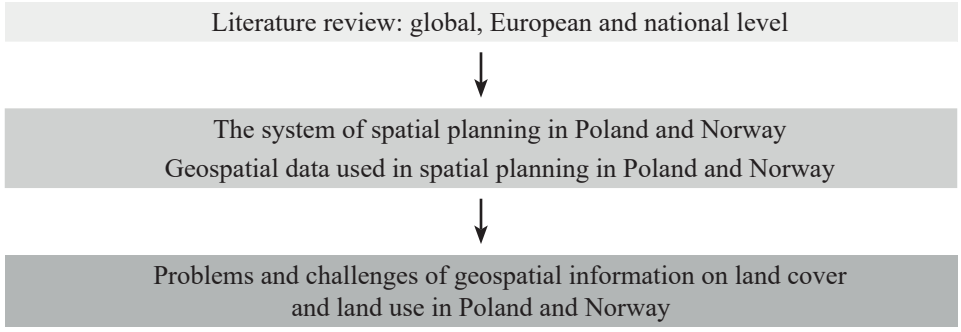

Fig. 1. Overview of the research process

Source: own work.

3. RESULTS - NATIONAL POLICIES IN POLAND AND NORWAY

The Polish Spatial Planning and Land Development Act (of 27 March 2003) has since its revision in November 2015 required municipalities to prepare development analyses and demographic forecasts. Pursuant to Art. 32 of the Act, the head of a commune, mayor or city mayor is obliged to assess the validity of the study of conditions and directions of spatial development and local spatial plans of development, including the analysis of changes in the spatial development of the com-

mune, evaluation of the progress in local plans' preparation, and develops long-term programs of their preparation in line with the arrangements of the study. It is obligatory to assess financial possibilities, keep land balance during the preparation of a study of conditions and directions, and spatial plans prepared based on studies. The Act also requires to study, calculate, and define the extent of urban development and nature. Finding such a balance is a key and an urgent need of urban planning considering the current building situation, municipality finances, plans for future growth, and the public's quality of life. These regulations may limit urban sprawl and suburban development and make local governments' planning activities more realistic.

A systemic and strategic approach shall be taken to spatial planning using hard data and monitoring urban space changes. In cooperation with the Central Statistical Office, the Polish Ministry of Investment and Economic Development coordinates the general development policy monitoring system, including developing appropriate indicators and methodologies to monitor the implementation of municipal policies. Also, the Urban Policy Observatory was established in Poland, which organises databases, conducts research, and monitors urban policy to improve it (Poland Ministry of Investment and Economic Development, 2019).

The Norwegian Planning and Building Act, in contrast, does not require any specific monitoring of land cover or land use. There is, however, a growing interest for land use accounting and a limited number of monitoring programs are in place. Furthermore, administrative routines and registers directly or indirectly imply or support land use monitoring:

– All new buildings are registered and georeferenced in the national property register (Matrikkelen).

– All new roads are registered and georeferenced in the national road database (NVDB) held by the Norwegian Public Roads Administration (Statens vegvesen).

– The local authorities are responsible for updating their base maps according to a national standard and store the data in a national database (the Collaborative Map Database, FKB).

– Municipalities must report the acreage of agricultural land reallocated to any other land use. The annual reports are submitted to the National Statistical Institute (SSB).

– Municipalities must report the number of new building permits in the coastal zone. The annual reports are submitted to the National Statistical Institute (SSB).

– The National Statistical Institute (SSB) maintains a detailed land use map, allowing it to monitor changes over time. An unconfirmed plan is to report changes every fifth year.

– A monitoring program for land cover and land use in the agricultural landscape has been operational since 1998.

– Irregular monitoring is conducted by various institutions, either as research projects or commissioned by one of the ministries. Examples include studies of

constructions in the coastal zone, leisure homes, illegal buildings, urban green areas, etc. The national Office of the Auditor General (Riksrevisjonen) also conducts projects where it investigates various aspects of the implementation of the Planning and Building Act.

