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**MOBILITY IN THE CENTURY OF METROPOLISES: A SUSTAINABLE AND  
MULTIDIMENSIONAL APPROACH TO PUBLIC FUNCTION OF COMMON  
INTEREST**

CAXIAS DO SUL

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Doctoral Dissertation submitted to the  
Committee designated by the Collegiate of the  
Doctoral Business Program of the University of  
Caxias do Sul as part of the requirements for  
obtaining the Doctoral Degree in  
Administration.

Advisor: Prof. PhD. Ana Cristina Fachinelli  
Bertolini

Co-supervisor: Prof. PhD. Janaína Macke

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CAXIAS DO SUL  
2024

To my mother, Raquel, and my father, Décio (in memoriam), for their personal sacrifices to provide us with the best education. To my siblings, Andi and Nica, for their unwavering support of my choices. To my wife, Lais, and my son, Vicente, for their daily understanding and for recognizing the importance of the pursuit of knowledge in my life. And to God the Father, for the gift of life.

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Seek the prosperity of the city (...), for your prosperity depends on its prosperity (Jeremiah 29:7).

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We live in regions where no municipality is willing to yield, as no one wants to give anything up, yet ultimately, everyone ends up losing



## ABSTRACT

The 21st century, known as the "metropolitan century," sees over one-third of the global population residing in large cities. This phenomenon has been explained by classical theories, such as Central Place and Growth Pole theories, which associate urban growth with human mobility. Mobility emerges as a central theme for municipalities within metropolitan regions, being essential to meet the daily needs of the population and to foster sustainable development. However, territorial management and the formulation of integrated administrative solutions face significant challenges due to the institutional and geographical complexity of these regions. In this context, this thesis proposes to analyse the multiple dimensions of mobility as a Public Function of Common Interest (FPIC), defining the necessary attributes to make a metropolitan region sustainable. Adopting a mixed-method case study, the research seeks to develop a model capable of measuring, qualifying, and monitoring metropolitan evolution based on relational and affective analyses that contribute to institutional, economic, and territorial decision-making. Sustainable mobility is explored as an integrative mechanism, connecting urban planning, environmental policies, and city resilience to human movement demands. The thesis explores metropolitan regions through case studies of Greater London, Porto Alegre, and Serra Gaúcha, comparing their contexts and mobility solutions. The findings of the thesis contribute to the field of sustainable mobility in metropolitan regions by proposing an integrated framework that defines four key dimensions - regulation, urban development, innovative culture, and resilience - alongside twelve critical attributes and sixteen horizontal pathways. These elements offer scalable strategies to enhance urban-rural connectivity, foster socio-spatial integration, and support adaptive metropolitan governance. Incorporating stakeholder and citizen perspectives from diverse contexts, the framework ensures flexibility and relevance to varying regional conditions. This approach enhances the understanding of socio-spatial interdependencies and serves as a practical tool for formulating effective, context-sensitive policies to advance sustainable metropolitan development.

**Keywords:** Greater London; Metropolitan Region; Metropolitan Region of Porto Alegre; Metropolitan Region of Serra Gaúcha; Sustainable Metropolis; Sustainable Mobility

## RESUMO

O século XXI, conhecido como o "século metropolitano," apresenta mais de um terço da população global residindo em grandes cidades. Esse fenômeno é explicado por teorias clássicas, como as teorias do Lugar Central e dos Polos de Crescimento, que associam o crescimento urbano à mobilidade humana. A mobilidade emerge como um tema central para os municípios em regiões metropolitanas, sendo essencial tanto para atender às necessidades cotidianas da população quanto para promover o desenvolvimento sustentável. No entanto, a gestão territorial e a formulação de soluções administrativas integradas enfrentam desafios significativos devido à complexidade institucional e geográfica dessas regiões. Nesse contexto, esta tese propõe analisar as múltiplas dimensões da mobilidade como uma Função Pública de Interesse Comum (FPIC), definindo os atributos necessários para tornar uma região metropolitana sustentável. Adotando um estudo de caso com abordagem de métodos mistos, a pesquisa busca desenvolver um modelo capaz de medir, qualificar e monitorar a evolução metropolitana com base em análises relacionais e afetivas que contribuam para a tomada de decisão institucional, econômica e territorial. A mobilidade sustentável é explorada como um mecanismo integrador, conectando planejamento urbano, políticas ambientais e resiliência urbana às demandas de movimento humano. A tese explora regiões metropolitanas por meio de estudos de caso na Grande London, Porto Alegre e Serra Gaúcha, comparando seus contextos e soluções de mobilidade. Os resultados da tese contribuem para o campo da mobilidade sustentável em regiões metropolitanas ao propor um framework integrado que define quatro dimensões centrais - regulação, desenvolvimento urbano, cultura inovadora e resiliência - juntamente com doze atributos críticos e dezesseis caminhos horizontais. Esses elementos oferecem estratégias escaláveis para fortalecer a conectividade urbano-rural, promover a integração socioespacial e apoiar uma governança metropolitana adaptativa. Incorporando as perspectivas de stakeholders e cidadãos de contextos diversos, o framework assegura flexibilidade e relevância em diferentes condições regionais. Essa abordagem aprofunda a compreensão das interdependências socioespaciais e serve como uma ferramenta prática para a formulação de políticas eficazes e sensíveis ao contexto, visando o avanço do desenvolvimento sustentável em regiões metropolitanas.

**Palavras-chave:** Grande Londres; MetrÓpole; Região Metropolitana; Região Metropolitana de Porto Alegre; Região Metropolitana da Serra Gaúcha; MetrÓpole Sustentável; Mobilidade Sustentável.

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## ABBREVIATIONS LIST

AMEM	Metropolitan Association of Municipalities
AMESNE	<i>Associação dos Municípios da Encosta Superior do Nordeste</i>
ASSUME	Metropolitan Affairs Authority
AU	<i>Aglomeração Urbana</i>
AUNE	<i>Aglomeração Urbana do Nordeste</i>
AULN	Northern Coastal Urban Agglomeration
AVE	Average Variance Extracted
AUS	Southern Urban Agglomeration
CF	<i>Constituição Federal</i>
CFA	Confirmatory Factor Analysis
CMM	Metropolitan Municipal Council
COREDE	<i>Conselhos Regionais de Desenvolvimento</i>
CPT	Central Place Theory
CSR	Corporate Social Responsibility
DUNBS	Department of Urban Surveys of National Bureau of Statistics of China
DWLS	Diagonally Weighted Least Squares
EC	<i>Estatuto da Cidade</i>
EM	<i>Estatuto da Metrópole</i>
FPIC	Public Service of Common Interest
FT	Flow Theory
FUAs	Functional Urban Areas
GDP	Gross Domestic Product
GERM	Metropolitan Region Executive Group
GHG	Greenhouse Gas
GLA	Greater London Authority
GMA	Gothenburg Metropolitan Area's
GPT	Growth Pole Theory
GRANPAL	Porto Alegre Metropolitan Region Municipal Association
IBGE	Brazilian Institute of Geography and Statistics
IIASA	International Institute for Applied Systems Analysis

IPCC	Intergovernmental Panel for Climate Change
IPEA	Institute of Applied Economic Research
KMO	Kaiser-Meyer-Olkin
METROPLAN	Metropolitan Planning Foundation
MR	Metropolitan Regions
NEG	New Economic Geography
NUA	New Urban Agenda
OECD	Organisation for Economic Co-operation and Development
ONU	<i>Organización de las Naciones Unidas</i>
PDUI	Integrated Urban Development Plan
PNDU	National Urban Development Policy
PPGA	Graduate Program in Administration
PTAL	Public Transport Accessibility Levels
RIDEs	Integrated Development Regions
RMPA	Metropolitan Region of Porto Alegre
RMSG	Metropolitan Region of <i>Serra Gaúcha</i>
SDG	Sustainable Development Goals
SEG	Systemic Economic Geography
TfL	Transport for London
TRENSURB	Empresa de Trens Urbanos de Porto Alegre
UA	Urban Agglomeration
UDP	Unitary Development Plan
UHIE	Urban Heat Island Effect
ULQI	Urban Landscape Quality Index
UN	United Nations
WUP	World Urbanisation Prospects



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## 1. INTRODUCTION

By 2050, two-thirds of the global population will live in urban areas, many of them organized into metropolises. This scenario intensifies the challenges faced by metropolitan regions, including congestion that consumes billions of productive hours, alarmingly high levels of greenhouse gas emissions, and widening social inequalities. At the core of these issues lies mobility, an essential element for fostering balance between urban growth, environmental sustainability, and quality of life. This research explores sustainable mobility as a strategic axis to rethink metropolitan development in the 21st century.

The urgency of addressing these challenges is underscored by current trends. By the end of 2024, an estimated 1,982 metropolises worldwide will have populations exceeding 300,000 (ONU-Habitat, 2020a). Currently, 32.5% of the global population, approximately 2.6 billion people, live in metropolises. In 2024, demographic data indicates that about 62% of the global population will reside in countries and regions experiencing growth in metropolitan areas (UN-DESA, 2024). According to the report, the global population is projected to reach about 9.7 billion by 2050, continuing the growth trend outlined in the report's medium scenario. It is estimated that approximately 325 new metropolises will emerge worldwide by 2035, equating to the formation of two new metropolises every two weeks. Population growth will be primarily driven by Asia and Africa, while Europe is expected to remain stable, and Latin America will experience slower growth. Currently, Asia hosts 1,038 metropolises, accounting for 56.11% of the global total, followed by Western Europe with 325 metropolises (15.76%), Latin America and the Caribbean with 215 (12.5%), Africa with 235 (11.7%), and Eastern Europe with 121 (3.9%) (ONU-Habitat, 2020a).

Studies on metropolises encompass various terms, such as metropolitan regions; (Hansen, 1959; Luck; Wu, 2002; Alberti, 2005; Kennedy; El-Yan, 2007; Catalán et al., 2008; Smith, 2013; Moreno-Monroy et al., 2020), urban agglomeration, as defined by the Department of Urban Surveys of the National Bureau of Statistics of China (DUNBS) (Sun et al., 2022), as well as megacity, city group, and city cluster (Fang; Yu, 2017). Metropolises are also analysed in studies that consider the limitations of territorial boundaries. Academics, public and private administrators, and communities face challenges in developing new research and specific actions for clusters of municipalities or urban regions. Concepts such as space (Santos, 1979), spaces of places, networks, and flows (Castells, 2004), city-state (Keene, 2004), city-region (Parr, 2005), regional spaces (Harrison; Growe, 2014) and urban-regional (Rauhut, D; Humer, 2020) are central to understanding these complexities. This treatise recognizes that a set of

municipalities (both urban and rural) with common interests, aligned with criteria defined by regulations, constitutes a metropolitan region.

A metropolitan region (MR), as defined in this thesis, is a spatially interconnected network that integrates urban and rural areas within a unified territory, defined by shared economic, social, and infrastructural linkages with permeable boundaries between municipalities. It includes a central city and surrounding municipalities that function collaboratively as a cohesive entity focused on sustainability. This concept underscores the importance of coordinated governance, integrated mobility, and regional planning to balance urbanisation, environmental resilience, and quality of life across municipal boundaries, addressing both local needs and broader regional challenges.

Metropolises are major urban centers characterized by their functional integration of urban and rural areas, particularly in relation to mobility and territorial planning. Internationally, the OECD defines Functional Urban Areas (FUAs) based on spatial continuity between urban centers and their commuting zones, emphasizing the role of social and infrastructural connectivity in fostering sustainable metropolitan systems. The United Nations further identifies metropolises as hubs of economic and social development, though global disparities persist in integrating mobility with metropolitan governance.

In Brazil, the definition of metropolises and metropolitan regions is established by the 1988 Federal Constitution and the Metropolis Statute (2015). A metropolis is a contiguous urban agglomeration of significant demographic, economic, and political relevance, exerting national or regional influence. Metropolitan regions, on the other hand, are administrative units created by states to coordinate public services of common interest, such as transportation and sanitation. The Brazilian Institute of Geography and Statistics (IBGE) refines this definition by hierarchically classifying urban centers, distinguishing national and regional metropolises based on population size, economic activity, and territorial influence. Additionally, IBGE's concept of population arrangements highlights the interdependence of municipalities through commuting flows and urban continuity, reinforcing the need for coordinated actions to ensure effective metropolitan governance.

Understanding territorial dynamics in metropolises requires the analysis of complex and diverse data, a task commonly undertaken in the fields of geography and economics. These disciplines provide extensive insights into the interactions between natural environments and human societies, social stratification and development, and the connections between local and global spaces. One notable approach is Systemic Economic Geography (SEG), which aims to offer historical perspectives and insights into the spatial organization of regional settlements.

Similarly, New Economic Geography (NEG) seeks to explain the perspectives of individuals and businesses within urban agglomerations and their relationship with the global economy (Dzieciecki et al., 2021). Other significant works in this area include studies by (Banaszak et al., 2015) and (Holmes et al., 2000).

Metropolises are often conceptualized as clusters of centers, with terms as polycentric (Derudder et al., 2021) and polycentric regions (Rauhut; Humer, 2020) gaining prominence. Various studies have addressed specific policy recommendations across diverse sectors, such as tourism (Gmeiner, 2021); updates on the relationship between population and space (Dmitriev, 2021), or *Metromontano* – regional territorial analysis, including the study of Italian mountain regions (Barbera; De Rossi, 2021). Other research focuses on regional analysis through Central Place Theory (CPT), supplemented by Flow Theory (FT) (Taylor; Hoyler, 2020), new metrics and indicators for urban land use (Shi et al., 2020), and spatially-oriented and non-spatially-oriented theories related to concepts like creative cities, compact cities, and smart cities (Kowalczyk, 2020). Additional studies explore varied themes such as responses to rural settlement projects (Phokaides, 2018), functional regions and new central places (Saenz Zapata; Garza, 2019), spheres of influence based on data and indicators (Banaszak et al., 2019), and critical assessments of CPT in mining districts; critical appraisal of the central place theory in a mining district (Diers, 2018). Research on social interaction within metropolitan regions (Farber et al., 2013), and discussions on new regionalism (Wheeler, 2002) further enrich the field. Common to these studies is a deep examination of regional territories through diverse case studies, even in planning units that lack formal legislative recognition.

Research on ecological processes, sustainability, and human-environment interactions underscores the importance of the regional scale for understanding and addressing issues that impact a territory as a whole. Sol et al, (2013), highlight the role of social learning across different societal sectors in fostering regional innovation, stressing the significance of considering human interactions within this context. For instance, Duque-Cane (2024) emphasizes the role of departments, beyond municipalities, particularly in the direct provision of services. Similarly, Da Silva and Fenandes (2024) examine smart governance in São Paulo's metropolitan region, highlighting the need for improved use of geoinformation and territorial cadastres to enhance urban management. From an urban-regional perspective, dynamics arise from interactions among urban areas within a municipality, driven by the flow of people, goods, and services, and often extend across multiple municipalities within a region or metropolitan area.

Further studies address environmental concerns, such as the link between green spaces

and increased flood vulnerability in disadvantaged communities in Philadelphia, advocating for integrated flood management to promote equity (Asl, 2024). In another context, Choi et al., (2024) introduce a method to assess ground risk in urban air mobility, identifying higher risks in densely populated areas like Seoul, especially during peak periods.

While some studies highlight negative aspects, others acknowledge positive contributions from recent legislation and management initiatives. These include actions in family farming, sanitation, metropolitan governance, public-private partnerships, and public consortia (Costa; Pantoja; Marguti, 2014); various Public Functions of Common Interest (FPIC) in transportation, sanitation, and land use Institute of Applied Economic Research (IPEA, 2014), expansion of metropolitan train services (Dos Santos; Sobral, 2014); collective action for rural development (Ribeiro et al., 2015); methods for developing indicators for sustainable regional planning (Rezende; Sinay, 2016); and indices of sustainable development (Lima et al., 2021).

Regardless of whether the findings on metropolises are positive or negative, whether there is progress or decline, or whether urbanisation is advancing or not, the issue remains a challenge for both public and private sectors at national and international levels. This thesis has permeated the academic world, inspiring researchers to seek solutions for identified problems. The impact of it is not only in the final analysis of urban phenomena but also in the process of reflection and recognition of past achievements. This includes fostering an understanding of the territory, valuing natural reality without geographic limits, and integrating urban and rural environments without opposition. A specific focus on key issues in metropolitan development may reveal essential underlying factors for harmonious territorial growth. The role of mobility, as noted in previous studies (Giannotti et al., 2016; Zheng; Chen, 2019; Lim; Heo, 2019; Kulkarni et al., 2019; Kraemer et al., 2020; Poltimãe et al., 2022; Caballini et al., 2024; Valenzuela-Aguilera; Romero-Tecua, 2024; Piras et al., 2024) along with mobility in metropolitan regions (Cavalcanti et al., 2017; Melkonyan et al., 2020; De Moraes; Dos Santos, 2020 and Ojeda; Ruiz, 2021) is central as it represents human movement in the pursuit of living spaces within cities. This thesis recognizes that sustainable mobility is essential for studying and understanding the dynamics of metropolitan regions. It asserts that progress in defining criteria for the formation of metropolitan regions and evaluating them across various aspects is unattainable without addressing related themes.

Building on the essential role of mobility in metropolitan development, it is crucial to recognize that cities themselves are shaped by a continuous series of decisions, reflecting both successful and flawed approaches to urban planning. The design and organization of urban

spaces are inextricably linked to how people choose to move within them, highlighting the interplay between mobility systems and the urban environment into metropolitan context. This cause-and-effect relationship, as eloquently noted by Winston Churchill in 1944, underscores the profound impact of transportation infrastructure: “First we shape our mobility system, and afterwards that mobility system shapes us” (Brömmelsroet; Verkade, 2020). Thus, the strategic planning of mobility is not merely about facilitating movement but about actively shaping the structure, dynamics, and livability of metropolitan regions.

One of the key factors influencing productivity and human behaviour in metropolitan areas is mobility. The way people and goods move significantly impacts regional growth and development, making mobility a crucial indicator for assessing metropolitan dynamics (ONU Habitat, 2020). In urban settings, mobility is defined by the movement of people and goods across various modes of transport to reach specific destinations (Vidovic et al., 2019). Mandatory travel includes routine, commuting movements such as trips to work or school, while voluntary travel usually involves personal activities related to commerce, culture, recreation, or tourism. Both types of travel feature pendular movements characterized by round trips. Mandatory movements often condition subsequent voluntary travel, while voluntary movements are less likely to dictate mandatory ones. It is essential for the economic, social, environmental, and political development of a region, affecting the livability and functionality of cities (Berrone et al., 2016). Mobility can manifest as a set of daily user decisions or follow standardized patterns based on citizen routines and behaviours, while human mobility patterns reflect behaviours ranging from regular routines (e.g., commuting to work or school, traveling for vacations or religious gatherings, or seeking seasonal employment) to irregular activities (Meredith et al., 2021).

Behavioural studies at community or local scales provide further insights into mobility. The relationship between common interests, needs, and behaviours helps explain how people travel. “(...) It is popularly conceived as a group of people sharing common interests, needs, and behaviours,” state Zignani and Rossi (2013, p. 314). Similarly, local characteristics, such as population density, land use, and function, create points of interest or geolocations that drive new demands as mentioned by the same authors.

Mobility is closely linked to sustainability. According to the Intergovernmental Panel on Climate Change (IPCC), greenhouse gas (GHG) emissions have doubled since the 1970s and may increase by 50% by 2035, potentially doubling by 2050 IPCC (2014 *apud*, Nikolaeva et al., 2019). The IPCC (2021) studies confirm the projected temperature rise of 1.5°C between 2021-2040 and 1.6°C between 2041-2060 in the SSP1 scenario, highlighting the need to

incorporate mobility into global sustainability policies. Automobiles account for 80% of GHG emissions, necessitating systemic actions to promote alternative modes of transport IPCC (2014 *apud*, Nikolaeva et al., 2019). The environmental impact of emissions is measurable and calls for reduction strategies.

Sustainable mobility seeks to maintain people's ability to travel and transport goods while balancing environmental and socioeconomic aspects, aiming to reduce adverse environmental impacts (Krukke; Ernsteins, 2019, p. 954). An integrated approach to mobility and sustainability is recognized by the United Nation (UN), which promotes sustainable transport analysis. This sustainable analysis relates to assessing urban metabolism concerning city movements and maintaining balance in transportation patterns, speed, location, connectivity, coverage, and the quality of individual experiences within a framework of actor integration. (ONU-HABITAT, 2020, p. 40).

This sustainable analysis aligns closely with globally recognized frameworks that emphasize holistic urban planning. Among these, the New Urban Agenda (NUA) and the Sustainable Development Goals (SDGs), developed by the UN (2015) and UN-Habitat (2020), provide comprehensive approaches to achieving balanced urban growth. The NUA seeks to integrate actions across various sectors, aiming to unify global development agendas among the public sector, private sector, and communities. The SDGs, on the other hand, are structured challenges with indicators designed to ensure more sustainable communities and living environments. Both frameworks acknowledge the importance of mobility within urban structures and its interrelations with other critical areas.

(...) sustainable transport and mobility in the NUA, such as sustainable transport infrastructure and services generation; rural-urban linkages; travel demand management; road safety; climate change, air quality and energy efficiency; freight transport; land use, urban transport planning; transport poverty, equity and inclusion; capacity building; and sustainable transport financing (UN-HABITAT, 2020a, p. 10).

The relationship between sustainability and mobility has been a recurring theme in the literature. Schipper et al. (2020) note that this issue has been discussed since the industrial and urban revolutions of the 1850s. During this period, urban policymakers -active members of international networks - met at World's Fairs, starting in 1851, to share global best practices on issues related to the industrial era. These discussions included concerns over rising fossil fuel consumption and its connection to the growing trends in industrial production and automobile



use. Visionary networks anticipated what unfolded over the next century, with fossil fuel consumption soaring in the 1950s, a century later <sup>1</sup>.

According to Schipper et al. (2020), mobility encompasses the movement of people within cities but also extends to connections between cities and other urban, provincial, national, and global areas. They advance this analysis by recognizing how mobility affects cities' interactions and their association with other approaches, such as urban planning. "Cities typically do not function in isolation; they interact. Major cities often lead the transnational circulation of urban planning ideals and sustainable mobility" <sup>2</sup> Saunier (2002 *apud* SCHIPPER et al., 2020, p. 05).

Sustainable mobility in metropolitan regions is a progressive, collective policy framework that prioritizes efficient, low-impact, and accessible transportation modes across interconnected urban and rural areas. It fosters a cohesive transit system that emphasizes public transit, cycling, and walking, while also advancing democratic public spaces and prioritizing people over vehicles. This approach not only educates and engages citizens in sustainable practices but also promotes coordinated governance across municipal boundaries, supporting environmental resilience, social inclusivity, and enhanced quality of life throughout the metropolitan region.

This treatise recognizes sustainable mobility in metropolitan regions as a progressive, collective policy framework that prioritizes efficient, low-impact, and accessible transportation modes across interconnected urban and rural areas. It fosters a cohesive transit system that emphasizes walking, cycling, and public transit, while advancing democratic public spaces and prioritizing people over vehicles. This approach not only educates and engages citizens in sustainable practices but also promotes coordinated governance across municipal boundaries, supporting environmental resilience, social inclusivity, and enhanced quality of life throughout the metropolitan region.

The topic of mobility - particularly its ties to territory and sustainability - cannot be analysed in a standardized manner. Large cities with populations exceeding 500,000 require different levels of service than smaller cities. In larger urban centers, the relationship between urban and rural areas, commute times, and quality of life is perceived and planned differently

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<sup>1</sup> Qualitative analysis of Christian Pfister, "The '1950s Syndrome' and the Transition from a Slow-Going to a Rapid Loss of Global Sustainability", in *Turning Points in Environmental History*, ed. Frank Uekötter (Pittsburgh: University of Pittsburgh Press, 2010), 90-117; and recently Harry Lintsen, Frank Veraart, Jan-Pieter Smits, and John Grin, *De Kwetsbare Welvaart van Nederland* (Amsterdã: Prometheus, 2018), for statistical evidence of the take-off of the 50s.

<sup>2</sup> Pierre-Yves Saunier, "Taking the Bet on Connections: The Municipal Contribution," *Contemporary European History* 11, no. 4 (2002): 507–27. See also Oldenziel et al., this volume.

from smaller towns. In major metropolitan regions, issues like anonymity, loss of identity, culture, and familiar landmarks are common, resulting in greater demand for collective and motorized transport. In contrast, smaller cities rely more on non-motorized modes, such as bicycles, and combine urban and rural characteristics with a strong sense of community. Within metropolitan regions, these varied realities coexist, integrating smaller towns with larger cities that function as regional hub.

## 1.1 PROBLEMATISATION

The UN's vision of a better quality of life for all in an urbanizing world (ONU-Habitat, 2020a) highlights the significant challenges cities face today. Improving citizens' quality of life requires that public administrators make decisions based on accurate, comprehensive, and reliable information. However, access to such data is often limited, especially in countries where databases are not regularly updated or made accessible. This lack of reliable data complicates territorial assessments, diagnostics, and projects, often leading to solutions that do not address root problems or meet the goal of enhancing quality of life.

Currently, decision-making in this context is frequently based on uncertainty, as it relies on incomplete, unreliable, or inaccessible data regarding demographic, physical, environmental, social, economic, cultural, and urban service dynamics (ONU-HABITAT, 2020a, pag. xi).

The data availability issue is particularly acute in densely populated regions, such as metropolises, which house approximately two thirds of the global population (OECD, 2018). The lack of reliable information and clear, convergent concepts for defining and evaluating metropolises presents a global challenge. Each country approaches this issue based on its specific context, resulting in diverse definitions and criteria for classifying metropolises across regions. The UN's World Urbanisation Prospects (WUP) offers insights into the concept of metropolises (UN-EGM, 2020, p. 04) and metropolitan areas (UN-DESA, 2018). Similarly, the Organisation for Economic Co-operation and Development (OECD) has introduced the concept of Functional Urban Areas (FUAs) (UN-Population Division, 2020).

Addressing this global challenge requires countries to develop frameworks tailored to their unique urban contexts. In Brazil, federal legislation and studies by the Brazilian Institute of Geography and Statistics (IBGE) have made significant efforts to establish clear concepts and criteria for defining metropolises. In an IPEA (2013) publication, researcher Firkowski (2013) addresses the challenges of reconciling the concepts of metropolises and metropolitan

regions in Brazil. In the same publication, Klinf (2013) reflects on metropolitan governance and socio-spatial segregation, while Branco et al. (2013) propose defining current metropolitan regions based on criteria from the 1970s. This complexity in Brazil has also been explored by IPEA (2013, 2014), Balbim (2016), IBGE (2016), Silva et al. (2018), among others.

Studies on metropolitan territories do not always incorporate these definitions and analysing the dynamics and behaviours of people and goods within these territories is even more challenging. The concentration of people, wealth, and services in a single area requires coordinated territorial management, economic sustainability, and regionally integrated business practices. These relationships are established through connectivity among road infrastructure, urban and rural networks, transportation systems, and the mobility of people and goods. Each metropolis has common elements that require specific territorial analyses, studied in various ways, including: central hierarchies meeting social needs (Ciechocinska, 1984), regional economic space (Holmes et al., 2000), urbanisation cycles (Antrop, 2004); the integrated urban development plan (Moura; Cardoso, 2004), spatial-economic relations (Venables, 2005), knowledge-based territorial development (Yigitcanlar et al., 2008), socio-spatial relations (Jessop; Brenner, 2008), nationalization, globalization, and metropolitanization (Brenner, 2011), the national urban mobility system (BRASIL, 2012), metropolitan governance (Costa et al., 2014); complex universal issues (Harrison; Growe, 2014), Public Functions of Common Interest, (BRASIL, 2015), intrametropolitan mobility (Benini, 2018), scale delineation (Peres et al., 2018), temporary migration (Orum; Collins, 2019), criteria for metropolitan formation and definition (Dijkstra et al., 2019), common mobility (Nikolaeva et al., 2019), Sustainable mobility scale territorial phenomena (ONU-Habitat, 2020b), commuting within the same territory (Moreno-Monroy et al., 2020), real-time information (Lermana et al., 2020), mobility language (Brömmelstroet; Verkade, 2020), mobility as a service (ITF, 2021), Sustainable mobility scale (Bebber et al., 2021) and among others.

The interaction between the movement of people and goods within metropolitan areas necessitates assessing mobility's influence on territorial dynamics. In this research project, the relationship between movement, displacement, and the relocation of people and goods is defined as mobility. Consequently, the project focuses on the variables of metropolises and mobility, a relationship addressed in legislation and various frameworks for territorial organization and development.

In Europe, Functional Urban Areas (FUAs) are defined using a four-step methodology: identifying an urban center, a city composed of one or more local units, a commuting zone, and a functional urban area. This method considers the relationship between metropolitan and

mobility variables (Dijkstra, et al., 2019). Globally, however, similar frameworks often fail to recognize the links between metropolises and mobility (UN-Population Division, 2020), as regional mobility does not adhere to municipal boundaries.

While Europe's FUA framework demonstrates an integrated approach to urban planning and mobility, the global inconsistency in recognizing metropolitan-mobility interdependencies underscores a significant policy gap. This issue is further pronounced in Brazil, where recent legislative updates highlight ongoing challenges in harmonizing metropolitan and mobility policies and defining institutional structures.

At the national level, recent legislative<sup>3</sup> updates reflect ongoing challenges in aligning metropolitan and mobility policies and establishing clear criteria for forming institutional arrangements in Brazil. This is evident in Article 21, Section XX, and Article 182, Section 1 of the *Constituição Federal* (CF):

Art. 21. The Union is responsible for:

...

XX - setting guidelines for urban development, including housing, basic sanitation, and urban transport.

Art. 182. Urban development policy, executed by municipal public authorities according to general guidelines, aims to ensure cities' social functions and improve residents' well-being.

Section 1: The Master Plan, approved by the Municipal Council, is mandatory for cities with over 20,000 inhabitants as a primary tool for urban development and expansion (BRASIL, 1988, our translation).

Thirteen years after the *Constituição Federal*, these articles were regulated through the *Estatuto da Cidade* (EC) (Law n°. 10,257, 2001)<sup>4</sup> which outlines urban policy goals and the responsibilities of the union and master plans:

Art. 2. Urban policy aims to promote cities' social functions and property through the following general guidelines:

(...)

VII - integration and complementarity between urban and rural activities to support municipal and regional socioeconomic development.

(...)

Art. 3. The Union's responsibilities for urban policy include:

(...)

IV - setting guidelines for urban development, covering housing, basic sanitation, transport, mobility, and public accessibility standards.

(...)

Art. 41. The Master Plan is mandatory for cities:

<sup>3</sup> Law n°. 14,000 of May 19, 2020, amended Law n°. 12,587 of January 3, 2012, which establishes the guidelines of the National Urban Mobility Policy, to provide for the development of the Urban Mobility Plan by municipalities.

<sup>4</sup> It regulates articles 182 and 183 of the *Constituição Federal*, establishes general guidelines for urban policy, and provides other measures. This law is known as the *Estatuto da Cidade*.

(...)

Section 2: Cities with over 500,000 inhabitants must develop an integrated urban transport plan compatible with, or included in, the Master Plan. (BRASIL, 2001, our translation).

Neither the CF nor the EC mandates metropolitan and mobility integration, except for cities with over 500,000 residents, which must have an integrated urban transport plan. This requirement conflicts with the 2012 federal law n°. 12,587, which introduced the national urban mobility policy, defining it as an instrument of urban development policy and mandating urban mobility plans, without recognizing the integrated urban transport plan:

Art. 24 mandates:

Section 1:

I - for cities with over 20,000 residents,

II - for metropolitan regions, integrated development regions, and urban agglomerations with populations exceeding 1 million,

III - for tourism areas, including coastal cities with significant tourist influxes on weekends, holidays, and vacations, as defined by the Executive.

Section 1-A: The Urban Mobility Plan must align with respective Master Plans and, where applicable, with integrated urban development plans and metropolitan transport and mobility plans (BRASIL, 2012, our translation).

Despite previous legislation lacking in cohesive metropolitan and mobility policies, the EC was updated in 2020 to include Section 1-A in Article 24, reinforcing the need for compatibility among master plans and other relevant plans:

Art. 24.

(...)

Section 1-A: The Urban Mobility Plan must integrate and align with Master Plans and, when applicable, with integrated urban development and metropolitan transport and mobility plans (BRASIL, 2020, our translation).

Prior to this update, the Brazilian congress enacted the Metropolitan Statute (Law n°. 13,089, 2015), establishing “(...) general guidelines for planning, managing, and executing public functions of common interest in metropolitan regions and urban agglomerations (...)” (Brazil, 2015). However, this statute does not address mobility, only requiring the preparation of an integrated urban development plan (PDUI) without setting minimum content standards.

In analysing current legislation on regional and metropolitan planning, the concept of FPIC stands out. FPIC is defined as a "public policy or action whose execution by a single municipality is either unfeasible or impacts neighboring municipalities." However, the law does not specify which FPICs plans must address. The *Constituição Federal*, through Article 23, Section IX, requires the recognition and promotion of "housing, living conditions, and basic sanitation programs" (BRASIL, 1988). Since FPICs impact neighboring municipalities, it is

evident that mobility should be a mandatory FPIC within metropolitan arrangements. An IPEA (2014) study titled "Public Functions of Common Interest in Brazilian Metropolises" identifies transportation, basic sanitation, and land use as key FPICs, noting the need for further studies on their implementation in certain metropolitan regions.

While there is a lack of cohesion, clarity, and consistency in metropolitan and mobility policies, there is also a gap in well-defined criteria for establishing metropolises in Brazil. However, this was not always the case. In 1969, the Metropolitan Areas Group introduced basic criteria for evaluating Metropolitan Regions, including: (a) demographic factors, such as population, density of the central city and neighbouring municipalities, and population variation; (b) structural factors, such as industrial workforce, commuting, and industrial output; and (c) integration, including daily intermunicipal travel (Peres et al., 2018). These criteria are also reflected in IPEA's studies, such as the report "Metropolitan Territory: Municipal Policies for Joint Solutions to Urban Problems in the Metropolitan Sphere" by Branco et al (2013).<sup>5</sup>

These early criteria provided a foundational approach to evaluating and structuring metropolitan regions, emphasizing demographic, structural, and integrative factors essential to regional planning. However, with the proliferation of metropolitan areas in the 21st century, the lack of clear and convergent definitions has resulted in institutions that are often inoperative, as noted by Cunha (2005). This lack of purpose and basic governance framework has allowed ambiguities in metropolitan space conceptualization and management, further consolidating

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<sup>5</sup> Population Density: Contiguous municipalities should have a population density of at least 60 inhabitants per km<sup>2</sup> to be incorporated into the metropolitan region (MR). This density level was chosen as it was typically associated, according to the authors, with a predominance of urban over rural populations at that time.

Population Growth: It's noteworthy that a high population growth criterion was also included, reflecting the marked development phase in the country during that period, characterized by high fertility rates and accelerated urbanization with significant rural-to-urban migration flows. According to the criteria of Galvão et al. (1969), a municipality would need to have shown at least 45% population growth between 1950 and 1960 to be incorporated into the MR.

Economic Structure: From the perspective of the occupational structure in Brazilian urban areas, a municipality could be included in the metropolitan area if it exhibited one of the following characteristics: industrial production volume at least three times greater than agricultural production, or at least 10% of the potentially active population employed in industrial activities (Galvão et al., 1969, p. 62). While it is common in various MR delimitation methodologies to include criteria indicating a less agricultural economic profile (Soares, 1960; IUR, 1959 *apud* Soares, 1968a; Soares, 1968b; Monteiro, 1968; OECD, 2012), these thresholds set for Brazil in the 1970s were not justified by Galvão et al. (1969).

Integration by Commuting Flows: Finally, Galvão et al. (1969) proposed the use of commuting or telephone connection data between municipalities as a measure of the level of integration between them. According to the authors, a municipality "A" could be incorporated into the MR if the total volume of its residents commuting daily to work in other municipalities in the region, plus residents of the region commuting to work in "A," corresponded to at least 10% of the total resident population in "A." The inclusion of commuting flow data as a measure of city integration is a common point in various methodologies for MR delimitation in Brazil and worldwide (Soares, 1968b; Monteiro, 1968; Freeman and Cheshire, 2006; Moura et al., 2007; Casado-Diaz and Coombes, 2011; Ojima, 2011; OECD, 2012). However, the minimum threshold for commuting flows is often set ad hoc, varying between 10% and 20% and following different calculation methods (Branco et al., 2013).

inequalities (Peres et al., 2018, p. 284). Additionally, metropolitan plans focusing solely on housing and sanitation as FPIC overlook a critical variable in metropolitan dynamics: mobility. Classical theories like Christaller's Central Place (1966) and Perroux's Growth Poles (1950) already recognized the link between regional influence and transportation networks. Clear criteria are thus needed to define and develop metropolises, incorporating mobility as a structural element. Equally important is considering urban space, urbanisation processes, and the concentration of services and populations within cities.

These complexities raise several questions: Is urban analysis the best approach to understand this phenomenon? Could dismantling traditional views on metropolitan space lead to a new regional model? While administrative boundaries artificially separate territorial areas, cities remain functionally interconnected, as noted by Barbera and De Rossi (2021). Rural, mountainous, or flat territories, whether populated or deserted, may serve as integral - if not primary - regional elements. Furthermore, metropolitan regions face a clear challenge in developing sustainably. UN-Habitat (2020a) emphasizes the connection between sustainability and urbanisation, proposing economic, social, environmental, technological, investment, local governance, and innovation values as key study guidelines. This focus builds upon earlier sustainable development strategies introduced in Agenda 21 (Barton, 2006).

Studies also explore the intersection of sustainable development and metropolitan areas. Governance and sustainability have been studied by Leal Filho et al. (2016), while Gavriliadis et al. (2016) propose an Urban Landscape Quality Index (ULQI) to assess urban landscape, quality of life, and sustainable development. Other research, such as Reckien et al. (2018) examines how cities are planning for environmental changes, and Zhu et al. (2018) highlight the rural impact of industries, calling for system reforms to promote sustainable development. There are also varied approaches to the 17 UN SDGs (Salvia et al., 2019), including analyses of human-environment relationships (Leal Filho et al., 2018); concerns about SDG delays due to the COVID-19 pandemic (Leal Filho et al., 2020); education for sustainable development within Agenda 2030 (Shulla et al., 2020), and a specific focus on SDG 11 - Sustainable Cities and Communities - which aims to make cities and human settlements inclusive, safe, resilient, and sustainable.