– A prototype of a land use calculator has been developed, where a land use plan can be uploaded and land take is calculated by overlay with data from the Collaborative Map Database (FKB).

3.1. The system of spatial planning in Poland

Poland has a decentralised spatial planning system closely related to the hierarchy of administrative division. The administrative division of Poland has been based on three levels of subdivision since 1999. Decisions made at each level must follow any decision made at a higher level (Table 2).

Table 1. The administrative division of Poland and urban policy regulations and strategies framework

The administrative division		Planning documents	Strategic documents
NATIONAL LEVEL: STATE GOVERNMENT ADMINISTRATION		None [Until November 2020: The National Spatial Development Concept 2030 (NSDC 2030)]	The National Strategy of Regional Development 2010-20
SELF-GOVERNMENT ADMINISTRATION	**REGIONAL LEVEL: VOIVODSHIP**	The voivodeship spatial development plans	The voivodship development strategies landscape audit
	SUPRA-LOCAL LEVEL: COUNTY	planning documents at this level	The supra-local (county) development strategies
	LOCAL LEVEL: MUNICIPALITY	• The studies of conditions and directions of spatial development (SUiKZP) • Local spatial development plans (MPZP)	The local development strategies

Source: own work based on The Polish Spatial Planning and Land Development Act (of 27 March 2003).

3.1.1. National level

Urban policy regulations are set on all administrative levels except at the county level, and we can divide these regulations into planning and strategic documents. Regardless of the level of administration, all planning-related documents are based on strategic documents. The currently applicable Polish development management

system is based on the Act of 6 December 2006 on the development policy's principles.[3] The socio-economic planning system is, however, not closely linked to spatial planning. Therefore, the Polish Development Management System was adopted to create a holistic and uniform system of management and coordination of policies supporting the country's development processes (Act of 29 October 2018).

With respect to urban and spatial planning, the main legislation is the Spatial Planning and Land Development Act (Act of 27 March 2003, as amended). In addition to the above documents, Polish legislation also applies, among others: Regulation on the required scope of the study of conditions and directions for the spatial development (Act of 17 December 2021), Regulation on the required scope of the local spatial development plan (Act of 17 December 2021), The Building Code (Act of 7 July 1994, as amended), and Regulation of the Ministry of Infrastructure of 12 April 2002 on technical conditions to be met by buildings and their location.

On the national level, until November 2020, there was also the National Spatial Development Concept (the last one referred to Poland's vision for 2030). It was the most crucial long-term national strategic document concerning spatial development. It corresponded to the National Strategy of Regional Development. The document was the only formal basis for conducting a long-term spatial policy and the premise of coordinating the deployment of investments of strategic importance for Poland.[4]

3.1.2. Regional level

Voivodeships have to prepare spatial development plans and development strategies. Spatial development plans for voivodeships are the most crucial documents of voivodeship self-governments. The vision of development, goals, and objectives of a regional policy in the economic, social and spatial dimensions and the milestones necessary to achieve them are defined there.

3.1.3. Local-level

On the local level development strategies are prepared. As municipalities are fundamental units in the Polish spatial planning system, two spatial planning-related documents exist on the local level: A study of conditions and directions of spatial development (PL: "studium uwarunkowań i kierunków zagospodarowania przestrzennego", PL. abbreviation: SUiKZP) and A local spatial development plan

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[3] https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20062271658/O/D20061658.pdf [accessed on: 16.07.2023].

[4] https://www.tup.org.pl/index.php?option=com_content&view=article&id=1863%3Astanowisko-tup-w-sprawie-reformowania-planowania-i-zagospodarowania-przestrzennego&catid=131%3Aartykuly&lang=pl

(PL: "miejscowy plan zagospodarowania przestrzennego", abbreviation: MPZP). The main differences between a SUiKZP and a MPZP are presented in Table 2.