The wide-ranging focus on sustainability within metropolitan contexts underscores the necessity for integrated approaches that address environmental, economic, and social dimensions holistically. Such approaches are not only essential for tackling the unique challenges faced by metropolitan regions but also align closely with efforts to improve mobility and optimize resource use across municipalities.

Sustainable development approaches are broad and systemic, rooted in environmental, economic, and social dimensions (Pitarch-Garrido, 2018). These are directly relevant to the challenges of metropolitan regions (Nagy; Benedek, 2018), mobility or accessibility (Priester; Wulfhorst, 2014; Alonso et al., 2017; Perra et al., 2017; Louro et al., 2019; Menichinelli et al., 2024) or active commuting as a form of sustainable urban mobility (Gorný, 2024). Approaches to metropolitan planning can also be categorized by: (i) benefits to the federal entity, such as access to specific federal resources and programs; (ii) comprehensive planning within the integrated area of constituent municipalities; (iii) the provision of shared services to avoid redundancy; and (iv) cost reductions in providing certain services like water, sewage, and alternative energy. Legally, it is essential for regions to be regulated and formalized to enable municipalities to plan effectively, address challenges, implement projects, and receive corresponding benefits.

This context prompts fundamental questions: Do metropolitan regions have established legal criteria for their formation, maintenance, and expansion? What are the essential elements to analyse metropolitan regions as social phenomena? Are these elements consistent nationally and internationally? Can similar elements and characteristics be identified across metropolitan regions of varying sizes? Is mobility an essential criterion for a metropolitan region's existence? To what extent does recognizing mobility as a Public Function of Common Interest support regional development? How does mobility contribute to sustainable development in metropolitan regions? What attributes define a sustainable metropolitan region, and how can these be measured? These questions shape the central research inquiry of this thesis: How can the appropriation of mobility as a FPIC contribute to defining the attributes of a Sustainable Metropolitan Region?

The question investigates how the appropriation of mobility as a FPIC can influence the definition and application of sustainable development strategies in metropolitan regions. In this context, "appropriation" reflects the active and practical internalization of the concept by stakeholders. It goes beyond merely understanding mobility to incorporating it into decision-making processes, public policies, and everyday practices that promote metropolitan sustainability. Such appropriation would ensure that the FPIC concept is translated into concrete actions, fostering alignment between global objectives and local needs.



## 1.2 GENERAL OBJECTIVE

### 1.2.1 General Objective

The objective of this thesis is to analyse how mobility, appropriated as a Public Function of Common Interest (FPIC), can contribute to defining the attributes necessary for the sustainability of metropolitan regions.

### 1.2.2 Specific Objective

The specific objectives of this research are:

- a) To identify the attributes of FPIC for mobility.
- b) To examine policies, practices, and mobility infrastructures as FPIC in the studied regions.
- c) To analyse the processes of metropolitan region formation in Brazil and the UK.
- d) To propose a framework for sustainable metropolitan regions, based on sustainability attributes and mobility as a FPIC.

## 1.3 JUSTIFICATION

The twenty-first century, often called the metropolitan century which is marked by rapid urbanisation, especially in low- and middle-income countries and in Africa and Asia. Global urbanisation is influenced by political and economic migration, with one in seven people worldwide classified as migrants. Metropolitan regions can contribute up to one-third of a nation's economy, depending on the makeup of their municipalities (UN-Habitat, 2020a).

Studying urbanisation in metropolises is essential because these hubs of attraction experience high growth in density and population, requiring specific public and private services. Megacities also play a critical role in connecting urban and rural areas, impacting the daily movement of people and goods (UN-Habitat, 2020a).

The Table 1 illustrates the global Urbanisation trend, showing the percentage of the urban population residing in agglomerations from 1950 to projected figures for 2035. Starting at 40% in 1950, the share of urban residents in densely populated areas rose to 54% by 2000 and 59% by 2020, with a projected increase to 63% by 2035. This data highlights the global shift towards urban living, driven by economic opportunities, infrastructural development, and migration, underscoring the need for sustainable urban policies and planning frameworks worldwide.

Table 1 - Global Database of Metropolises 2020 - % of the Urban Population Residing in Agglomerations

Region, sub-region, country or area	% of urban population living in agglomerations			
	1950	2000	2020	2035
Global	40	54	59	63

Source: UN (2020) from UNDESA, Population Division (2018, 2022).

This Table 2 presents a comprehensive view of global urbanisation trends from 1950 through projected figures for 2050, illustrating shifts in the resident population of agglomerations, the urban population, and total population by region. In 1950, global urban agglomerations housed approximately 300 million people, representing a modest share of the global population. However, by 2000, this figure increased dramatically to over 1.5 billion, nearly quintupling, and by 2020 reached approximately 2.6 billion. Projections for 2035 and beyond suggest continued growth, with agglomerations estimated to reach 3.5 billion residents, underscoring the intensifying urban concentration worldwide.

Table 2 - Global Database of Metropolises 2020 – Population Division by continent.

Region, sub-region, country, or area	Resident Population in Agglomerations (thousands)				
	1950	2000	2020	2035	
<b>Global</b>	300.594	1.553.701	2.591.989	3.472.827	
Region, sub-region, country, or area	Mid-year urban population (thousands)				
	1950	2000	2020	2035	2050
<b>WORLD</b>	750.903	2.868.308	4.378.994	5.555.833	6.679.756
ÁFRICA	32.659	285.998	587.738	966.330	1.488.920
ÁSIA-PACÍFICO	242.324	1.387.411	2.346.141	2.980.981	3.460.209
EUROPA ORIENTAL	96.362	233.695	230.922	232.942	236.395
AMÉRICA LATINA E O CARIBE	69.811	397.177	539.543	626.789	685.180
EUROPA OCIDENTAL E OUTROS ESTADOS	309.747	564.026	674.649	748.792	809.052
Region, sub-region, country, or area	População total na metade do ano (milhares)				
	1950	2000	2020	2035	2050*
<b>GLOBAL</b>	2.536.275	6.145.007	7.795.482	8.892.702	9.687.000

\* The data for 2050 has been updated according to the report published in 2022

Source: UN (2020) from UNDESA, Population Division (2018, 2022).

The Table 2 also breaks down the urban population by global regions, highlighting particularly steep growth in Africa and the Asia-Pacific. Africa's urban population rose from just 32.7 million in 1950 to an anticipated 1.49 billion by 2050 - a more than 45-fold increase, reflecting significant urban shifts in developing regions. Similarly, the Asia-Pacific region shows rapid growth, from 242.3 million in 1950 to a projected 3.46 billion by 2050, reinforcing

its critical role in global urbanisation. In contrast, Eastern Europe's urban population has remained relatively stable, reflecting lower population growth rates and urban density shifts due to socioeconomic factors and regional migration trends. Western Europe and other developed regions also show more moderate urbanisation growth, indicative of already high urbanisation levels by 1950.

When comparing the total global population to urbanisation trends, the proportion of people living in urban areas continues to expand, with the global population expected to reach nearly 9.7 billion by 2050. Urbanisation's impact is pronounced, with urban residents increasingly concentrated in large agglomerations. This shift underscores the urgent need for sustainable urban planning and infrastructure development to support rapidly growing urban populations, especially in regions experiencing unprecedented urban expansion. The data also reveal critical insights into the economic and policy implications for urban governance, particularly as cities become primary drivers of economic activity and social change, further emphasizing the need for adaptive strategies to accommodate urban growth and ensure sustainable, equitable urban futures.

The increasing concentration of populations within large urban agglomerations not only demands sustainable planning but also highlights the substantial economic contributions of metropolitan regions. As primary hubs of economic activity, these areas demonstrate a strong correlation between urban density and gross domestic product (GDP) output, underscoring how strategic urban planning can amplify economic growth and social transformation.

Metropolitan regions and megacities play a pivotal role in regional economic development, with a notable disparity between their population size and GDP contributions. For example, Boston, Washington, and New York collectively occupy just 2% of U.S. territory but are home to about 44 million people and contribute 20% of the national GDP. Data show that urbanisation levels correlate with national income, with high-income countries having urbanisation rates more than double those of low-income countries in 2018 (81% vs. 32%) (UN-DESA, 2018, p.21). Additionally, a study of the 30 largest U.S. metropolitan areas and Japan's three largest regions (Tokyo, Osaka, and Nagoya) found that workers in these urban centers earn, on average, one-third more than those outside these regions, underscoring how concentrated population and economic activities drive growth (UN-Habitat, 2020a).

However, this economic concentration also brings significant environmental challenges, including increased energy consumption and greenhouse gas (GHG) emissions. Urban areas account for about 70% of global energy consumption, resulting in high GHG emissions not only from residents but also from the concentrated economic and social activities in these

regions (Bibri; Krogstie, 2017). Thus, understanding metropolitan dynamics is critical to harnessing economic benefits while mitigating negative impacts on quality of life and the environment.

Developing effective metropolitan governance structures is essential to addressing the challenges posed by urbanisation and city growth. Countries such as Australia, Bolivia, Brazil, Colombia, France, Italy, Japan, South Africa, and the United Kingdom are updating their legal frameworks to strengthen metropolitan governance. Notably, South Africa has created a cooperative governance model through voluntary federated participation, while the UK enacted the Cities and Local Government Devolution Act (2016), allowing local authorities to manage regional responsibilities. In some cases, metropolitan governance also includes community participation in electing authorities, as seen in Chile and some U.S. cities. These efforts are vital for ensuring legitimacy, transparency, and effectiveness in urban policies, fostering an integrated approach to regional urban challenges (UN-Habitat, 2020a).

Managing metropolitan regions presents complex challenges and shared responsibilities. Authority and outcomes are divided across local, regional, state, and national administrations globally. While policies on administration, economy, and environment in cities within regional institutional frameworks have both local and global impacts, international entities do not directly manage local mitigation efforts. Therefore, practical actions and measurable results at the local level are essential to addressing broader global issues (UN-Habitat, 2020a). Furthermore, metropolitan management is crucial for addressing the complex interjurisdictional and cross-sectoral challenges metropolitan areas face, including the need for coordinated governance, strategic spatial planning, and sustainable financing. Metropolitan institutions are key to managing issues beyond the scope of local governments, such as environmental degradation, infrastructure demands, and regional economic competition. Effective metropolitan governance integrates strategic planning and optimizes resource allocation across municipalities, thereby strengthening urban resilience and sustainability (UN-Habitat, 2020b).

Metropolises did not emerge overnight; they have deep historical and cultural foundations accumulated over decades and centuries, underscoring their significance. Recent studies and theories have examined these phenomena, combining classical and foundational perspectives that align with the rapid global urbanisation experienced in the 19th century in developed countries and the 20th century in developing nations.

The Table 3 presents foundational theories in urban and economic geography that have shaped our understanding of metropolitan development. Johann Heinrich von Thünen's Isolated

State Theory (1826) introduces the concept of land use patterns based on transportation costs and distance from central markets, laying a groundwork for spatial analysis in economics. August Lösch's Spatial Organization of the Economy (1940) builds on this by examining how economic activities organize spatially within a region, influencing later theories on regional planning. François Perroux's Growth Pole Theory (GPT) (1955) conceptualizes economic development as concentrated in specific poles, driving regional growth - a principle central to understanding metropolitan economies. Walter Christaller's Central Place Theory (CPT) (1966) further advances spatial theories by explaining the distribution and hierarchy of urban centers based on service areas and accessibility. Jane Jacobs' City Growth Theories (1969) offers insights into urban development through organic growth patterns, highlighting the roles of diversity, density, and human interactions. Collectively, these theories provide essential frameworks for analysing urban dynamics, regional growth, and economic integration within metropolitan areas.

Table 3 - Foundational Theories in Spatial and Economic Geography

<b>Theory</b>	<b>Authors</b>
Isolated State Theory (1826)	Johann Heinrich von Thünen (1783–1859)
Spatial Organization of the Economy (1940)	August Lösch (1906–1945)
Growth Pole Theory (GPT) (1955)	François Perroux (1903–1987)
Central Place Theory (CPT) (1966)	Walter Christaller (1893–1969)
City Growth Theories (1969)	Jane Jacobs (1916–2006)

Source: Elaborated by author (2024).

The Central Place Theory (CPT) by Walter Christaller and the Growth Poles Theory (GPT) by François Perroux offer frameworks for understanding the formation of metropolises, addressing elements such as the relationship between activities and territory, the integration of local and regional analysis, and the hierarchy and scale of urban areas alongside mobility needs. Examining these theories allows us to identify conceptual elements and convergences that explain metropolitan development. These insights can enhance institutional relationships across federal, state, and municipal levels, foster coordinated solutions to metropolitan challenges, promote economic competitiveness regionally and globally, and strengthen connections between people and their regions. The study of CPT was conducted through Christaller's original English publication from 1966, providing a direct analysis from the source. The investigation of GPT, however, relied on various articles and authors interpreting Perroux's work. This approach enabled a thorough yet indirect analysis, carefully respecting the original theoretical framework.

Connecting the theoretical frameworks of metropolitan formation with a multi-scalar, case-based analysis allows for a comprehensive exploration of how regional, national, and global metropolises can embody sustainable and integrated urban mobility as a FPIC. The CPT and GPT offer foundational insights into the spatial organization, economic hierarchies, and interdependencies that drive metropolitan growth, laying the groundwork for understanding how varied governance models and planning practices can meet the mobility needs of modern urban centers. Through the selected cases – the Greater London, the Metropolitan Region of Porto Alegre (RMPA), Metropolitan Region of Serra Gaúcha (RMSG) – this thesis applies these theoretical lenses across scales to reveal the nuanced interactions between mobility, institutional arrangements, and regional integration within metropolises at different stages of regulatory development and historical evolution. By linking theory to these specific cases, the analysis not only highlights how institutional and mobility-based solutions can address local and regional challenges but also underscores the significance of adaptable governance practices that foster sustainability, connectivity, and regional cohesion in metropolitan areas worldwide.

To justify the selection of the Greater London, RMPA, and RMSG as case studies, a multi-scalar approach is employed to analyse mobility as a FPIC and to define essential attributes for sustainable metropolitan regions. The choice of these regions - ranging from regional (Serra Gaúcha), national (Porto Alegre), to global (Greater London) scales - allows for a comparative framework that captures diverse governance models, urban dynamics, and historical development patterns within metropolitan regions. The RMSG is recognized as a regional capital by IBGE and in the process of formal regulation, exemplifies emerging metropolitan arrangements that highlight the economic and cultural influence of regional centers within Brazil's territorial organization. The RMPA, a legally established national metropolitan region, serves as an example of consolidated metropolitan governance and infrastructure planning, presenting unique challenges and strategies in addressing urban sprawl, transport integration, and interjurisdictional collaboration. At the global scale, Greater London offers insights into a mature metropolitan structure with well-established governance systems, historical urban expansion, and integrated public services, functioning as both a national capital and a global economic hub. Analysing these regions enables a comprehensive understanding of how diverse historical, geographic, and administrative contexts influence the implementation of sustainable urban mobility and contribute to the effective governance of metropolitan regions, ultimately guiding best practices and policy recommendations for FPIC integration across varying metropolitan scales.

#### 1.4 DELIMITATION OF THE STUDY

This thesis examines metropolitan regions through the lens of two foundational theories: Christaller's CPT (1966) and Perroux's GPT (1955). These theories are relevant to the field of administration, aligning with the area of concentration of UCS's Graduate Program in Administration (PPGA). CPT evaluates how state and private administrative activities contribute to establishing a system of central places, emphasizing service distribution, such as healthcare and administrative offices, to optimize service provision and territorial management. In contrast, GPT provides an economic analysis of regional development, emphasizing the role of resource advantages, market access, and proximity to political and economic centers. Together, these theories address critical aspects of metropolitan management, which require a systemic perspective to understand the formation, influence, challenges, and strategic potential of metropolitan regions.

While neither theory traditionally resides within core administrative studies, their systemic insights are essential for understanding metropolitan phenomena. This research emphasizes the centrality of mobility as a driving force in metropolitan development and proposes a mobility-centered model to enhance regional competitiveness. This model reflects a holistic approach, integrating structural, administrative, and economic factors while addressing cumulative forces that can drive inter-regional competition or divergence.

In alignment with the innovation and competitiveness research track at UCS's PPGA, which focuses on innovation and competitiveness as sources of growth and sustainability, this study underscores mobility as a vital factor influencing regional, national, and global competitiveness. By advancing insights into mobility innovations and their role in metropolitan development, the study contributes to a nuanced understanding of competitiveness across markets. Additionally, this research integrates recent advances in technology and information systems (e.g., mobile data networks) that capture human movement patterns, aiding the study of mobility within metropolitan spaces (Giannotti et al., 2011; González et al., 2008; Song et al., 2010)

This study does not approach mobility as a technical issue focused on transportation systems or infrastructure but rather examines it as a fundamental social construct that underpins the creation and evolution of metropolitan regions. Mobility is understood here as a key driver of social interactions, economic integration, and territorial cohesion, shaping the dynamics that enable regions to function as interconnected networks. The research places mobility at the center of metropolitan development, emphasizing its role in fostering relationships between

urban and rural areas, facilitating access to essential services, and supporting the formation of cohesive metropolitan identities. This perspective aligns mobility with its broader social purpose, positioning it as the foundational element in the emergence and sustainability of metropolitan regions rather than merely a logistical or infrastructural concern.

Furthermore, software that uses artificial intelligence has been used to help correct grammatical errors in English and accurately translate some sentences. The research took care to use this tool without distorting the main ideas.



## 2. THEORETICAL REFERENCES

### 2.1 METROPOLIS FORMATION

The term metropolis is challenging to define due to its varied applications across historical contexts, such as classical antiquity, the modern age, and contemporary urban environments. There is a consistent association between metropolitan and prestige, implying superiority, power, and spatial control. In classical antiquity, the term metropolis, derived from the Greek *mitrópolis*, indicated a power relationship, combining *mítir* and *polis* to mean mother city (Celestino, 2021). This term referred to the founding of new cities or colonies (Keene, 2004) and represented the origin of colonizing expeditions establishing independent city-states, or *apoikia*. Unlike modern colonies, ancient colonies did not rely politically or economically on their metropolis; rather, colonizers lost their original citizenship, becoming citizens of the new polis and adapting to new local conditions. Their relationship was moral rather than political, thus avoiding military conflicts (Celestino, 2021).

This hierarchical notion influenced administrative structures over millennia, as seen in Diocletian's reform<sup>6</sup>, where each province or smaller city fell under the oversight of a metropolis. Similarly, Keene (2004) notes that this model impacted the Roman diocesan structure in England, where four provinces were functionally metropolises. Another example is Bologna in Italy, which, after becoming a province in papal territories, exerted predominant control over its hinterland, mirroring diocesan boundaries and acquiring food and industrial goods from surrounding areas. According to Keene (2004), the Western Christian Church adopted this model, where a metropolis became the seat of an archbishop, while other cities housed bishops. Bede<sup>7</sup> describes:

(...) London as a metropolis, especially when describing those moments of crisis when a new monarch entered the city in the process of seizing control of the kingdom, of which London was certainly the chief city and in some sense the capital (KEENE, 2004, p. 460).

Records from King Alfred's 15th-century assembly of bishops describe London as the "metropolis of the whole island" *Hyda apud* (KEENE, 2004, p. 461) influencing European city maps, where capitals were frequently designated as metropolises starting from 1572. The

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<sup>6</sup> Diocletian was a Roman emperor from 284 to 305 AD, known for promoting a policy of decentralization.

<sup>7</sup> Bede lived from 673 to 735 AD. An English monk and scholar, he was prominent in the Middle Ages as an author and teacher. His most famous work, *Ecclesiastical History of the English People*, earned him the title of the "Father of English History." He is also known as Saint Bede and Bede the Venerable.

English dictionary formally describes “(...) a great capital ... the metropolis – often used pompously in the case of London” (Keene, 2004, p. 460).

Currently, each country and region hold its own definition of Metropolitan Region (MR), making the subject complex and embedded with local realities, diverse perspectives, and unique territorial development characteristics, as well as different institutional arrangements and governance systems that influence its definition. A UN Statistics Commission document defines a metropolis as "the full extent of a city, including densely populated areas beyond municipal boundaries" and an MR as "a city and its commuter zone, encompassing suburban, peri-urban, and rural areas socially and economically connected," with:

World Urbanisation Prospects (WUP) uses "urban agglomeration" to describe cities with contiguous territory beyond city boundaries, including adjacent suburban and peri-urban areas. WUP also uses "metropolitan area" to encompass socially and economically linked rural areas (UN, 2020, p. 04).

Economists define a Metropolitan Area as a region marked by urban and residential continuity with direct influence over services for lower-density cities:

Um the concept of the metropolitan area, which includes both the contiguous territory inhabited at urban levels of residential density and additional surrounding areas with lower settlement density that are under the direct influence of the city (for example, through established transport networks, road linkages or commuting patterns) (UN - DESA, 2018, p.04).

A globally influential definition of MR was established by OECD, in collaboration with European Union member states. In these countries, metropolitan regions are known as FUAs, defined as "a functional urban area" through a four-stage approach:

1. Identify an urban centre: a set of contiguous grid cells with a density of at least 1,500 residents per km<sup>2</sup>. An urban centre has population of at least 50,000 inhabitants. Gaps in the cluster are filled and the edges are smoothed. If needed, cells that are 50% built-up can be added. This step is identical to the one used in the Degree of Urbanisation to define an urban centre.
2. Identify a city: one or more local units that have at least 50% of their residents inside an urban centre. This step is identical to the one used in the Degree of Urbanisation to define a city.
3. Identify a commuting zone: a set of contiguous local units that have at least 15% of their employed residents working in the city. If 15% of employed persons living in one city work in another city, these cities are treated as a single destination. Enclaves, i.e. local units entirely surrounded by other local units that belong to a commuting zone or a city are included and exclaves or non-contiguous local units are dropped.
4. A Functional Urban Area is the combination of the city with its commuting zone. (UN-POPULATION DIVISION, 2020, p. 14 - 15).

In the literature, it is rare to define concepts based on specific criteria. However, the Brazilian case differs, as current legislation lacks established criteria for MR formation, except

for those set in the 1970s when the first MRs were created. FUAs are defined by four main components: an urban center, a city, a commuting zone, and a functional urban area. Each component has specific criteria: (1) a high-density area with 1,500 residents per square kilometer and a minimum population of 50,000; (2) one or more local units with at least 50% of residents within an urban center; (3) contiguous local units where at least 15% of employed residents commute to the city; and (4) the combination of the city with its commuting zone.

The development of Metropolitan Regions (MRs) in Brazil traces back to Article 29 of the 1937 Federal Constitution, which permitted the grouping of municipalities within the same region. The 1967 Constitution formalized MRs, granting the federal government authority to establish them via complementary laws to manage "services of common interest." This responsibility shifted to state governments under the 1988 Constitution, specifically Article 25, §3 (Peres et al., 2018). The first eight MRs - Belém, Belo Horizonte, Curitiba, Fortaleza, Porto Alegre, Recife, Salvador, and São Paulo - were created in 1973.

Even before the 1970s, the groundwork for MR formation was laid by the Metropolitan Areas Group, which in 1969 proposed demographic, structural, and integration criteria, such as population density, industrial output, and intermunicipal travel patterns (Peres et al., 2018). In the mid-1970s, the National Urban Development Policy (PNDU) emphasized the need to address urban challenges stemming from rapid urbanization, including vehicle congestion and pollution. The PNDU outlined metropolitan development guidelines, focusing on integrated planning and land-use management.

The PNDU's framework addressed urban and inter-urban scales, providing solutions for cities with populations over 50,000. Although its focus was primarily urban, it established a foundation for future urban development plans, including the ongoing revision of the PNDU. This evolution highlights the increasing complexity of metropolitan governance and the need for robust frameworks like the *Estatuto da Metrópole* (EM). Enacted in 2015, the EM serves as the primary legal framework for MRs and urban agglomerations (UAs), offering guidelines for their planning and management.

The EM defines urban agglomerations as territorial units formed by contiguous municipalities characterized by geographic, environmental, and socio-economic integration (BRASIL, 2015). It further describes MRs as regional units established by states through complementary laws to organize and execute public functions of common interest. Complementary concepts, such as Integrated Development Regions (RIDEs), outlined in Articles 21, 43, and 48 of the Federal Constitution, highlight the federal government's authority to create regions spanning multiple states or federal units.

The EM also differentiates between metropolises and MRs. Metropolises are urban areas with territorial continuity that exert national or regional influence due to their population and socio-economic importance, as defined by IBGE criteria. Metropolitan areas are identified as the continuous urban expansion of a metropolis, marked by road system integration, high commuting flows, and significant residential, service, and industrial areas (EM, 2015; IBGE, 2016).

Article 3 of the EM reinforces the authority of states to establish MRs and UAs, aligning with Article 25 of the 1988 Federal Constitution, which allows states to define regions to integrate the organization and execution of public functions of common interest. IBGE (2016) further supports the institutionalization of MRs, describing them as frameworks for cooperative management of essential public services such as sanitation and transport, legitimizing their role in fostering integrated public action to meet the needs of the population

The IBGE classifies Brazil's urban centers into five major levels, further subdivided to recognize 15 cities as metropolises. These are categorized into Greater National Metropolises, National Metropolises, and Regional Metropolises based on population, economic activity, and regional influence (IBGE, 2018).<sup>8</sup>

A related concept, "population arrangement," defined by the IBGE, identifies groups of municipalities with strong integration due to commuting patterns and urban contiguity. These clusters are formed based on three criteria: integration index, intensity of pendular movement, and urban contiguity. The IBGE defines population arrangements as groupings of two or more municipalities exhibiting significant integration through commuting for work or study or urban contiguity among their principal urban areas (IBGE, 2016, pag. 19).

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<sup>8</sup> These are the 15 main urban centres, from which all existing cities in the country receive direct influence, either from one or more metropolises simultaneously. The region of influence of these centralities is broad and covers the entire territorial extension of the country, with areas of overlap in certain contacts. Metropolises are subdivided into three levels:

a) Large National Metropolis - the São Paulo/SP Population Arrangement alone occupies the position of the country's largest urban hierarchy, concentrating 21.5 million inhabitants in its Population Arrangement in 2018 and 17.7 per cent of the national Gross Domestic Product - GDP in 2016;

b) National Metropolis - the *Brasília/DF* and *Rio de Janeiro/RJ* Population Arrangements occupy the second hierarchical position, also with a strong national presence. The *Brasília/DF* Population Arrangement had 3.9 million inhabitants in 2018, while *Rio de Janeiro/RJ* had 12.7 million on the same date; and

c) Metropolis - the Population Arrangements of *Belém/PA*, *Belo Horizonte/MG*, *Campinas/SP*, *Curitiba/PR*, *Florianópolis/SC*, *Fortaleza/CE*, *Goiânia/GO*, *Porto Alegre/RS*, *Recife/PE*, *Salvador/BA*, *Vitória/ES* and the Municipality of *Manaus (AM)* are the 12 Cities identified as Metropolises. They are made up of nine capital cities that have been classified as 1 in terms of territorial management centrality, plus *Belém (PA)*, *Campinas (SP)* and *Manaus (AM)*, which, although they are in class 2, have a significant population of over 2 million inhabitants. The average population of the metropolises is 3 million inhabitants, with the most populous being *Belo Horizonte (MG)* with 5.2 million and the least populous being *Florianópolis (SC)* and *Vitória (ES)*, with 1.0 million and 1.8 million people respectively living in their Population Arrangements in 2018. *Campinas (SP)* is the only city that isn't a state capital to be classified as a metropolis

From this analysis, the IBGE concluded that only 12 out of 26 urban concentrations met the criteria for metropolitan status IBGE (2016, pag. 48). Comparing the concept of "population arrangement" with the metropolitan regions (MRs) defined in the EM and the 1988 Constitution reveals a shared recognition of clusters, groups, or continuous urban expansions among municipalities.

At the national level, the IPEA has provided critical technical data on metropolitan areas. According to IPEA (2021, 2024), Brazil comprises 84 metropolises, distributed across 77 metropolitan regions, 3 urban agglomerations, and 3 integrated development regions. The Table 4 summarizes the distribution of metropolitan regions across Brazil's five macro-regions, detailing the number of municipalities within MRs, the total count of MRs, and the population residing in these areas. The Southeast region, with 13 MRs and over 57 million inhabitants, exhibits the highest population concentration in metropolitan municipalities. In contrast, the Midwest, with only 3 MRs, reflects the country's regional disparities in Urbanisation and varying levels of metropolitan integration.

Table 4 - Overview of Metropolitan Regions in Brazil by Region

Region	Number of Municipalities in MRs	Number of MRs	Population of Municipalities in MRs
Midwest	39	3	5.136.807
Northeast	338	27	25.010.662
North	74	10	8.262.509
Southeast	303	13	57.493.919
South	366	24	18.422.886
Total RMs	1120	77	114.326.783
<b>Total Brazil</b>	<b>5570</b>		<b>212.583.750</b>

Source: IPEA (2024).

Note: Estimated population of Brazil according to Panorama IPEA (2024).

The comparison between Brazil's total population of 212,583,750 and the 114,326,783 individuals residing in metropolitan regions shows that approximately 53.8% of the population lives in densely populated urban centers, which comprise about one-fifth of the country's municipalities. This significant concentration underscores metropolitan regions as key hubs of economic, social, and infrastructural activity, reflecting a broader trend of urbanization.

This demographic reality emphasizes the unique spatial, social, and economic dynamics defining metropolitan areas. Milton Santos's conceptual framework provides insights into these dynamics, framing metropolitan regions as territorial expressions of hyper-urban spaces with

complexities extending beyond traditional urban environments (Peres et al., 2018, p. 277). In *A Urbanização Brasileira* (1993), Santos introduces the concept of the "metropolitan fact," describing urban agglomerations with sufficient complexity - such as metropolitan regions - as totalities due to their intricate social and spatial networks (Peres et al., 2018, p. 281).

Despite the foundational legal frameworks provided by the Constitution and the EM for organizing metropolitan regions, the proliferation of new MRs in recent decades has exposed regulatory shortcomings. Critics point to challenges such as "paper metropolises" (Cunha, 2005); the trivialization of Metropolitan Regions (Cordeiro, 2019), hyper-segregation of metropolitan elites (Mendonça et al., 2019), and the creation of regions based on political interests (De Oliveira; Borges, 2021).

To clarify these varying interpretations, this thesis includes Table 5, summarizing key concepts of metropolitan arrangements through four columns: author, concept, year, and related observation. These perspectives illustrate the evolving understanding of metropolitan regions and their institutional phenomena, providing a foundation for deeper analysis.

Table 5 -Summaries of the main concepts related to the Metropolitan Region

(continue)			
Author(s)	Concept	Year	Observation
UN Statistical Commission	Urban expansion with economic and social linkages	2020	Expansion zone economically and socially linked
UN Statistical Commission, via WUP	Urban expansion among municipalities with economic and social linkages	2020	Expansion zone with economically and socially linked cities
Organisation for Economic Co-operation and Development (OECD)	Reference city with contiguous high-density urban area and commuting zone	2020	Defines concepts and criteria for relational percentages between territories
UN Department of Economic and Social Affairs	Metropolitan Area with contiguous urban sprawl	2018	Differentiates region from area; sees metropolitan area as urban sprawl with varied residential densities dependent on city infrastructure
Brazilian Institute of Geography and Statistics (IBGE)	Urban Centers	2018	Hierarchy by levels; recognizes 15 metropolises based on national influence (population and economy)
Milton Santos	Territorial expression of metropolitan or hyper-urban space	<i>Apud</i> 2018	Complex dimensions of urban space
Brazilian Institute of Geography and Statistics (IBGE)	Population arrangement	2016	Grouping of municipalities with strong population integration, commuter flows, continuous urban sprawl
Statute of the Metropolis (Law 13089)	Metropolitan region with grouping of adjacent municipalities	2015	Integration of organization, planning, and execution

(continuation)

Author(s)	Concept	Year	Observation
Statute of the Metropolis (Law 13089)	Metropolis, contiguous urban space with a regional capital reference	2015	Adopted criteria to be set by Brazilian Institute of Geography and Statistics - IBGE
Law 13683, Amending Statute of the Metropolis	Metropolitan area, continuous urban expansion with conurbation	2015	Urban expansion through road systems, residential areas, services, industries with commuter flows
Brazilian Institute of Geography and Statistics (IBGE)	Metropolitan Region, set of municipalities for public functions	2014	Requires cooperation and solutions to common problems; integration through municipal boundaries
Milton Santos	Metropolitan Fact	1993	Smaller part of a greater whole; analyses spatial dimensions and complexities relative to urban space

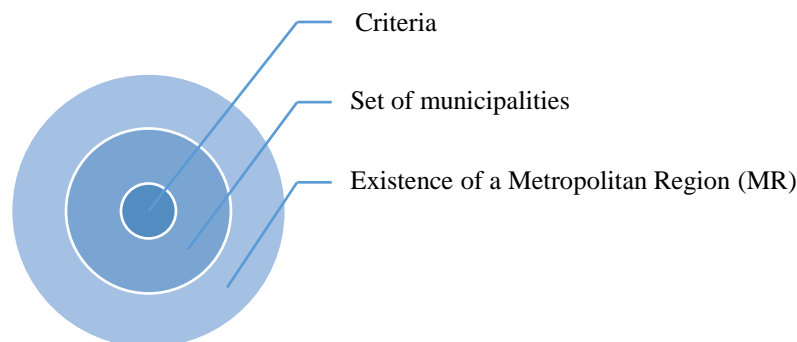
Source: prepared by the author (2024).

In most cases studied, there is consensus that MRs primarily exist due to their urban fabric, urban centers, or urban agglomerations, typically comprising contiguous municipalities. These areas are defined by territorial continuity and criteria such as economic linkages, social ties, commuting zones, population density, and shared service provision.

Figure 1 presents a concentric model illustrating the spatial organization and influence zones of metropolitan areas. At the core lies the central urban area, the primary hub for economic, social, and administrative activities. Surrounding this core is the direct influence area, a zone closely linked to the core through high commuter flows and reliance on central services. Encircling both is the extended metropolitan zone, which, while less integrated with the core, remains connected through economic, infrastructural, and social ties.

This model highlights the multilayered structure of MRs, where influence diminishes with distance from the core, but each layer remains vital to the region's overall functionality. It underscores the importance of coordinated governance and planning across these zones to address shared challenges and optimize resource allocation.

Figure 1 - Convergence of elements that constitute the recognition of an MR



Source: Elaborated by the author (2024).

This research refines the understanding of a MR as a formally established territorial unit composed of contiguous municipalities whose spatial, social, and functional integration supports a cohesive urban and rural network. These municipalities share geographic boundaries and maintain interdependent relationships through integrated infrastructure, roadways, and resources that enable mobility and communication. MRs balance collective decision-making for shared needs with the autonomy of individual municipalities, incorporating both urban centers and rural areas. This diverse composition blends densely populated urban hubs with lower-density rural zones, fostering a complementary relationship between urban development and rural activities such as agriculture and environmental conservation.

MRs collectively manage essential public functions and services, including transportation, healthcare, sanitation, and waste management, to ensure equitable access to infrastructure and resources. Coordinated governance is vital for effective policymaking and efficient administration, minimizing redundancies and fostering integration. However, institutional fragmentation and uneven resource allocation often hinder the implementation of public policies. To address these challenges, strategies such as intermunicipal consortia and metropolitan networks have been proposed to improve service delivery and support socio-economic and territorial cohesion. High-quality, accessible services - such as education, robust public transit, and resilient healthcare - are critical to the sustainable development of MRs, reinforcing their role as economic and social centers within the nation (Costa; Tsukumo, 2013; BRASIL, 2015).

### **2.1.1 Limit and Preliminary Injunction**

In “*Pedras são fronteiras: elas demarcam um território de risco, mas não indicam impossibilidade,*” (Cortella, 2017) suggests that boundaries mark spaces of challenge rather than restriction. Sennett (2018, p. 247) similarly describes the concept of porosity by comparing an open city to a sponge, which, though porous, retains its shape. This city model questions rigid boundaries, viewing borders as either frontiers or dividers. For Sennett, frontiers are permeable and integrative, while dividers create rigid, low-intensity separations that stifle community engagement.

Geographic and ecological frameworks provide insights into these boundary types, with frontiers acting as dynamic, integrative spaces, and dividers as strict demarcations. Sennett (2018) argues that low-intensity communities suffer from lack of stimulation, often manifesting in a stark division akin to black and white. In ecology, open human communities are likened to



cellular membranes, which maintain balance by selectively allowing materials to flow in and out. This selective permeability is essential for nurturing both cell and urban health, where spaces remain accessible yet regulated. Thus, urban planning should encourage porous spaces, rather than empty voids, to create functional urban ecosystems:

A cell membrane immediately needs to allow matter to flow in and out of the cell, but selectively, so that the cell retains what it needs for nourishment. Porosity exists in dialogue with resistance: a dialogue that sometimes means the cell is open to being flooded, and at other times is retentive. This dialogue should be fostered by the urban planner, instead of imagining that only open space - pure emptiness - can be considered porous (SENNETT, 2018, p. 249-250).

Sennett's reflections challenge conventional views on territorial boundaries, regardless of scale, and call for urban planners to create perforated membranes that promote vibrant community life. He criticizes the intense community clusters in large city centers as evidence that planners often ignore the subtleties of boundary management. The author draws on Danish urbanist Jan Gehl's work with Gensler and Aldo van Eyck's public space designs in Amsterdam to illustrate porous boundary strategies. Van Eyck's approach - removing physical barriers in public spaces to encourage children's understanding of traffic and territory - demonstrates a shift from traditional urban planning paradigms (Sennett, 2018, p.253).

Sennett further emphasizes the term "liminality" as an "experience of transition, even without a clear barrier between two states" (Sennett, 2018, p. 253). He integrates Donald Woods Winnicott's theory of transitional spaces, proposing a liminal, membrane-like awareness that could be applied to urban spaces. Extending this concept, Sennett explores the role of sound in urban porosity, advocating for open cities that function like cellular membranes, blending visibility with selective permeability.

Ellin (2006), a decade ago than Sennett's reflections, contributed to the discourse on integrated urbanism by identifying porosity as one of five essential qualities. She connects this concept with transparency and translucency, where layered elements become visible and interact across varied environments. Ellin's classification of these qualities encompasses comprehensive analyses of territory, incorporating historical, ecological, mobility, administrative, urban, symbolic, and commercial dimensions, which are particularly valuable for regional planning approaches.