A SUiKZP determines the directions of spatial development and spatial planning policy choice at the local level (particular municipality). The study is not an act of law (not binding), so it does not constitute the basis for issuing administrative decisions. However, the findings of the study are crucial and binding for local plans.

Local plans (MPZP) are required to implement municipal spatial planning policies. The spatial development plan sets land-use rules and conditions for buildings and land on a current and future basis. Moreover, it is one of the four forms of monument protection and care, and it is an act of local law, i.e., legally binding. A particular form of a local spatial development plan may be a local revitalisation plan (PL: "miejscowy plan rewitalizacji", abbreviation: mpr). This is a tool for restoring areas from a state of critical degradation, introduced into the legal system by the Act of 9 October 2015 on revitalisation.

In the absence of a valid MPZP, a building permit may be issued based on an individual administrative decision on land development conditions and land use. It is a kind of legal gap in the Polish planning system. Therefore, a decision does not need to be consistent with the directions of a commune's spatial policy defined in the (local) study of conditions and directions, so this may thrust the cultural landscape and space into chaos. To make things worse, on the 2 January 2022, regulations were adopted which allow single-family residential buildings with a building area of up to 70 sq. m without obtaining a building permit, appointing a construction manager or keeping a construction log.

In local spatial development plans, it is obligatory to define the rules of development and spatial indicators, including the minimum percentage of the biologically active area in relation to the building plot. If the plan is not valid, the bioactive area must also result from the so-called urban analysis, which is conducted before issuing the development conditions necessary to obtain a building permit. Information on the share of biologically active surface is not directly available anywhere, it must always be calculated by an urbanist. This is especially problematic for people who are not proficient in GIS programming and have to calculate these values by hand, usually based on an orthophoto map.

Table 2. The main differences between a SUiKZP and a MPZP in Poland

Criteria	A study of conditions and directions of spatial development (SUiKZP)	A local spatial development plan (MPZP)
Objectives	A document which determines the directions of spatial development and the choice of spatial planning policy	A tool to implement municipal spatial planning policy which sets land-use, and rules and conditions for buildings and land cover

Criteria	A study of conditions and directions of spatial development (SUiKZP)	A local spatial development plan (MPZP)
Legal status	Not binding	Binding (Act of local law)
Scale	1:5,000 to 1:25,000	1:500, 1:10,00 or 1:2,000
Level of detail	A morphological region / zone	Plot / terrain / land use
Land-use division	Not specified in detail	Specified in detail
Other	According to a strict planning procedure, both documents must be prepared based on the Spatial Planning and Land Management Act; the project has to be agreed or opinioned by the Committee for Urban Planning and Architecture, regional authorities and organizations, neighbouring municipalities, etc.	

Source: own work.

3.1.4. Geospatial data used in spatial planning in Poland

The draft of a SUiKZP drawing is made on the basis of a topographic map from the state geodetic and cartographic resource or of a military topographic map. The SUiKZP is prepared on a scale from 1:5,000 to 1:25,000. The MPZP project drawing is made on a copy of the master map with an electronic signature. Planning material must be up-to-date on the day of starting the project[5].

The Head Office of Geodesy and Cartography (GUGiK) launched a collective WMS service called the National Integration of Local Spatial Development Plans (KIMPZP)[6]. Currently, in 300 units, these are vector plans, and in the remaining 993 units they are included in a georeferenced raster format. Geodetic data in Poland is subject to the Geodetic and Cartographic Law Act of 17 May 1989 (Journal of Laws of 2020 Item 276, as amended), which is regulated by the Act of 4 March 2010 on Spatial Information Infrastructure (IIP)[7] (Journal of Laws Item 177).

The most significant and crucial spatial data resources are gathered in the National Geodetic and Cartographic Resource (PL: PZGiK), which is defined in the Geodetic and Cartographic Law Act of 17 May 1989 (Art. 2(10)). For example, BDOO – General geographic objects database (PL: "Baza danych obiektów ogólnogeograficznych") and ORTO/NMT Orthophotomaps and numerical terrain

[5] the Spatial Planning and Land Development Act of 27 March 2003.