The Italian project *metromontano* proposes a radical rethinking of traditional metropolitan boundaries by integrating city and mountain landscapes under a single analytical framework, effectively dismantling the perceived dichotomy between urban and mountainous spaces (Barbera; De Rossi, 2021). This approach shifts the focus away from rigid municipal

boundaries, typical of metropolitan regions, to a broader spatial paradigm. Barbera and De Rossi (2021) argue for the need to break from viewing metropolitan areas as isolated entities by emphasizing how mountainous regions, with their natural resources and tourism, should actively contribute to urban settings. Instead of viewing these regions merely as consumer spaces or conservation zones, they highlight the productive potential within these mountain-city interfaces Varotto (2020 *apud* BARBERA; DE ROSSI 2021).

Drawing on the work of Jean-Jacques Rousseau, they illustrate a vision where Switzerland, for example, can be viewed as a large city in which forests and mountains act as roads connecting dispersed homes Jean-Jacques Rousseau (1776 and 1778 *apud* BARBERA; DE ROSSI, 2021, p.5). In examining *metromontano* as a quasi-concept, the authors invoke Leigh-Griesemer's notion of boundary objects, capable of aligning diverse interests across different domains. Abbott's work on boundaries and objects further supports this, suggesting that boundaries do not merely separate but also create dynamic relations between spaces (Leigh-Griesemer, *apud* 1989 BARBERA; DE ROSSI, 2021, p.8).

The concept of *metromontano* is understood as encompassing physical, environmental, economic, and infrastructural dimensions that extend beyond geographic limitations, allowing for regional projects without strict territorial constraints. They argue that "administrative boundaries artificially separate territorially interconnected areas that can foster unified development projects by valuing interdependencies" (Barbera; De Rossi, 2021, p. 8 and 9, our translation). Critiquing the 20th-century *metrophiliac* model, which favoured urban-centric developments, the authors identify a need for a paradigm shift to recognize the reciprocal dependence between rural and metropolitan territories, criticizing the radical urban-rural dichotomy that has historically fragmented cities from their surrounding areas.

Emphasizing regional supply chains based on local characteristics and population needs, the authors advocate for innovative environmental connections, infrastructure, and logistical adaptations, fostered by technological advances and telecommuting. This perspective aligns with ideas from Francesco Mauro and Adriano Olivetti on regional integration as a cohesive entity, where each part supports and enhances the others. Furthermore, Arturo Lanzani's research further supports this interdependent view, highlighting the material interconnections between rural, mountainous, urban, and metropolitan areas, arguing that these relationships are essential to the sustainability of both city and country. The authors contend that mountain and internal regions are as vital to metropolitan areas as metropolitan areas are to rural landscapes, emphasizing mutual dependencies spaces (Barbera; De Rossi, 2021).

Ellin (2006), Sennett (2018) ideas converge with Barbera and De Rossi (2021) concept of permeable boundaries and rethinks the edge of the cities and territories. The authors critique rigid territorial divisions and propose new spatial models that value interstitial spaces as opportunities for innovative territorial policies and collaborative partnerships. Sennett (2018), describes these boundaries as permeable membranes, while Barbera and De Rossi (2021) highlight the potential within *spazio dell'opportunità*, cautioning against the missed opportunities created by underutilizing the productive potential of rarefied spaces.

This analysis challenges traditional metropolitan boundary interpretations, stressing that understanding the urban-rural interface requires more than an urban-centric perspective. It necessitates an acknowledgment of the contributions of rural areas - people, productive processes, and sustainability initiatives - to mobility. Mobility encompasses human movement, as well as the flow of goods and resources across these permeable boundaries, supporting a balanced and integrated approach between urban and rural zones, as well as across urban spaces themselves.

The concept of permeable boundaries challenges traditional rigid definitions of metropolitan divisions, offering a framework to better understand the interplay between urban and rural areas and its impact on mobility and spatial planning. This approach aligns with the core objective of MRs: promoting regional development through coordinated management and shared benefits. By incorporating the spatial models advanced by Ellin, Sennett, Barbera, and De Rossi, MRs can embrace a more inclusive framework that recognizes and integrates urban and rural contributions. This perspective enhances resource flow and connectivity across boundaries while emphasizing the importance of collaborative planning and integrated policies. These combined frameworks reimagine metropolitan regions as dynamic and equitable systems, where mobility, sustainability, and interdependence are optimized to enhance residents' quality of life.

The primary purpose of a MR is to drive regional development, guiding organizational and management efforts toward the collective benefit. A cooperative planning approach underscores this purpose, encouraging municipalities to work collaboratively in setting policies and establishing objectives that serve the region comprehensively. Efficiency is central to the region's functioning, achieved through optimized resource allocation, waste minimization, and policy implementation designed to maximize social and economic returns for the metropolitan population. Sustainability remains a core goal, promoting development that respects environmental integrity and ensures long-term resource availability, allowing future generations to thrive in a balanced and economically viable environment. Integrated policies

are essential, requiring coordinated programs across the region to harmonize critical areas such as housing, transport, healthcare, and infrastructure. This policy integration is complemented by the strategic sharing of financial, human, and material resources, supporting balanced development across municipalities by enabling wealthier areas to assist those with fewer resources. In this way, policies and actions are implemented in an equitable, functional manner, guaranteeing all residents access to public services and shared benefits. Addressing collective needs, these regions serve a broad spectrum of community demands, spanning health, education, security, and transportation, all of which are crucial for enhancing residents' quality of life in a well-organized, efficiently managed metropolitan framework.

This thesis understands the MR as a formally established regional territorial unit, composed of contiguous municipalities strategically integrated across their urban and rural territories. This structure requires the convergence of shared public services and functions of common interest, facilitating coordinated organization and management with the aim of fostering cooperative, efficient, and sustainable planning. With this configuration, it becomes possible to implement integrated policies and share essential resources to meet the collective needs of the population in a balanced and functional manner.

## 2.2 SOCIOECONOMIC DEVELOPMENT AND SPATIAL DYNAMICS THEORIES FOR MOBILITY AND METROPOLITAN SUSTAINABILITY

Building on the foundational theories of Christaller's Central Place Theory (CPT) and Perroux's Growth Pole Theory (GPT), this thesis adopts these as its theoretical backbone to explore the dynamics of mobility and metropolitan sustainability. CPT provides a robust framework for understanding the spatial distribution and hierarchical organization of urban centers, offering insights into how mobility influences access to services and regional interconnectivity. Meanwhile, GPT emphasizes the economic centrality of growth poles and their role in driving regional integration and development, aligning directly with the study's focus on the interplay between mobility and metropolitan formation. By leveraging these theories, the research seeks to analyse mobility not merely as a technical function but as a structural and social force integral to the emergence, governance, and sustainability of metropolitan regions. This dual-theoretical approach provides a comprehensive lens through which to define and measure the attributes necessary for sustainable metropolitan regions, in alignment with the research problem and objectives.

### 2.3 CENTRAL PLACE THEORY (CPT)

The principle of centrality has long been present in urban life, often unnoticed by city dwellers. Physical structures like town squares, churches, city halls, and courthouses - public and religious buildings - have traditionally shaped this sense of central place. Gradmann describes the central place of a city as its primary role, emphasizing the importance of the central area in serving as both a hub for surrounding rural areas and a mediator in local trade with the outside world (Gradmann, 1916 *apud* CHRISTALLER, 1966, p.16).

The Central Place Theory (CPT) was initially proposed by Walter Christaller in 1933 and later translated into English<sup>9</sup> in 1966. It builds upon Von Thünen's 1826<sup>10</sup> theory, providing a framework for understanding the development of urban reference centers and their spatial relationships. A reference center can be a city, neighborhood, or region of any size, analysed in terms of activities and public and private service provision. Christaller's theory, developed from his observations of southern Germany, identifies two primary components of urban development: (i) the location of settlements (cities, towns, villages) as ideal distribution points for goods and services, and (ii) the distribution of these goods and services across the spatial system of urban areas. Structured into three chapters - Fundamental Meanings, Static Relations, and Dynamic Processes - the theory also examines various urban settlement scenarios.

Christaller initially posited that settlements followed a hierarchical centrality based on population but later acknowledged that neither area nor population size reliably measures a city's importance. He challenged Wagner's assertion that "places of equal population are equal," emphasizing that centrality depends on both population size and economic activity (Christaller, 1966, p.18). He also recognized that small cities could hold substantial importance in the Central Place framework. Christaller introduced the concept of a Complementary Region, derived from the German *Ergänzungsgebiet*, to describe how multiple central places rely on connections to higher-order Central Places, forming a hierarchy of complementary regions (Christaller, 1966, p.21).

In a study by the National Institute of Statistics (2004 as cited in STAMM, 2013), explains Central Place Theory (CPT) as a framework for understanding urban centers' formation and spatial relationships, defining their size, location, economic activities, and

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<sup>9</sup> CHRISTALLER, W. *Central Places in Southern Germany*, New Jersey, Prentice-Hall, Englewood Cliffs, 1966.

<sup>10</sup> Johann Heinrich von Thünen's (1783-1859) main work was *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*, known as the *Theory of the Isolated State*. He analysed the existence of agricultural towns with no connection to other urban areas. He stated that any market distance depended on four characteristics: yield, price, cost and shipping rates.

hierarchy. According to Stamm (2013), CPT highlights that centrality growth is driven by the availability of goods and services, enhancing specialized functions in neighboring areas. It also provides insights into urban concentration by analysing economic activity locations, particularly in the tertiary sector.

Christaller's theory simulates scenarios with varying regional densities, positing that doubling a region's size and population leads to only a 1.5-fold increase in the sale of central goods. He explains that demand does not increase proportionally with supply due to spatial consumption patterns that regions cannot fully meet. The theory further examines complementary regions by analysing boundary cities and cross-border central nuclei, acknowledging the shared and complementary nature of central functions, particularly in cases where regions overlap—referred to as "sister cities."

CPT explores the economic dynamics of central goods consumption and its role in the development or decline of central places. Christaller (1966) argues that consumption is linked to population distribution, particularly the level of agglomeration in central areas. A central place's growth depends on net income from central goods sales, which reflects the economic well-being of its inhabitants. High net income fosters growth and prosperity, while low income results in stagnation or decline (Christaller, 1966, p. 27).

The relationship between gross revenue and consumption cannot solely account for a central place's development or decline. Additional factors, such as discrepancies in income classifications, also influence outcomes. For instance, individuals labelled as high-income consumers may exhibit disproportionately higher consumption patterns, creating disparities between gross revenue and consumption levels.

Another analysed scenario focuses on two parameters: demand and distance. Hypothetical models illustrate the number, relative size, and spacing of central places. The first parameter examines the minimum population size required for equilibrium, while the second evaluates the maximum distance consumers are willing to travel for goods or services. Simulations, such as the distribution of medical services across one, two, and three rings of varying populations, explore supply dynamics in single and interconnected central places.

These findings assume a basic transportation system with linear costs, revealing how spatial relationships among consumption, travel distance, and accessibility can drive opportunities for increased consumption and the expansion of service providers. Transportation and accessibility emerge as critical factors influencing central place development:

With respect to spatial distribution, it should be noted that higher incomes in the central place itself lead to more consumption of its central goods than higher incomes

in remote locations; in the latter case, transportation costs must be deducted, leaving only the remainder to be spent in the central place (CHRISTALLER, 1966, p. 35).

The relationship between gross revenue and consumption alone cannot fully explain the development or decline of a central place. Other factors must be considered, such as individuals classified as middle class who exhibit low consumption levels or high-income groups whose consumption is disproportionately higher. This discrepancy highlights gaps between gross revenue, net income, and actual consumption patterns.

The first parameter examines the minimum population size required for equilibrium, while the second assesses the maximum distance consumers are willing to travel for goods or services. Simulations include scenarios like providing medical services across one, two, and three rings with varying populations, analysing per capita consultation supply. These models reveal opportunities for increased consumption and service provision through improved accessibility and spatial distribution.

Transportation emerges as a critical factor in central place development, mediating the relationship between distance and the supply-demand dynamic. Christaller (1966) argues that "economic distance" replaces geographic distance, with traffic quality directly influencing service provision and cost efficiency. He concludes that regions with better traffic infrastructure foster larger, more developed central places: "In a region with better traffic conditions, reducing real distance, the central place will be larger than in a region with poor traffic conditions" (Christaller, 1966, p. 49).

Simultaneous spatial effects also play a significant role, as the availability of diverse services in central places encourages extended engagement and consumption. These effects optimize transportation costs, income distribution, and time, enabling consumers to acquire multiple goods during a single trip. Beyond economic distance, Christaller highlights the impact of additional costs, such as freight tariffs, insurance, storage fees, and spoilage, on the range of central goods: "More important are freight and passenger tariffs, insurance costs, storage fees, weight loss, and potential spoilage due to transit delays" (Christaller, 1966, p. 52).

Subjective factors, such as whether a trip is perceived as pleasant or advantageous, also influence consumer behaviour. For example, a farmer traveling long distances for services may value the trip due to its infrequency or perceived benefits, demonstrating the relevance of intangible elements alongside objective analyses.

Christaller incorporates Thünen's ring system from the Isolated State theory to explore traffic speed, distance, and connection frequency in central places. He argues that high transportation costs restrict the reach of central goods and uses rings rather than linear models

to depict this dynamic. His work extends Thünen's theory by adapting to variables such as shifting hub locations and population migrations, further emphasizing the interplay between transportation infrastructure and central place development.

Four key factors influence the reach of central goods: (1) the size and significance of the central place and population distribution; (2) buyers' price tolerance; (3) subjective economic distance; and (4) the type, quantity, and price of the good (Christaller, 1966, p. 54). In Christaller's ring model, the outer limit defines the maximum distance from which a good can be obtained, while the inner limit represents the minimum consumption required to sustain its production or provision. Together, these limits determine the development dynamics of central places.

To illustrate this concept, Christaller simulates four scenarios involving isolated locations with varying lower limits for central goods: (i) a low lower limit, enabling goods to be offered nearby; (ii) a 10 km lower limit, with uncertain availability in other central places; (iii) a 30 km lower limit, restricting availability to the central location; and (iv) a 50 km lower limit, where demand remains unmet even within the central location. These scenarios highlight the interaction of distance, demand, and the sustainability of central goods in shaping central place evolution.

Christaller (1966) categorizes goods by their range and accessibility, distinguishing between higher-order and lower-order goods. Higher-order goods, with both high upper and lower limits, are offered in larger central places and distributed across extensive regions. In contrast, lower-order goods, with low upper and lower limits, are widely available in smaller locations to ensure coverage across the country. Goods with a high upper limit and low lower limit can be provided in multiple central places, fostering competition among regions. Conversely, goods with a low upper limit and high lower limit are exclusive to higher-order central places and require a well-developed complementary region to remain profitable due to the small critical ring determining their market viability.

To organize Christaller's concepts, this study presents in Table 6 divided into three columns: the first describes the typical range, the second differentiates the relationship between limits, and the third explains each specific relationship between upper and lower limits.

Table 6 - Analysis of relationships between typical ranges of lower and upper limits

(continue)

Typical Range	Relationship Between Limits	Description
Central good of a higher order.	High lower and upper limit	The good will be offered in central locations of a higher order.



(continuation)

Typical Range	Relationship Between Limits	Description
Central good of a lower order.	Low upper and lower limits	The central good should be offered in several places and also in smaller locations to serve the entire country.
	High upper limit and low lower limit	The central good can be offered in many central locations that will vigorously compete in the complementary region regarding this good.
	High lower limit and low upper limit	The central good can only be offered in central places of a higher order, and only when there is a highly developed complementary region.

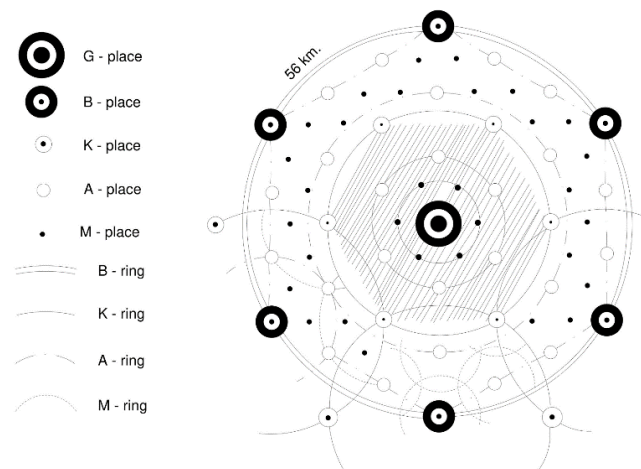
Source: Christaller (1966), elaborated and adapted by the author.

In summary, the lower limit is defined by the minimum sales required for a central good to meet basic supply costs. This minimum amount can be sold within the lower limit, which, together with the upper limit, determines whether the central good can be offered at one or multiple locations within a region. The lower limit outlines the smallest region where enough sales occur to justify offering the central good, while the upper limit defines the maximum area where sales of the central good are feasible.

Christaller (1966) further investigates the relationship between city size and central place characteristics. He suggests that city size and number likely influence central place attributes and questions whether cities of similar sizes could be grouped under a unified criterion or study. "We are not satisfied in discovering relationships with which we might explain the size, number, and distribution of central places in individual concrete cases" (Christaller, 1966, p. 52). He concludes that each central place has unique characteristics, shaped by population distribution, distance from the central place, traffic conditions, and the interaction of price, demand, and public finances. He terms this synthesis the "average conditions of the economy of the nation."

Christaller asserts that an ideal central place results from the convergence of multiple factors. His theory progresses to a stage where it must illustrate and simulate various scenarios according to distinct criteria. Christaller (1966) proposes three foundational principles for central place systems: (i) Central System based on the Market Principle, (ii) Central System based on the Traffic Principle, and (iii) Central System based on the Administrative Principle. Each of these principles will be examined in the subsequent analysis, beginning with the central place system according to the market principle.

Figure 2 - A System of Central Places According to the Market Principle

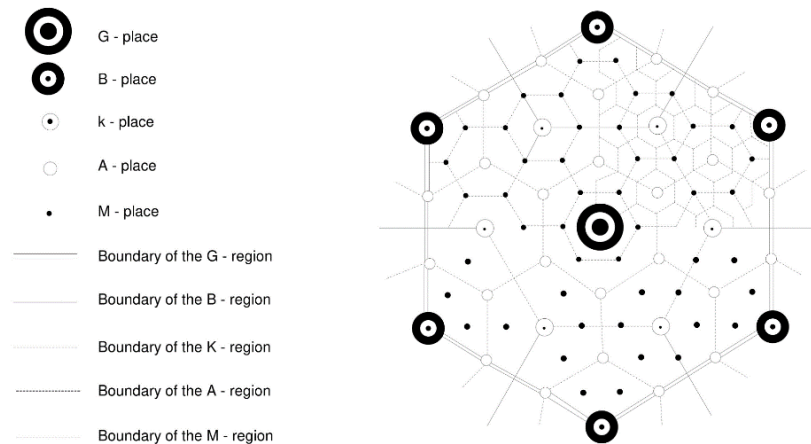


Source: Figure 1 - Christaller (1966, p. 61). Adapted by the author.

The author simulates a central place with approximately 10,000 inhabitants, designating the primary central place as point G. Each letter - G, B, K, A, and M - represents human settlements (places) of varying hierarchies. These letters are also used to denote places and their corresponding service areas or rings. The figure highlights two main rings at 21 km and 36 km, each containing six central places equally distributed among other central places. In this system, place K supplies goods that are not provided in the surrounding area of place B. Central places at point A supply goods to areas that cannot be serviced by places K and B. Meanwhile, the most distant central goods, represented by place M, serve as rural or remote centers providing essential supplies to less populated areas. This system allows for counting the number of places associated with each level of significance.

In understanding this structure, the author notes that each place and its ring would form overlapping circles when viewed as a whole. Given the assumption of territorial uniformity, the author modified the model by adjusting the circular rings to a hexagonal shape, as illustrated below, to align better with the theory's framework.

Figure 3 - The Marketing Regions in a System of Central Places



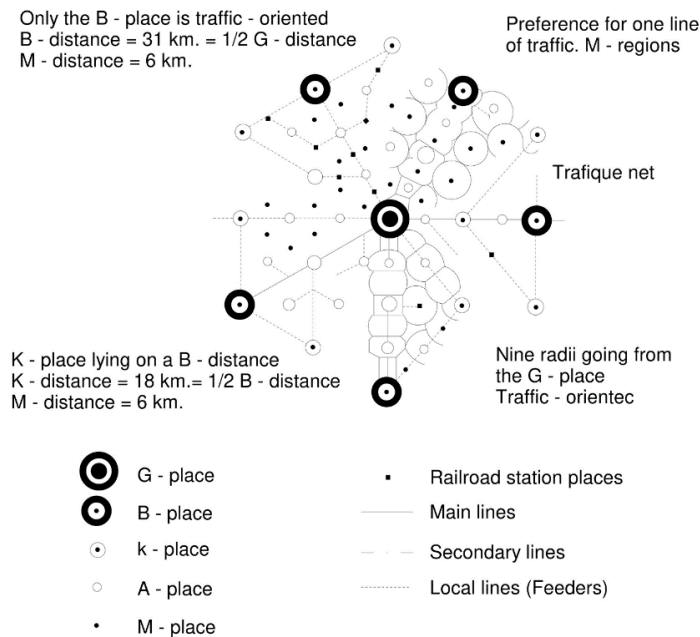
Source: Figure 2 - Christaller (1966, p. 66). Adapted by the author.

The fundamental element in the author's scheme lies in the relationship between the size, number, and distribution of central places according to the reach of central goods, which he terms the "supplying or market principle" (Christaller, 1966, p. 72). He acknowledges that other principles, such as traffic patterns and various types of connections, need consideration, as they can drive different types of central place development. This principle calls for service delivery efficiency, aiming to meet the highest possible demand at the lowest cost. Additionally, the central place system becomes more advantageous when positioned along a route between two significant places, especially if other places also lie along this route, as the author explains:

(...) The transit principle asserts that the distribution of central places is most favourable when the largest possible number of important places is situated on a transit route between two major cities, with the route established as directly and inexpensively as possible (CHRISTALLER, 1966, p. 74).

In Figure 4, we observe simulations of different strategies and intentions for connecting point G to point B. This demonstrates how planning connections between two places can significantly impact travel time, territorial planning, and local and regional development.

Figure 4 - A System of Central Places Developed According to the Traffic Principle



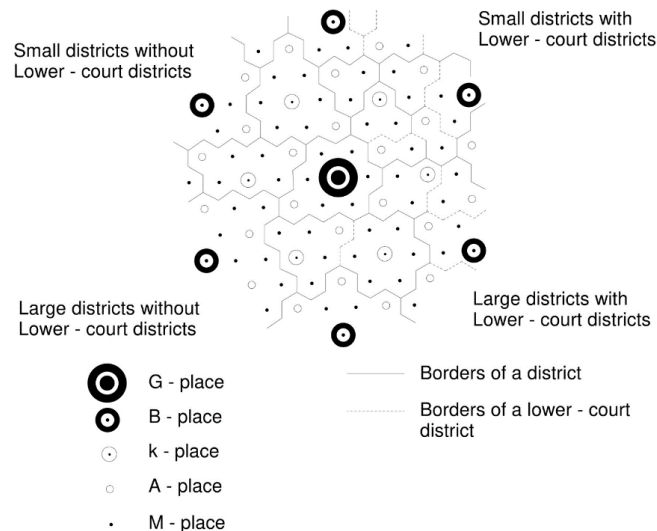
Source: Figure 4 - Christaller (1966, p. 74). Adapted by the author.

The theory introduces the second principle, the Central Place System based on the Traffic Principle. In certain cases, this principle necessitates a considerably larger number of central places to supply the region with central goods within a specified range. This approach differs from the Market Principle analysis. While these principles interpret the central place system differently, the author acknowledges that both are theoretically sound but may benefit from new principles or a combination of approaches to better adapt the theory. Another factor the author evaluates is topography, as the way a territory is occupied often centers around desirable, accessible, or flat locations. These central places may also be exclusive or uniquely suited. Mountains and streams, for example, generate distinct demands compared to other central places. Although such universal elements are found everywhere, their location and characteristics vary by region.

The third principle, proposed by the author, is the socio-political or administrative principle, known as the Central System based on the Administrative Principle. In the theory, this division serves as a defence mechanism, often viewed through a military lens for protection or strategic advantage. This principle aligns most closely with the real-world formation of central places and complementary regions. The socio-political principle can also be seen as a geopolitical one, related to the division of cities by existing territorial boundaries in current planning. Natural elements like rivers, roads, and topography can act as administrative boundaries within a central place system. In identifying this principle, the organic shape of the

territory, distances between central places, and market perspectives on demand and supply relationships become secondary or are disrupted. In the simulation shown in Figure 5, each central place takes on unique characteristics, varying in size, shape, and features, which necessitates more precise morphological and typological studies.

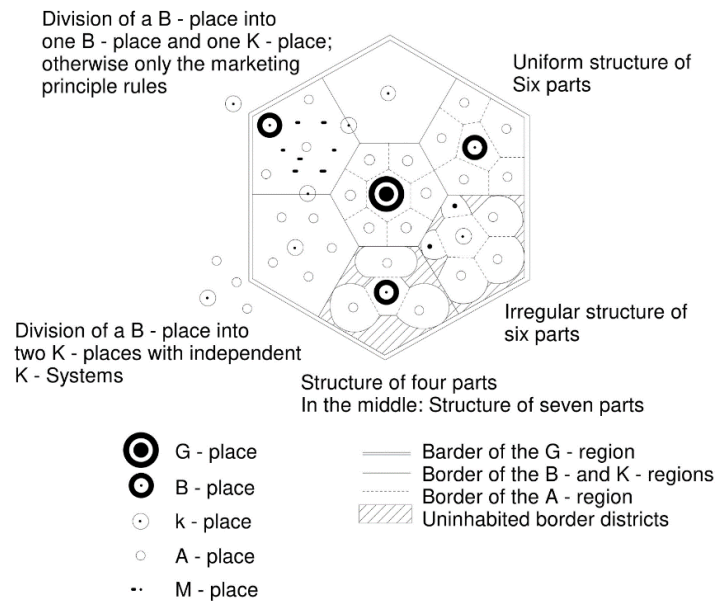
Figure 5 - The Distribution of Administration in a System of Central Places



Source: Figure 5 - Christaller (1966, p. 78). Adapted by the author.

In this principle, Christaller (1966) explains that within the administrative classification, one can identify formations of districts within municipalities or even provinces - a composite of multiple municipalities. The simulation was designed, and can be constructed, based on the laws established in each region. The models include configurations of small districts, with or without smaller subdivisions, as well as large districts, also with or without smaller subdivisions. Thus, while adhering to the Central System according to the Administrative Principle, the author models new arrangements by integrating additional principles in the formation of a territorial settlement. In the example shown in Figure 10, the theory presents the principle of separation, shaped by the political and geographic formations specific to each region, combined with influences from the Market Principle. In this scenario, the division is maintained independently across four types of divisions into six uniform (hexagonal) and irregular parts.

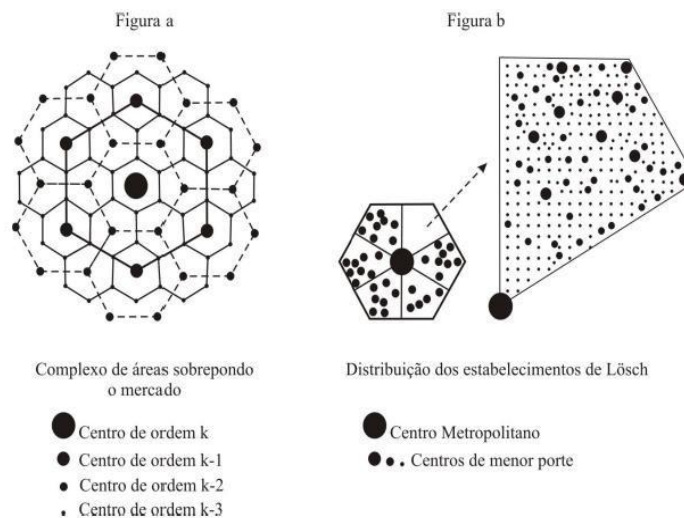
Figure 6 - A System of Central Places According to the Separation Principle.



Source: Figure 5 - Christaller (1966, p. 78). Adapted by the author.

In the theory, the author considers the hypothesis of territorial homogeneity. Stamm (2013) adapted the urban network configuration proposed by the theory based on Haggett’s (1973) analysis. From an educational perspective, it is possible to relate the hexagonal configuration systems to the city network system, incorporating surrounding relations.

Figure 7 - Configuration of the Urban Network of Hierarchized Cities.



Source: Haggett (1973), adapted by Stamm (2013).

In the final section of the theory, dynamic processes are explored. The constant reshaping of a central place creates a non-stationary state. Historical processes, trade relations, currency stability, and individual relationships are incorporated into the theoretical discussion,

which the author views as a dynamic theory. In this dynamic framework, central places may acquire new levels of importance regardless of population growth rates. Additionally, other central places - whether auxiliary or distant - may undergo transformations, making them more appealing to residents. Various scenarios are simulated: (i) rapid expansion of central places due to the traffic principle or industrial activity locations; (ii) population decline in central places, leading to reduced demand for central goods; (iii) increased production specialization, optimizing processes for service delivery - transportation, pricing, demand, and product variety; (iv) increased automobile use, impacting traffic as it becomes a primary mode of transportation to central places and influencing the location of central institutions: "(...) the use of the automobile to serve the customer and its use as transportation to places where central institutions exist" (Christaller, 1966, p. 106). (v) the size and importance of the central place; (vi) the buyer's willingness to pay; (vii) subjective economic distance; (viii) type, quantity, and price of a good; (ix) the rational structure of the system itself, where minor adjustments might occur without requiring a systemic reevaluation; and (x) time measurement.

At the beginning of this analysis, the author's intentions were summarized in Table 7. In these concluding simulations that validate the theory, the author introduces additional information, termed "conditions." These conditions can be interpreted as preferences, desires, or intentions associated with each limit relation and its corresponding descriptions. Each condition reflects a direct interpretation of the author's assertions within the theory, drawing on ideas from Christaller (1966) and adapted here for clarity.

Table 7 - Analysing the relationships between typical tracks with description and categories

(continue)

Typical Range	Relationship Between Limits	Description	Conditions
Central good of a higher order	High lower and upper limit	The good will be offered in central locations of a higher order.	Large places will be favorably developed, and small places will be unfavorably developed
Central good of a lower order	Low upper and lower limits	The central good should be offered in several places and also in smaller locations to serve the entire country	Small places will be favorably developed, and large places will be unfavorably developed
	High upper limit and low lower limit	The central good can be offered in many central locations that will vigorously compete in the complementary region.	All places will be well developed.

(continuation)

Typical Range	Relationship Between Limits	Description	Conditions
	High lower limit and low upper limit	The central good can only be offered in central places of a higher order, and only when there is a highly developed complementary region.	All places will be underdeveloped.

Source: Christaller (1966), elaborated and adapted by the author.

CPT outlines four distinct scenarios. The first scenario pertains to a higher-order central good with both high lower and upper limits. In this case, large places develop favourably, while smaller places develop unfavourably. The second scenario relates to a lower-order central good with both lower and upper limits set low, which results in small places developing favourably and large places developing unfavourably. The third scenario, also involving a lower-order central good, features a high upper limit and a low lower limit, leading to well-developed outcomes across all locations. The fourth scenario, again related to a lower-order central good, differs from the previous ones with a high lower limit and a low upper limit, resulting in minimal development in all places.

To achieve a well-developed environment, the author suggests economic and policy measures. These include administrative restructuring with district headquarters, revenue systems, flexible tariff policies, and transport and land-use planning aimed at strengthening central places. Additionally, Senenow (1927 *apud* CHRISTALLER, 1966, p. 126) highlights the need for creating "special districts" and "integrated districts."

CPT has faced criticism, particularly because it has primarily been studied in developed countries and was formulated in an era with commercial and spatial dynamics that differ significantly from those today. This theory requires further regional analysis and adaptation. Contributing to this critique, IPEA et al. (1999 and 2000) interpret that urban networks form when territorial polarization is clearly differentiated, with places acquiring greater or lesser centrality based on the functions they serve. The general characteristics of urban networks and some specific attributes need to be studied individually for each case.

Table 8 - Summary structure of the CPT

(continue)

Theory	Author	Year (original)	Object Studied	Complementary characteristics studied	Comments
Teoria do Lugar Central	Walter Christaller	1933 1966 (translated)	Human settlement centers and their relationship with their surroundings	Relation of Demand, Distance, Density, Price offered, Traffic, Variety of central goods. Suggests 3 (three) principles: (i) Central System according to the Market principle; (ii) Central System according to the Traffic	It considers dynamic elements, but is unable to visualise the scope of technology and innovation even though it has used the concept of "technical progress"



(continuation)

Theory	Author	Year (original)	Object Studied	Complementary characteristics studied	Comments
				principle, and (iii) Central System according to the Administrative Separation principle	

Source: Christaller (1966), elaborated and adapted by the author.

The CPT proposed by Christaller (1966) examined the rationale behind the formation of human settlements and their immediate surroundings. Key elements studied included distance, density, price, traffic, and the variety of central goods, analysed through three defined central systems: (i) the market system, (ii) the traffic system, and (iii) the administrative system. While the theory contributed to understanding the formation of regional arrangements based on these elements, the author acknowledged the presence of dynamic factors, referred to as technical progress, which were not fully explored in the theory's presentation.

## 2.4 GROWTH POLE THEORY (GPT)

The Growth Poles Theory (GPT), also known as the Theory of Polarization, aids in understanding the transformations of geographical and geo-economic spaces. Originally proposed by François Perroux in a lecture at Harvard in 1950, this theory demonstrates how a territory can be reshaped by establishing a central growth pole - such as an industry, facility, or specific infrastructure - within its surroundings. The influence of this pole on the adjacent territory can determine the region's development and its economic significance on local, regional, and global scales.

The theory emerged after the period of the Depressed Area in the early 20th century, marked by high unemployment, low per capita income, limited human development, and restricted access to public services. Parr (1999a,1999b) examined the effects of this phenomenon, especially in North America and Western Europe, identifying two main responses: moving workers to the work or moving work to the workers. Depending on the strategy and available infrastructure, regions either attracted skilled labor and investment, leading to concentrated development, or experienced deterioration and migration of resources. Most often, workers migrated within the region to growth poles rather than public incentives moving to other locations.

Wickham (1963 *apud* Rauhut e Humer, 2020) highlighted the necessity for industry and urban development with minimal theory and planning in the post-World War II era. This period allowed for practical application of various economic theories, and Rauhut e Humer

(2020) stress the importance of understanding the theory's historical context, as global supply chains did not operate on the current scale. For them, growth poles can arise either through planned intervention or as a result of historical trends.

Several scenarios are outlined within GPT. First, growth and development poles are inherently unbalanced; growth centers around the main pole (sector), initially creating uneven regional development (Rauhut; Humer, 2020).

Over time, equilibrium may be achieved through secondary industries linked to the main pole, generating a continuous cycle characterized by recognizable patterns in surrounding markets. The theory emphasizes the concept of economic space, suggesting that peripheral areas around urban investment centers attract innovative, dynamic companies.

Growth does not appear everywhere at the same time; it appears in points or growth poles with varying intensity; it extends through various channels and with different overall effects on the entire economy (PERROUX, 1955 *apud* PARR, 1999a, p.1197).

Parr (1999a)<sup>11</sup> argued that growth poles should help define regional labor patterns, demographic density, and the necessary investments in infrastructure, education, and transportation networks. Some strategies aimed to reduce regional concentration by diminishing the influence of central cities over satellite towns. In other cases, public intervention accelerated natural growth trends through transportation improvements and strategic land use.

In theory, these measures would better serve regional economic growth by reshaping the spatial structure, often by creating new poles outside existing ones. Although more common in developed countries, emerging nations at the time also adopted similar strategies. Examples include the development of Albury-Wodonga and Bathurst-Orange in Australia, and the planning of new growth poles in the United Kingdom in cities like London, Glasgow, Birmingham, and Liverpool, with smaller-scale projects in Paris (MERLIN 1969 *apud* PARR 1999a, p. 1202) and Madri (RICHARDSON 1975 *apud* 1969 *apud* PARR, 1999a, p. 1202).

In Brazil, similar regional decentralization strategies have been implemented in cities such as Goiânia (1935), Brasília (1960), and Tocantins (1989), established to create new political and geographic centers and to decentralize functions previously concentrated in other

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<sup>11</sup> John B. Parr cites various studies by authors and institutions carried out after a period of recession in which they evaluate the different public strategies around the world aimed at restarting growth centers. Each with its own particularity, obtaining different results, in particular the following studies: ECONOMIST INTELLIGENCE UNIT (1959), HOOVER (1971), UK (EUROPEAN FREE TRADE ASSOCIATION, 1968; Moseley, 1974; Parr, 1979) and eastern Canada (Higgins, 1972; and Wilson, 1964), as well as the Appalachian Region of the US (APPALACHIAN REGIONAL COMMISSION, 1970; Estall, 1982; Hansen, 1972; Newman, 1972; Widner, 1990).

central cities. This approach involves strategic location within a region linked to an industrial hub, encouraging the development of related industries around the planned growth pole and promoting growth across the surrounding areas.

The second scenario of GPT suggests that concentration and polarization arise from historical patterns. This scenario justifies the intentional concentration of investment in central hubs. As noted by Friedmann (1956 *apud* PARR, 1999a, p. 1197), the development of a growth pole is inseparable from the spatial economic structure, as concentrated regional growth can be essential for broader economic progress. Parr (1999a) categorizes growth pole formation into two types: induced growth poles and those based on historical evidence.

Much of the early literature on growth pole strategies failed to distinguish clearly between the growth pole as a feature of a dynamic spatial economy and the growth pole as a strategic tool for enhancing regional economic performance—essentially a distinction between 'natural' or 'spontaneous' growth poles and 'planned' or 'induced' growth poles (PARR, 1999a, p. 1196).

The third scenario, as presented by Parr (1999a) focuses on urbanisation and migration dynamics. The urbanisation rate accelerated through the mid-20th century, slowing in recent decades, while migration trends deepened during this time and continue today. Parr references studies by Rigby-Childs (1963), Hautreux and Rochefort (1964), Hautreux (1966), Allen and MacLennan (1970), Drewe (1971), and Conroy (1973) to illustrate how countries like the United Kingdom, the Netherlands, France, and Colombia strategically directed populations toward planned pole cities and newly established metropolitan regions. These growth poles were designed as mid-sized urban centers to effectively integrate rural and urban economies.

Planned growth poles in mid-sized centers were also viewed as contributing to regional development by enhancing pro-service perspectives, creating more efficient regional transportation, promoting linkages with agriculture, and fostering innovation diffusion in rural sectors (RONDINELLI, RONDINELLI AND RUDDLE, 1981, 1978 *apud* PARR, 1999a, p. 1204).