[6] Link to the service: https://mapy.geoportal.gov.pl/wss/ext/KrajowaIntegracjaMiejscowychPlanowZagospodarowaniaPrzestrzennego [accessed on: 10.05.2023].

[7] The Act on the infrastructure for spatial information was a consequence of the INSPIRE directive adopted by the European Union in 2007, establishing the European infrastructure for spatial information, and developed with the environment and its protection in mind.

model (PL: "Baza danych zobrazowań lotniczych i satelitarnych oraz ortofotomapy i numerycznego modelu terenu"). Based on Art. 40a of the Geodetic and Cartographic Law, data from PZGiK is provided at a fee. It is available at the GUGiK website (http://www.gugik.gov.pl/pzgik/dane-udostepnia-ne-bez-oplat) and can be used without any restrictions by both the administration and commercial entities.

There are three basic databases containing LULC information in Poland.

1) The Geoportal (www.geoportal.gov.pl) is considered as one of the most important as it integrates data from various sources and is the basic mapping portal for the national spatial data infrastructure.

2) The National Topographic database (BDOT10k) is available in vector format and can be obtained from the Main Office of Geodesy and Cartography. The BDOT10k topographic database provides data on the level of detail corresponding to the topographic maps at 1:10,000. The content of the database is hierarchical, there are 10 thematic classes (level 1). The Land Cover Level 1 is divided into 12 classes (Level 2), and 35 classes (Level 3). The class Land Use Complexes Level 1 contains 10 classes (Level 2), and 52 classes (Level 3).

The Land and Property Register (EGIB) database shows the division of land into types according to the actual use or development. In Poland, the land and building register, also known as the real estate cadastre, is a uniform information system for the entire country that ensures the collection, updating, and provision of information about land, buildings, and premises, their owners, and other entities that own or manage these lands, buildings, and premises. The register is updated regularly.

The register of land and buildings includes information on the following:

1) land – its location, boundaries, area, types of land use and its qualification classes, designation of land registers or sets of documents, if it has been established for the property that includes the land;

2) buildings – their location, purpose, utility functions, and general technical data;

3) premises – their location, utility functions, and floor area.

The register serves primarily to disclose the actual state of properties. The data contained in the registry forms the basis for economic planning, land-use planning, the assessment of taxes and benefits, the designation of real estate in land records, public statistics, real estate management, and farm records. Changes in the data covered by the land and building registry must be reported to the starost competent for the property's location within 30 days. The deadline is calculated from the date of occurrence of these changes (http://www.gugik.gov.pl/projekty/zsin-faza-i/dane-egib). The EGiB database stands not only as a repository of property-related information but as an indispensable tool in Poland's spatial planning landscape. Its capacity to verify residential units, utilisation patterns, ownership, and connections with land records underscores its fundamental role in fostering informed, effective, and transparent planning practices. Unfortunately, the EGIB database is not updated regularly (Jarzmik, 2020).

3.2. The system of spatial planning in Norway

Spatial planning in Norway is regulated by the Planning and Building Act (https://lovdata.no/dokument/NL/lov/2008-06-27-71). Municipalities[8] are the administrative units responsible for, and acting as the decision-making authority in local planning (Table 3). The state, represented by the government or by a county governor, is responsible for plans traversing municipal or county boundaries.[9]

Table 3. The administrative division of Norway, and related documents for spatial planning

Administrative division	Planning documents	Strategic documents
NATIONAL LEVEL: State	• Central government land-use plans (NB: usually developed by municipalities, but commissioned by central government)	• Central government planning guidelines • Central government planning provisions
REGIONAL LEVEL: County (NO: fylke)	• Regional master plan (mainly strategic, limited to a fixed period of time; not obligatory)	• Regional planning strategy (the only obligatory planning document on regional level) • Regional planning provisions (not obligatory)
LOCAL LEVEL: Municipality (NO: kommune)	• Municipal master plan: Social element (kommuneplan, samfunnsdel) • Municipal master plan: Land-use element (kommuneplan, arealdel) • Area zoning plan (områderegulering) • Detailed zoning plan (detaljregulering)	• Municipal planning strategy (obligatory to be renewed every electoral term (4 years))

Source: own work.