The fourth scenario addresses inadequate inter-regional structures, highlighted by disparities in income, political-administrative strategies, public financial support, and a lack of regional knowledge. In this scenario, national growth progresses differently across regions, amplifying spatial contrasts between urban cores and peripheries. Parr (1999a) cites Hirschman (1958), Friedmann (1969), and Williamson (1965)<sup>12</sup>, who acknowledge these disparities and suggest compensatory strategies for underdeveloped areas.

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<sup>12</sup> In addition to the examples given above, Parr (1999) cites other examples studied in Venezuela, Ireland, India, Indonesia, Malaysia, the Philippines and Thailand. See (Parr, 1999, p. 1206).

Lack of reliable regional data also contributes to suboptimal outcomes. Afonso (1968 *apud* PARR, 1999a, p. 1205) notes that "a frequent lack of information and uncertainty about underdeveloped regions can make entrepreneurs perceive investment outside the main established core as a high-risk endeavour."

Although Parr (1999a) identifies four distinct scenarios, he proposes analysing shared characteristics and strategies across them. He emphasizes that these features are not confined to one specific scenario but collectively represent unique strategies that distinguish GPT. The logical foundations laid out by Parr are not tied to a single strategy but instead form a flexible framework where multiple characteristics may apply to one, two, or even three strategic approaches. To provide clarity, this study presents the primary foundations of these strategies in Table 9 below.

Table 9 - The nature of the growth pole theory scenario strategy.

Characteristics of the Strategies	Logic of the growth-pole strategy in regional economic planning.
1 <sup>a</sup> Strategy involves encouraging the growth of employment and population within a region in certain planned locations or hubs over some specific period of time	1st Infrastructure concentration. Seen as a fundamental ingredient for economic development, it could become more important if there is greater diversification of supply.
2 <sup>a</sup> Strategy imposes a limitation on the number of sites or centres that are designated as planned poles, and this will vary from adjustment to adjustment.	2nd Concentration of investment. This is seen as exploitation of the economies in the agglomeration itself - they are dependent. This is not the most complicated case to analyse when we talk about the propelling industry of the planned pole in Perroux's work.
3 <sup>a</sup> Strategy necessarily requires spatial discrimination or selectivity between sites.	3rd Planned Centre. The region undergoes a radical remodelling over time as a result of the installation of an industrial hub. This change is accompanied by a major redistribution of the population and a redirection of service provision.
4 <sup>a</sup> Strategy inevitably involves a modification of the spatial structure of employment and population within a region	

Source: Parr (1999), elaborated and adapted by the author.

In addition to the four evaluated scenarios, GPT has also been applied to regional development strategies based on tourism. In this context, Harper (1966, cited in PARR, 1999a, p. 1207) suggests that growth poles could be instrumental in "managing and controlling a recreation resource," requiring environmental preservation to restrict and limit urban or constructed expansion. Other cases focused on growth pole development through public sector initiatives or private sector service expansion to improve and rationalize service provision.

Beyond these examples, a third application—the promotion of rural development—emerged with significant influence. Growth pole strategies in rural territories encouraged public investment through financial and infrastructural incentives to support small-scale industries and

programs in these regions.<sup>13</sup> These planned growth poles led to improvements in quality of life, service provision, and rural income levels, giving rise to what Parr (1999b, p. 1208) later termed "integrated rural development." However, studies indicate overlooked aspects in growth pole formation. Parr (1999b) categorizes these into four areas: (i) spatial configuration of growth poles, (ii) economic activities within the poles, (iii) external effects, and (iv) poles within an urban system. Regarding spatial configuration, Parr highlights the significance of size, hierarchical level, frequency, and location, suggesting that a deeper exploration of these relationships could have yielded more valuable insights. While the theory connects these aspects, it neglects the existing urban system. Concerning economic activities, the critique centers on the assumption that planned or spontaneous economic structures would automatically align with geographic spaces. Additionally, the relocation of manufacturing outside the central pole limited inter-regional interactions that could foster technical and financial services, entrepreneurial skills, and retention of existing activities. Perroux's early work (1955) focused on economic systems and interindustrial relationships rather than spatial aspects; it was only after three decades that Perroux (1988) began to consider territorial dimensions in GPT.

In examining external effects, Parr (1999b) distinguishes between favourable and unfavourable impacts. Favourable impacts, or spread effects as described by Myrdal (1957, *apud* in PARR, 1999b, p. 1255) and trickling-down effects as outlined by Hirschman (1958, *apud* in PARR, 1999a, p. 1207), include improved public and private services, increased household income, reduced business costs, and enhanced accessibility to the planned pole. Conversely, unfavourable impacts, or backwash effects (MYRDAL, 1957, *apud* in PARR, 1999b, p. 1255) and polarization effects (HIRSCHMAN, 1958, *apud* in PARR, 1999a, p. 1207), arise from large-scale business activities requiring extra-regional markets, which can drive less efficient enterprises out of the region and limit new employment opportunities.

Another issue is the lack of improvement in regional transport networks to support the growth of planned poles, which can drive internal migration from less productive to more progressive areas, weakening some regions. Additionally, there is a need to evaluate the role of poles within the urban system. Hierarchical models, such as those proposed by Lösch (1954), Christaller (1966), Beckmann and McPherson (1970), and Parr (1978), are cited as foundational

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<sup>13</sup> Parr (1999) illustrates this scenario by citing various contributions studied in different countries, such as: Germany (Krumme, 1972), Scotland (Moseley, 1974, pp. 27-33), Wales (Thomas, 1992; and Welsh Development Agency, 1990), (Johnson, 1970), Indonesia (Leinbach and Cromley, 1989; Leinbach, 1992), Kenya (Richardson, 1978), and several other nations (Harrison, 1967).

for designing growth pole strategies, though Parr (1999, p. 1258) cautions against viewing these as ideal structures:

It is probably better to view such regularities not as indications of some optimal structure but as evidence of tendencies toward statistical equilibrium (Vining, 1974) or as the outcome of a hierarchical system of centers having been subjected to a series of disturbances that may be treated as random shocks (BECK-MANN, 1958; PARR, 1999b, p. 1260).

While theoretical frameworks for establishing centralizing poles have developed, they are often criticized for irregular implementation. Economists and urban planners argue that these strategies lack long-term continuity, often due to shifting political objectives or government changes, as noted by Conroy (1973, *apud* in PARR, 1999b, p. 1260). The failure to establish successful growth poles is frequently attributed to misalignment with regional needs, resulting in inadequate, impractical, or unrealistic strategies. Parr (1999) suggests that regional economic planning could benefit from more detailed information to ensure decision-making is relevant and impactful.

Parr (1999b) identifies four distinct phases in the application of growth pole theory. The first phase, in the early 1960s, reflects Perroux's influence. The second phase, in the late 1960s, marks the widespread adoption of growth pole theory to address various regional issues. The third phase, occurring twenty years later, involves a re-evaluation of the model as economic and political changes led to its partial or full abandonment. Finally, the fourth phase saw the near-total rejection of the strategy, although some approaches shifted toward knowledge-based growth, technology, and regional clusters—concepts aligned with contemporary regional development frameworks.

#### **2.4.1 The current context and the maturing of the theory**

The growing research, publications, and global focus on urban environments, driven by governmental and institutional initiatives, have heightened the urgency for international agreements and local actions. UN-Habitat (2020a) projects that by 2050, two-thirds of the world's population will live in cities. This rapid urbanisation poses challenges for optimising resource use while ensuring sustainable coexistence with human-occupied territories (OECD, 2012, 2013, 2018; ESPON, 2007). A significant portion of the global urban population lives in clusters, such as poles, agglomerations, metropolitan regions, integrated regions, and polycentric areas, described by Rauhut (2000 *apud* RAUHUT; HUMER, 2020, p. 2121) or, in

the European context, Functional Urban Areas (FUAs)<sup>14</sup>. These urban clusters have evolved beyond their traditional configurations, demanding new studies and actions that challenge academia, policymakers, private administrators, and communities. According to Rauhut and Humer (2020), polycentric urban regions operate under principles similar to urban-regional scales.

Theoretical advancements suggest that regional imbalances are intrinsic to economic growth discuss Hirschman (1958 *apud* RAUHUT; HUMER, 2020, p. 2120). Li (2012 *apud* RAUHUT; HUMER, 2020, p. 2120) and Ferreira de Lima (2003 *apud* STAMM, 2013, p. 42) argue that analysing urban space is essential for understanding human, commercial, strategic, and institutional regional interactions. Industrial activities—including production, consumption, trade, and taxation—centralise the workforce and productivity, reshaping territorial forms and uses. Centralizing poles drive migration and commuting, offering opportunities and challenges for employers and workers. Friedmann (1973) identified growth poles as geographic hubs for spatial expansion, diffusion, and innovation, while Castells' urban network theory suggests cities remain interconnected regardless of geographic proximity, challenging earlier assumptions about proximity's role in urban interconnectivity (CARDOSO and MEIJERS, 2016 *apud* RAUHUT; HUMER, 2020, p. 2120).

Schumpeter (1994) explored the transformative power of innovation, highlighting its ability to disrupt established systems and forge new relationships between companies and consumers. His concept of "creative destruction" explains how the growth of a central business can drive innovation and imitation among surrounding companies, fostering regional economic acceleration. Structural, economic, or political changes often lead to regional centralisation, illustrating Schumpeter's influence on Perroux's theory of growth poles. This theory holds that the expansion of one company spurs innovation and technological progress among neighboring firms through imitation, fuelling broader economic development:

(...) Innovative activity disrupts the stationary circular flow, promoting local growth and leading other firms to innovate through imitation. Companies that fail to adapt eventually disappear through "creative destruction" (2005 *apud* STAMM, 2013, p. 43, our translation).

Carvalho and Chaves (2007 *apud* MATTE JÚNIOR; DE ALVES, 2017, p.109) argue

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<sup>14</sup> FUAs are classified on the basis of functional relationships such as social, economic, geographical, criteria, heritage and landscape. They are known in the European network with different identifications. This requires in-depth research into the various reports by European statistics (Eurostat), the European Territorial Observatory Network (ESPON), METREX - The Network of European Metropolitan Regions and Areas (MEXTREX) and the Organisation for Economic Co-operation and Development (OECD).

that polarized regions evolve through two interconnected dimensions: industrial organization and regional economy. The former addresses the competitive characteristics of industrial organization and its ties to regional territory, while the latter focuses on regional factors underpinning the pole. Perroux (1955 *apud* PLUMMER; TAYLOR, 2001, p 222). highlighted that "firms and industries" are central to economic prosperity, an idea reinforced by Boudeville (1966), who described growth poles as "urban centers inducing economic activity across their spheres of influence."

The expansion of international trade and technology has reshaped regional economic structures. Vernon (1966) observed how global commerce and technological advances introduced new products and phased out others. Rees (1979) and Rees and Stafford (1986) further highlighted how these dynamics impact regional economic cycles, with spatial consequences such as centralizing production in metropolitan areas. Webber (1972) noted that while external economies of scale encourage firms to concentrate in metropolitan regions, this centralization incurs spatial and economic costs (Plummer; Taylor, 2001, p. 223).

The product life cycle, influenced by technology and trade, redefined local and regional economic relations. These cycles often follow finite patterns that necessitate territorial analyses. Plummer and Taylor (2001) further introduced the theory of flexible production, citing Scott (1988) and Storper (1995), which emphasizes localized demand and the emergence of industrial districts, tech hubs, and financial centers. These localized systems, described as "earning regions" or "innovative milieus" (Asheim, 1997; Lundvall, 1992; Maskell et al., 1998), balance regional and external interactions, fostering economic growth through human capital and industry collaboration.

Changes in corporate decision-making introduce external influences that reshape local operations, adding new dimensions of information, knowledge, and specialization to Schumpeter's model of flexibility. This framework underscores the importance of institutional evolution, cumulative learning, and local social norms (MORGAN,1996 *apud* PLUMMER; TAYLOR, 2001, p 226).

Schumpeter's ideas gain further depth through the integration of local resources, technological leadership, and institutional support, complemented by Porter's (1990, 1998) focus on productivity through competitiveness and clustering. Porter emphasizes that regional growth depends not on existing resources but on the rate of resource creation (Plummer; Taylor, 2001, p.227).

Taylor and Thrift (1982, 1983) examined regional business relationships, identifying three factors shaping growth: technological control, profit extraction by corporations, and the



integration of smaller firms. Their classification system highlights how these variables influence operational characteristics and regional integration, preserving historical advantages while fostering new growth (Plummer; Taylor, 2001, p.228).

Von Thünen's focus on agricultural production distances and Christaller's central place theory influenced Perroux's growth pole theory (GPT), which examines industrial production and its regional effects. GPT emphasizes the importance of historical and induced factors in shaping growth poles, advocating sensitivity to local and regional contexts while analysing their broader economic impacts.

Table 10 summarizes the Theory of Growth Poles by François Perroux (1950), emphasizing its focus on the distribution of economic activities in polarized spaces. The theory incorporates complementary characteristics such as polarization effects, inducing poles, and historical evidence but initially failed to link economic activities to specific territories or regional realities. This highlights its early theoretical limitations in addressing contextual and spatial complexities.

Table 10 - Summary structure of the Theory of Growth Poles.

<b>Theory</b>	<b>Author</b>	<b>Year</b>	<b>Object Studied</b>	<b>Complementary characteristics studied</b>	<b>Commentary</b>
Theory of Growth Poles	Francois Perroux	1950	Distribution of economic activities in a polarised space (geographical or economic)	Context, Polarisation effects, inducing pole, historical evidence, regional concentration, regional deconcentration, tourist pole.	It didn't initially relate economic activities to the territory and didn't respect the nature of the problem and the regional reality.

Source: Perroux (1950), elaborated and adapted by the author.

## 2.5 CONVERGENT APPROACHES TO CENTRAL PLACE AND GROWTH POLE THEORIES

The CPT and GPT offer valuable frameworks for understanding metropolitan institutional arrangements. This study draws upon the foundational concepts developed by Christaller (1933; 1966) and various scholars who analysed Perroux's theory (1950).

The analysis follows these steps: (i) identifying the core concepts presented by each theory's authors; (ii) avoiding hierarchical classification, as some concepts are explicitly foregrounded as primary, while others are embedded as secondary within the text; (iii) interpreting each concept in relation to current territorial realities, specifically examining connections with existing metropolitan institutional arrangements; (iv) cross-referencing

concepts between the two theories; (v) assessing each identified concept for any necessary conditions underpinning its applicability, recognizing that certain conditions are essential for the concept's relevance; and (vi) establishing a minimal classification for these concepts based on prior analyses. The results are summarized in Table 11 and elaborated upon in the following text.

Table 11 - List of common concepts between theories and their attributes/conditions

	<b>Concepts announced by the Central Place Theory and the Theory of Growth Poles</b>	<b>Classification</b>	<b>Condition</b>
1	Territory Study	Physical	Locality
2	Functional Hierarchy	Physical	Scale
3	Region	Physical	Scope
4	Road links and dependencies	Physical	Urban and rural mobility
5	Urban networks	Physical	Mobility between urban networks
6	Urbanisation process	Non-physical	Phenomenon
7	Investment concentration	Non-physical	Economic Context

Source: Elaborated by the author (2022).

The CPT and GPT share several key concepts that inform the study of metropolitan institutional arrangements. This analysis highlights these commonalities, referencing by (Ribeiro and Fachinelli (2021, 2024) interpretations. The first concept is (i) territorial analysis, examining how activities and services affect land use and the region. The second concept, (ii) functional hierarchy, is addressed differently in each theory. CPT defines hierarchy through central places categorized by population size or the importance of goods provided (higher or lower-order goods), while GPT posits that growth is inherently imbalanced, with the primary pole initiating development, followed by peripheral secondary poles, each with distinct spatial configurations.

Another shared concept is (iii) the regional dimension. Christaller (1966) proposes three principles - Market, Traffic, and Administrative Separation - each emphasizing a central place's cooperative relationship with its complementary region. Perroux (1950) similarly views growth poles as having regional or inter-regional connections, driven by labor migration, dispersal, or investment concentration in specific areas. The fourth concept is (iv) connectivity and functional dependence, relating to the interplay between central places and surrounding settlements. CPT emphasizes the importance of the Traffic Principle, which addresses different patterns of inter-city connectivity shaped by natural or planned factors. GPT, in line with this, considers regional infrastructure concentration vital for service diversification.

The fifth concept, (v) urban networks, is seen as organic and independent in CPT, where each network is based on population or density metrics and may connect seamlessly over land or infrastructure. In GPT, urban networks emerge as centralized spatial clusters influenced by a main pole and other factors, such as technology, innovation, and global trade. Another parallel concept is (vi) the urbanisation process, influenced by population concentration or internal migration. Christaller (1966) explores hypothetical scenarios that illustrate migration dynamics, focusing on consumption, travel time, and distance. As smaller cities lack economic diversity, residents gravitate towards larger, service-rich cities. This process is more explicitly addressed in GPT, where economic poles drive natural movements of goods and people, often creating socio-economic divides between urban centers and peripheral areas.

The final concept, (vii) investment concentration, in CPT is integral to its foundational principles. Each central place is an aggregation of people and services, where first-order places benefit from the development of second-order ones and vice versa. In GPT, investment concentration fosters local and regional development through planned poles, leading to economic activity concentration and interconnected industries.

Each of these concepts is connected to specific conditions that allow them to manifest. For example, (i) territorial analysis requires a defined locality; (ii) functional hierarchy depends on the concept of scale, which here is an instrument of comparison rather than geographical measure; and (iii) region relies on scope, with external influences expanding its boundaries beyond designated limits. For (iv) connectivity and functional dependence, the condition is urban and rural mobility, emphasizing the importance of inter-municipal linkages without prioritizing specific transportation modes. Urban networks, concept (v), also depend on the mobility condition, requiring connectivity within and between urban networks. The concept of (vi) urbanisation processes connect to phenomena measurable over time, highlighting shifts in population between urban and rural areas. Lastly, (vii) investment concentration is conditional on economic analysis, requiring data on private and public investment impacts relative to per capita and sectoral economic performance. This framework allows for a deeper understanding of how these foundational concepts apply across diverse metropolitan settings, with each condition providing a structured basis for interpreting these theories within their specific contexts.

Studies examining the convergent concepts of CPT and GPT often focus on socio-spatial analysis. This research first addresses the physical classification of these concepts - namely, territorial study, functional hierarchy, region, connectivity and dependency in transport, and urban networks, as noted by Jessop et al. (2008). It then considers the non-

physical classification, represented by urbanization process and investment concentration, as analysed by Harrison and Growe (2014) and Santos (1979, 1985).

In their exploration of common concepts across these theories, Jessop et al. (2008) highlight that numerous scholars have addressed these topics over the past three decades in specific, complex contexts (e.g., Cresswell, 2007, 2008; Paasi, 2004; Brenner et al., 2003; Hudson, 2002; Sheppard, 2002; Dicken et al., 2001; Collinge, 1999; Swyngedouw, 1997; Smith, 1995; Agnew and Corbridge, 1994; Taylor, 1994; Massey, 1984). For a comprehensive overview, they recommend studies by Cox (1997), Lee and Wills (1997), Wolch and Dear (1989), and Gregory and Urry (1985). Dear and Scott (1981) examined socio-spatial lexicons through a one-dimensional approach, analysing the totality of socio-spatial organization. They developed the TPSN framework, which encompasses territory (T), place (P), scale (S), and networks (N), assigning principles and standardizations to these socio-spatial relations.