[8] A municipality (Norwegian: "kommune") is a Norwegian administrative unit at the NUTS 5 level in the EU statistical system. Norway has 356 (2020) municipalities. The Norwegian "kommune" is also a political and an administrative unit in the system of governance.

[9] An English translation of the part of the Planning and Building Act pertaining to spatial planning is available at https://www.regjeringen.no/en/dokumenter/planning-building-act/id570450/ The translation is for information only, i.e., it is not legally binding. An English explanation of the terminology used in the Planning and Building Act is provided by the government at https://www.regjeringen.no/no/tema/plan-bygg-og-eiendom/plan--og-bygningsloven/plan/veiledning-om-planlegging/Bokmal-nynorsk-ordliste/ordliste-norsk-engelsk--plan--og-bygning/id462717/

3.2.1. National level

"The purpose of central government planning guidelines and decisions is to safeguard national or regional interests in planning" (Art. 3-5, Planning and Building Act). Planning at the national level is the government's responsibility, and administered primarily by the Ministry of Local Government and Modernization. The ministry can set conditions for regional and municipal planning, provide guidelines and provisions, and develop a national land use plan. However, 'national' in relation to a spatial plan basically means that the plan is commissioned by the government, but still usually prepared by municipalities affected.

3.2.2. Regional level

"The purpose of regional planning is to stimulate the physical, environmental, health-related, economic, social and cultural development of a region" (Art. 3–4, Planning and Building Act). Instruments of the regional planning authorities include a planning strategy, master plans, and planning provisions.

3.2.3. Local level

The bulk of spatial planning in Norway is carried out by local (municipal) authorities. "The purpose of municipal planning is to provide favourable conditions for development and the coordinated discharge of functions in the municipality through management of the land and natural resources in the municipality, and by providing a basis for the implementation of municipal, regional, central government and private-sector activities" (Art. 3–3, Planning and Building Act).

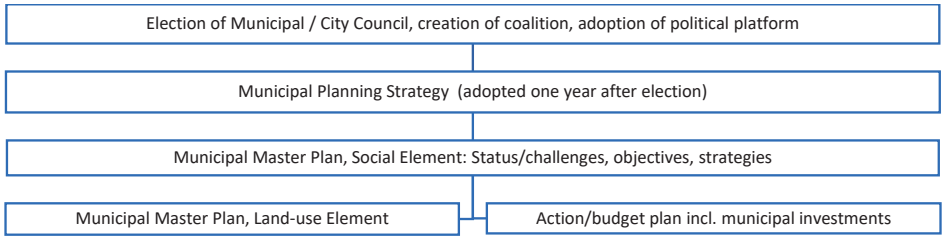

Fig. 2. Basic structure of municipal planning in Norway
Source: Aarsæther (2012), adapted and translated.

The planning instruments at the municipal level include a planning strategy, a master plan, and a number of more detailed zoning plans (Fig. 1). The munici-

pal councils (i.e., elected politicians) shall prepare and adopt a planning strategy at least once in each electoral term (4 years), and no later than one year after its constitution. The strategy shall discuss strategic choices in terms of, among others, long-term land use and environmental challenges. It shall also decide which planning documents may be prolongated, revised or prepared during the term.

Table 4. Central Norwegian planning documents on local level[10]

Criteria	Municipal master plan: Social element	Municipal master plan: Land-use element	Area zoning plan	Detailed zoning plan
Objectives	• Provide a long-term strategy for the societal development of the municipality: • Determine long-term challenges, goals and strategies, • Describe and assess alternative strategies, • serve as the basis for sector plans	• Show the connection between future social development and land use, • State the main aspects of the allocation of land and frameworks and conditions governing which new projects and new land use may be implemented, as well as which important considerations must be considered when allocating land, • Show the main objectives and areas requiring special consideration in relation to the use and conservation of land	Clarify land use in greater detail	Follow up the land-use element of the municipal master plan and, in the event, any requirements established in an adopted area zoning plan
Legal status	Binding: basis for the municipality's own activities and for the activities of the central government and regional authorities in the municipality	Binding for new projects or the expansion of existing projects	Binding for new projects or extension of existing projects	Binding for new projects or extension of existing projects

[10] https://www.regjeringen.no/contentassets/8a9cc8f0885d4f5cb9f32d1f7e3f385e/master_plan_prodspek_del1_arealplan010715.pdf [accessed on: 02.05.2023].

Criteria	Municipal master plan: Social element	Municipal master plan: Land-use element	Area zoning plan	Detailed zoning plan
Scale	None (text document only)	Normally 1:20,000–1:50,000, exceptionally 1:5,000–1:10,000	Normally 1:5,000 or 1:10,000, exceptionally 1:20,000 or 1:50,000	Normally 1:1000–1:2000, exceptionally 1:500–1:5000
Level of detail	Sector level (infrastructure, housing, business activities, municipal services (health, schools, kindergartens, cultural services), environment, etc.)	Entire municipality	Sub-section(s) of municipality	Construction project areas
Land-use division	None	Six land use categories and six kinds of consideration zones	Six types of land use categories, and 14 types of provisions	Six types of land use categories, and 14 types of provisions

Source: own work.

3.2.4. Geospatial data used in in spatial planning in Norway

Part I, Ch. 2 of the Planning and Building Act ("Requirements relating to basic map data, geodata, etc.") includes the following statements regarding responsibilities for map data available to be used in spatial planning:

– "The municipality shall ensure that there is an up-to-date, public set of basic map data for the objectives specified in the Act.

– The central government authorities shall make national map data available to all municipalities.

– Central government, regional and municipal bodies shall organize geodata in such a way as to ensure that the information is readily available for use in processing planning and building applications. The basic map data must also be available for use for other public and private purposes.

– Municipalities shall have a planning register that provides information regarding current land-use plans and other provisions that determine how land is to be used."

The authoritative collection of maps for spatial planning ("Det offentlige kartgrunnlaget", DOK) is defined in the Planning and Building Act. It is a set of national geospatial data for use in public spatial planning. National and local authorities are obliged to produce and maintain these data. The current (January 2021) list consists of 147 datasets, including detailed topographic maps, property and building registers, technical data (mainly infrastructure), and many thematic datasets.[11] The anticipated usefulness, coverage, completeness, technical quality, available documentation, and established routines for maintenance are criteria used to select the datasets on the list. Neither municipal land use master plans nor zoning plans themselves are considered part of the DOK. It is not obligatory for every municipality to use all datasets listed in the DOK. A municipality can also add other datasets (not on the master list) to its municipal DOK, provided that the additional data complies with the DOK regulation.

3.2.5. National databases containing LULC information in Norway

All geospatial data for Norway owned by national or local public authorities is available online together with the necessary metadata and product specifications.[12] The portal is maintained by the national mapping authority (Statens kartverk) and constitutes the core of the Norwegian National Geospatial Data Infrastructure (NGDI; Norge digitalt). The NGDI is mandated in the national Geodata Act and obliges all national and local public entities who produce or use geospatial data to participate in, and share their geospatial data through, the NGDI. Standardisation has been an important part of Norwegian geospatial data policy since 1991. The spatial and thematic accuracy is high and all relevant data is kept in national databases with established data management systems and routines for updating. In order to be a relevant data source for spatial planning in Norway, CLMS would need to either provide better data than currently available, data of the same quality at lower cost, or data filling known gaps in the national repository.

4. DISCUSSION

At the EU level there is no uniform policy concerning monitoring of land cover and land use change (LCLUC). It is probably possible to transform the current recommendations (Kovács *et al.*, 2013) into homogeneous guidelines for all

[11] https://www.regjeringen.no/contentassets/bdd0159c35a94b598f60398d83131df0/offisiell-dok-liste-per-2021b.pdf [accessed on: 02.05.2023].
[12] https://www.geonorge.no/

European countries precisely in the field of using monitoring data to define spatial policy, but there is no practical need for such uniformity at the national level. Conditions and challenges vary between countries, and data and monitoring requirements vary accordingly. Data standardized across Europe is, however, needed by EU authorities and other international organisations. According to the European Commission, land use and land cover data are at the basis for spatial analyses at European level (Ballin *et al.*, 2018). Similar messages and goals are being discussed at the global level (UN Habitat, 2020a; UN Habitat, 2020b; UNECE, 2018; Zhu *et al.*, 2021). The article develops the principles as such into suggestions for concrete practical solutions aiming at a better use of CLMS products.

Neither the Norwegian nor the Polish national Planning and Building Act require any specific monitoring of land cover or land use. The need for land accounting systems is, however, on the agenda. Accounting systems, and the data collected to support them, must be able to address actual information requirements and support policy development in each country. In order to provide useful information, accounting systems must be built on unbiased and reliable data. Strengthening national data series and developing management systems in order to archive copies of national registers at regular time intervals (e.g., annually) seems to be a safer approach than relying on CLMS data.

The spatial planning systems in Poland and Norway have many similarities. The administrative hierarchies are similar, and so is the allocation of spatial planning tasks and responsibilities to the administrative levels. In Poland, four levels of management can be formally distinguished, whereas three in Norway (Table 5). In Poland no spatial documents are prepared on the supra-local level and, therefore, the spatial management systems in both countries are similar. The most notable difference between Poland and Norway is the organisation and administrative routines surrounding the data availability for spatial planning.

Table 5. Administrative levels and responsibilities in spatial planning

Administrative/ political level	Poland	Norway
National	State	State/Government
Regional	Voivodship	County (NO ‚fylke')
Supra-local	County	Not formally existing, national government or county can ask for intermunicipal cooperation when appropriate
Local	Municipality	Municipality (NO ‚kommune')

Source: own work.

Table 6. Planning documents related to administrative levels

Administrative /political level	Poland	Norway
National	• No documents • [Until November 2020: The National Spatial Development Concept 2030 (NSDC 2030)]	• Planning and Building Act with regulations • Central government planning guidelines • Central government planning provisions
Regional	• the voivodeship spatial development plans	• Regional planning strategies • Regional master plans • Regional planning provisions
Supra-local	• No documents	• No formal planning level with documents, however intermunicipal planning cooperation can be encouraged
Local	• the studies of conditions and directions of spatial development (SUiKZP) • local spatial development plans (MPZP) – legally binding documents • administrative decisions on development conditions	• Municipal planning strategies (‘Kommunal planstrategi’) • Municipal master plans: (‚Kommuneplan’) consisting of two parts Social element (‘Samfunnsdel’) Land-use element (‚Arealdel’) • Zoning plans (area) (‚Områderegulering’) • Zoning plans (detailed) (‚Detaljregulering’)

Source: own work.

4.1. Potential of CLMS products in national spatial planning

Spatial planning in Poland and Norway is functional, and the provision of planning documents relates to specific land uses. CLMS products and BDOT/ EGIB refer to land coverage unless individual categories can be linked with the existing share of biologically active area (green area ratio), an obligatory urban indicator in local spatial development plans in Poland.

Poland’s planning documents refer to the target development vision, except of the conditions which are part of the study of conditions and directions from the city. CLMS data does not meet national standards with respect to geometric accuracy, and the thematic accuracy is also variable (Strand, 2022). CLMS products can be used as a source of information in this area for evidence-based

decision-making or to verify to what extent the plan arrangements have been materialised, at least as long as the quality is considered acceptable. This is not the case in Norway. Instead, a national map of green and grey areas is produced for this purpose.

CLMS products can be a source of knowledge for urban planners in terms of where urbanization occurs and its level of advancement. There will, however, be cadastral data, building registers and detailed maps used in the development and implementation of construction projects. These sources provide more detailed and accurate information than CLMS products, and can be useful in spatial planning and land monitoring, provided that they are standardised and collected in a central repository.

There is often a time lag between the implementation of development projects and the updating of official maps and registers. The CLMS could fill this gap by providing information about recent developments that are not yet documented in the registers. Such an approach would require a data management regime capable of temporarily updating registers using recent CLMS data, and later replacing this information by field data when those have become available.

CLMS products could also be a source of information about the development of space in the share of individual surfaces in the road space (asphalt/ concrete/ sidewalk/ greenery), in situations where this information is absent in the registers provided by national road authorities. It would, however, require levels of geometric and thematic accuracy that are rarely seen in current CLMS products.

The use of CLMS data as a supplementary resource for updating land and building registers would require careful consideration: while CLMS data could provide valuable insights into land cover dynamics, its limited detail and lack of geometric and thematic accuracy question its viability as a standalone tool for spatial planning decisions. Though a CLMS could serve as a landscape trend indicator, its lack of detailed information might hinder direct use in spatial planning. Nevertheless, integrating CLMS data within a broader framework, alongside more detailed data sources, could enhance the updating of land and building registers. While not ideal for direct spatial planning decisions, CLMS data's role as a complementary source can contribute to a more comprehensive approach to spatial data management and analysis. The CLMS could be a source of knowledge about spatial developments (e.g., a new building, the extension of an existing building, demolition, etc.) and thus indicate a need to verify the purpose and detailed classification to supervisory institutions.

Norway has a national map portal (www.geonorge.no) providing spatial planners with access to relevant land use and land cover information stored in national databases. In Poland, there is no such central database offering similar access to different spatial information in one portal. Users of spatial databases in Poland lack a publicly available map of the country's land use and land cover, presenting

both the current level of development and archival versions allowing users to compare situations with regard to detect changes over time. What would be desirable is a portal that would integrate: high-resolution data, land contours, soil and agricultural maps, information on urban heat islands, and data on social processes as registered by Statistics Poland.

It is also important to highlight that spatial planning would need a reliable and user-friendly tool, which would help planners harmonise and combine various datasets on land cover, land use, and changes.

5. CONCLUSION

Spatial planning systems in Poland and Norway have similar policy objectives. The planning system in Norway seems to be more orderly, if only because it does not provide for personal administrative decisions on development conditions, which may be issued contrary to the city's spatial policy and are considered a spatial pathology in Poland. Data availability also differs between the two countries. National repositories and access policy seem to be more organised in Norway, with a formal spatial data infrastructure developed and managed under a national Geospatial Data Act that secures public authorities, including spatial planners, and access to data across sectors.

National, European, and global bodies indicate the need for reliable spatial data and continuous monitoring of spatial planning, land use and land cover, and their change. Moreover, European and global bodies require data to be harmonised and comparable for larger regions involving many countries. Planners need similar data to make evidence-based informed decisions, but they do not depend on international standardisation. It is more important that data meets national requirements.

Official national data is reliable and usually very detailed. In Norway, they also include elements of development that were created without a proper building permit or are at the initiative of the property owner, usually identified on aerial photographs obtained through regular surveys. In countries without such a detection system, the CLMS can potentially be a tool to provide information for spatial planning by filling gaps in national registers. Delayed updating of public registers can also be relieved through temporary updates using CLMS data, provided that it is replaced by more detailed or accurate data upon availability.

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