The framework is structured to address socio-spatial dynamics through this multi-faceted approach, as summarized in the Table 12 below:

Table 12 - Four key dimensions of socio-spatial relations.

<b>Dimension of Sociospatial relations</b>	<b>Principle of sociospatial structuration</b>	<b>Associated patterning of sociospatial relations</b>
Territory	Bordering, bounding, parcelization, enclosure	Construction of inside/outside divides; constitutive role of the 'outside'
Place	Proximity, spatial embedding, areal differentiation	Construction of spatial divisions of labor; differentiation of social relations horizontally among 'core' versus 'peripheral' places
Scale	Hierarchization, vertical differentiation	Construction of scalar divisions of labor; differentiation of social relations vertically among 'dominant', 'nodal', and 'marginal' scales
Network/reticulation	Interconnectivity, interdependence, transversal or 'rhizomatic' differentiation	Building networks of nodal connectivity; differentiation of social relations among nodal points within topological networks

Source: Figure1 - Four key dimensions of sociospatial relations (JESSOP et al., 2008).

In addition to defining the four lexicographical dimensions, the authors propose a unidimensional analysis that links respective concepts across socio-spatial dimensions. They suggest that a territory-to-territory relationship produces methodological territorialism, while a place-to-place relationship yields place-centrism. Interactions between scales result in Scale-centrism, and network-to-network relations produce network-centrism (Jessop et al., 2008).

The authors themselves, however, question these unidimensional relationships, acknowledging that they are insufficient for a more advanced spatial evaluation strategy. In the same study, they introduce a multidimensional approach termed the Strategic-Relational

Approach (SRA). This approach aims to provide a spatial analysis of dilemmas and conflicts that shape spaces over time. According to the authors, the SRA has been applied in state projects to analyse potential spatial adjustments, historical-geographical combinations, crisis trends, and the reordering of the socio-spatial landscape.

Through the multidimensional analysis suggested in Table 13, each socio-spatial concept can be employed or related in three distinct ways within the SRA matrix. The authors emphasize the importance of linking various concepts to avoid unilateral or reductionist analyses. However, they clarify that these concept interactions are intended merely to “indicate the general direction of our thinking rather than to present a fully polymorphic account of the concepts and methods in question” (Jessop et al., 2008, p. 396). The concept of territory encompasses boundaries and multi-level governance, while place addresses core-periphery dynamics and local/urban governance. Scale refers to the division of political power and vertical ontology, and networks involve origin-limits, ripple effects, flat ontology, and networked systems. These concepts facilitate an understanding of the spatial division of labor and power relations across various domains and scales.

Table 13 - General guidelines and multidimensional analysis of the 4 socio-spatial lexias.

<b>Structuring principles</b>	<b>Territory</b>	<b>Place</b>	<b>Scale</b>	<b>Networks</b>
Territory	Past, present, and emergent frontiers borders, boundaries	Distinct places in a given territory	Multilevel government	Interstate system, state alliances, multi-area government
Place	Core-periphery, borderlands, empires, neomedievalism	Locales, milieux, cities, sites, regions, localities, globalities	Division of labor linked to differently scaled places	Local/urban governance, partnerships
Scale	Scalar division of political power (unitary state, federal state, etc)	Scale as area rather than level (local through to global), spatial division of labor (Russian doll)	Vertical ontology based on nested or tangled hierarchies	Parallel power networks, nongovernmental international regimes
Networks	Origin-edge, ripple effects (radiation), stretching and folding, crossborder region, interstate system	Global city networks, polynucleated cities, intermeshed sites	Flat ontology with multiple, scalar entry points	Networks of networks, spaces of flows, rhizome

Source: Figure 3. Beyond one-dimensionalism: conceptual orientations (Jessop et al., 2008).

In examining the second approach - focusing on non-physical classifications - this analysis considers the concepts of urbanization process and investment concentration, as noted by Harrison and Growe (2014) and Santos (1979, 1985).

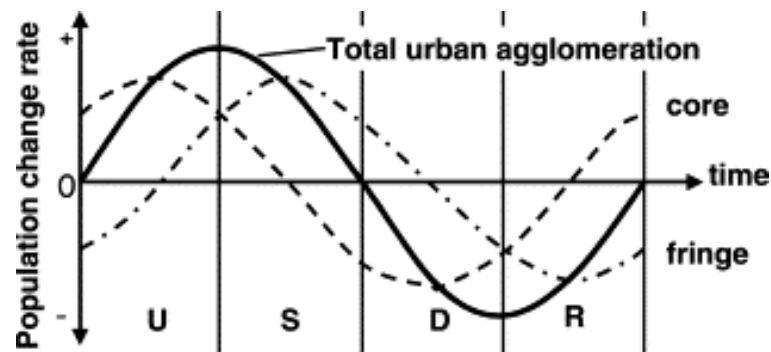
The urbanisation process, which developed throughout the 19th and 20th centuries, has

generated diverse analyses. Urban-rural population dynamics are influenced by economic, social, and political factors. According to IBGE (2020), the urbanisation rate is defined as the percentage of residents living in urban households relative to the total population. It is measured by the ratio between urban and rural populations. Antrop (2004) describes urbanisation as a complex shift from rural to urban lifestyles, closely linked to transportation advancements, communication availability, public service provision, commerce, and infrastructure development.

In Europe, urbanisation accelerated rapidly in the 19th century Champion et al. (2001, 2001a, 2000a, 1982 *apud* ANTROP, 2004). In Brazil, this phenomenon occurred mid-20th century, between the 1950s and 1960s. During this period, Brazil's urban growth rate was approximately 4.8%, compared to 2.3% in developed countries. According to Silveira (2008 *apud* MARINA, 2012), this growth persisted into the 1970s and 1980s, with slight adjustments to 4.1% domestically and 1.3% internationally. Authors like Redfield and Singer (1954), Sjoberg (1960), and Hoseliz (1960) provided theoretical perspectives on Urbanisation, though notable contributions were from McGee (1967, 1971) on urbanisation in the developing world Marina (2012), and Santos (1979) on spatial relationships and sustainability. Regions are neither independent nor autonomous; they both influence and are influenced by external and internal factors, shaping national development. The spatial process of urbanisation is also historically driven by the geographic distribution of productive forces, circulation, distribution, and resulting social relations (Saquet et al., 2008).

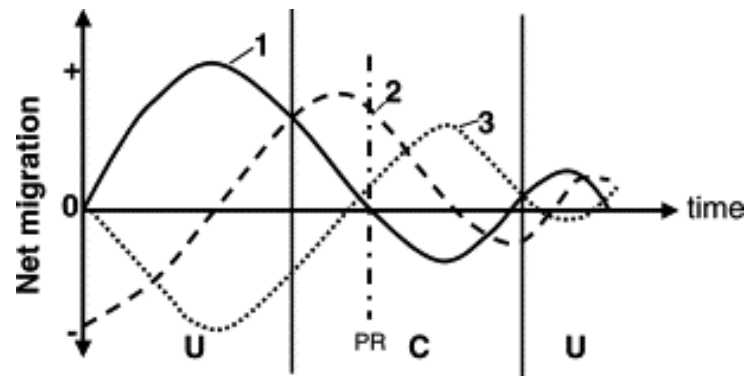
Urbanisation is neither singular nor uniform. Antrop (2004) identifies stages or phases of Urbanisation influenced by urban and rural spaces. Contributions by Champion (2001), Geyer and Kontuly (1993), Van der Berg et al. (1982), and Klaassen et al. (1981) outline four phases: urbanisation - concentration of population in central areas driven by rural migration; suburbanisation - growth across urban peripheries rather than the center; counterurbanisation or desurbanisation - a decline in both central and peripheral populations; and reurbanisation - population recovery in central and subsequently peripheral and rural areas. Antrop (2004) illustrates these stages, showing population change over time in central and peripheral areas. The first image details the patterns within urban agglomerations across all phases. The second image presents a differential model closely tied to cities undergoing industrial and economic transformations due to the industrial revolution. Here, cities are classified into (1) primary cities, (2) intermediate cities, and (3) smaller cities, each with a reverse population threshold marking a turning point in population trends.

Figure 8 - Stages of urbanisation cycles



Source: Fig. 2 Klaassen et al., Van der Berg et al., Champion (1981, 1982, 2001 *apud* ANTROP, 2014)

Figure 9 - Different model of urbanisation after industrialisation



Source: Fig. 3 Geyer and Kontuly (1993 *apud* ANTROP, 2014)

The process of urbanisation is also studied within regional contexts. Each urban cluster, institutional region, metropolis, or group of cities with shared interests is influenced by different cycles. It's not only population size, density, and location that matter, but also diverse lifestyles and cultural variations that reshape urban settlements (PADDISON, 2001, *apud* ANTROP, 2004). Research by Creshire (1995, *apud* ANTROP, 2004), analysing 241 Functional Urban Regions (FURs) in Northern and Southern Europe, identified varied urbanisation cycles over time. These findings highlight the need for careful examination of urbanisation within regional arrangements, as each exhibits unique behaviours and specific urban-rural dynamics, demanding tailored analytical models.

Urbanisation is inherently complex, shaping interpretations of territorial relations, especially in how urban space dominates rural. Often, the broader regional relationship between urban and rural arrangements is secondary, focusing primarily on urban-centric issues. Yet, territorial analysis cannot yield accurate conclusions without incorporating subjective or "relational" perspectives to respect regional identity and enhance local cultural values. Harrison and Growe (2014) argue that regional studies should address both territorial and relational

perspectives. Cochrane and Ward (2012 *apud* HARRISON AND GROWE, 2014, P. 2335) state that:

Conventional distinctions fail insofar as each [territory] defines and is defined by others. Territories are shaped by overlapping social, political, and economic relationships extending through space, while identifiable territories, in turn, shape and sometimes limit the development of these relationships.

Further emphasized “Progress in regionalism requires a deeper exploration of relational thinking on territorial politics and territorial thinking on relational processes” by Jonas (2012 *apud* HARRISON AND GROWE, 2014, P. 2335).

The relational approach offers a complementary perspective in territorial analysis for two primary reasons: (a) regional issues often arise from the political or economic structure specific to the area of study<sup>15</sup> and (b) limitations exist in analysing relational and territorial aspects separately. The authors argue for a nuanced approach that acknowledges both territorial and relational processes and spaces. This complex regional analysis draws on European examples, highlighting defined and undefined spatialities categorized as dominant, emergent, or residual in regional development (Paasi, 2008). Additionally, this complex connectivity demands a grasp of the "regional imaginary," where social actors, not the spatial form itself, drive regional dynamics Mayer (2008 *apud* PAASI, 2008).

The relational approach also underscores the role of the nation-state and state-level organization (Harrison, 2013), illustrated by German principles. In early 20th-century Germany, regional growth relied on balanced financial support. By the 1980s and 1990s, national strategies became more competitive, with a focus on leveraging regional potential, fostering cooperation with rural partners, and promoting self-organization without disrupting existing administrative structure Staats (2005 *apud* HARRISON AND GROWE, 2014).

Recently, the German concept of metropolitan has evolved under both territorial and relational analysis. Initially, in 2006, metropolitan areas were categorized as dense (agglomerations) and extended (political cooperations). Six years later, this distinction shifted to geopolitical cooperation, emphasizing networks maintained by flows of people and goods rather than geoeconomic divisions. This framework aligns with the Territorial Agenda of the European Union for 2020 (Harrison; Growe, 2014).

In examining the non-physical classification in urbanisation studies, the concept of investment concentration, resources, and economic dynamics - particularly in developing

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<sup>15</sup> The authors cite examples of studies that realise the importance of the relational approach. For this see (HARRISON; GROWE, 2014).



countries - becomes central, as highlighted by Santos (1978). His theory of the two circuits of the urban economy in underdeveloped countries explores economic development from a spatial perspective:

The segmentation present in urban society concerning the ability to meet needs creates quantitative and qualitative differences in consumption, which in turn, are both cause and effect of the existence of different circuits of production, distribution, and consumption within cities SANTOS (1978 *apud* MARINA, 2012, P. 154, our translation)

Santos's theory is grounded in the relationship between urban activities and their inhabitants, which depends on varying degrees of access to technology, capital, and organizational resources. High degrees characterize the upper circuit, which includes modern industries, export-oriented manufacturing, financial services, and wholesale trade. Conversely, low degrees form the lower circuit, oriented toward poorer consumers and composed of small-scale, less modern businesses with limited territorial impact (Marina, 2012).

Both the lower and upper circuits influence spatial organization and function, shaped by historical circumstances and the passage of time. The state acts as an intermediary between these spatial realities, historical contexts, and innovation agents (Saquet; Silva; Da Silva, 2008). The upper circuit often receives more focus, as it represents production-oriented mechanisms, while the lower circuit reflects consumption-based mechanisms (Simone et al., 2005). According to Marina (2012), studies by Missen and Logan (1977) also examine the interaction between these circuits and regional development policies.

Corrêa (1988, 1996 *apud* MARINA, 2012). further explores these circuits in relation to regional and urban networks in developing countries. He finds correlations between Santos's two-circuit model and Christaller's CPT. Corrêa suggests that.

Using the concepts of maximum and minimum spatial reach, one can see how local cities operate primarily through the lower circuit, intermediate cities integrate both circuits, and metropolitan centrality is defined by the upper circuit. The hierarchy of central places exists mainly for high- and middle-status populations, while the poor, with limited mobility, experience a restricted centrality (MARINA, 2012, our translation).

Recent studies link Santos's circuits to the broader, globalized economy driven by innovation and technology, with interaction between circuits increasingly blurred (Marina, 2012).<sup>16</sup>

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<sup>16</sup> See studies also in ALMEIDA, L. SANTOS E SERPA, MONTENEGRO, BICUDO Jr., CERPA E PORTO, OLIVEIRA, DI NUCCI (2000, 2000a, 2006, 2006a, 2007, 2010, 2010a *apud* MARINA, 2012).

A key observation is the intensifying metropolization of the global economy, with growth, wealth, and power concentrated in a few urban centers. Tokyo's output surpasses Brazil's, and Chicago's rivals Mexico City's, with half of Mexico's economic activity concentrated in its capital. Examples such as the budget of Hauts-de-Seine, comparable to Belgium's, illustrate this trend. Economic exchanges increasingly occur between metropolitan centers rather than between nations, creating networks akin to an "archipelago economy" that bypasses intermediate zones. This phenomenon of metropolization is evident in developed countries, where cities like Paris continue to grow despite decentralization, London expands across the UK, and Tokyo has evolved into a single-centered metropolitan area.

In developing nations, urban macrocephaly highlights the imbalances and dependencies within metropolitan regions, raising concerns about regional solidarity. While peripheral areas may seem disconnected from major cities, their economic fate is often linked to metropolitan centers through state redistribution policies. However, these peripheral areas may weigh more heavily on metropolitan economies today than they support them, as they are no longer primary sources of low-skilled labour. This evolving dynamic suggests that wealthy regions rely increasingly less on poorer areas, challenging traditional notions of territorial solidarity (BENKO, 2002).

Mi and Coffman (2019) analysis delves into the role of the sharing economy in advancing sustainability, emphasizing the transformative potential of peer-to-peer platforms in fostering efficient resource utilization and reducing environmental footprints. By enabling individuals to share underutilized assets, such as vehicles or housing spaces, the sharing economy not only lowers transaction costs but also facilitates a shift toward collective consumption, which, in turn, can decrease the overall demand for new goods and the resource intensity associated with them. The authors highlight notable environmental and social benefits, particularly within sectors like transportation, where services such as car-sharing and bike-sharing have proven effective in reducing vehicle ownership and emissions. In cities like Shanghai, bike-sharing programs have led to significant reductions in CO<sub>2</sub> emissions, underscoring the sector's capacity to contribute meaningfully to urban sustainability initiatives. However, Mi and Coffman (2019) acknowledge the governance challenges inherent in this model, notably the tension between profit motives and societal well-being. They argue that to mitigate these tensions, governments should adopt policies that incentivize sustainable practices within the sharing economy, potentially through the implementation of life cycle assessments (LCAs) to identify and support eco-friendly business models. By providing tax breaks or subsidies to companies demonstrating positive environmental impacts, public authorities could

realign corporate interests with public sustainability goals. Furthermore, the authors call for a genuine integration of sustainability into corporate social responsibility (CSR) frameworks within the sharing economy, cautioning against the superficial use of CSR as a mere marketing strategy. Instead, they suggest that companies should be transparent about their environmental impacts and actively commit to reducing them, thus fostering greater accountability. Consumer behaviour also emerges as a pivotal factor, as the choices of individuals shape the sharing economy's market dynamics. The authors propose that governments could incentivize sustainable consumer practices, for instance, by offering insurance discounts for using eco-friendly services, thereby reinforcing sustainable consumption patterns. Lastly, Mi and Coffman (2019) address the economic resilience and equity concerns within the sharing economy, arguing that long-term stability requires effective collaboration with governmental bodies. Given the sector's potential financial volatility, public authorities might adopt a cautious approach, allowing market leaders to establish stability before fully integrating sharing services into urban planning frameworks.

Santos (1985) in *Espaço e Método* book serves as a pivotal text in contemporary geography, essential for scholars investigating spatial issues and methodologies. Santos approaches the concept of space with depth, positioning it as a crucial factor in social evolution alongside economic and cultural dynamics. He frames space as a complex societal totality shaped by various agents, such as individuals, firms, and institutions, advocating for a historically - informed, holistic perspective to understand its transformations fully. The interplay between space and time emerges as a central theme, particularly in the context of developing countries, where historical economic stages - from large-scale commerce to the modern technological era - leave indelible imprints on spatial characteristics. Santos (1985) rigorously examines the role of capital in shaping space, especially through what he terms the "technical-scientific environment," and critiques how global capitalism, while unifying technical methods, yields diverse spatial outcomes depending on location-specific applications. His analysis emphasizes the integration of structure, process, function, and form within geographical methods as essential to decoding spatial phenomena. The text further explores regional dynamics, viewing regions as adaptable functional centers responsive to societal demands across time. In his critique of state and market interventions in resource distribution, Santos reveals how systemic inequalities foster spatial poverty, underscoring the ongoing impact of socio-economic forces on spatial organization. *Espaço e Método* thus endures as a foundational work, providing critical concepts that not only enrich spatial analysis but also deepen critiques of socio-economic disparities within geography.

Mi and Coffman (2019) analysis of the sharing economy's role in promoting sustainability and Santos (1985) seminal in *Espaço e Método* both examine how spatial and economic dynamics influence resource distribution, social equity, and environmental impact. Mi and Coffman (2019) highlight the sharing economy's potential to reshape consumption through peer-to-peer networks that reduce resource demand by enabling shared access to underutilized assets. This concept aligns with Santos (1985) view of space as a societal totality, in which economic activity and social relationships continuously redefine spatial configurations. Both perspectives intersect with principles from CPT and GPT, which emphasize the relationship between central functions and peripheral effects. CPT's focus on the hierarchical organization of service hubs mirrors the sharing economy's dependence on urban centers to foster accessibility and collective consumption. Similarly, GPT's view of growth centers as drivers of regional development parallels the sharing economy's potential to act as a growth pole, invigorating local economies while advancing socio-environmental objectives.

In Table 14, relationship between common concepts of CPT and GPT and recent studies, this study presents the combined analysis of convergent concepts derived from both theories and their respective implications. The table is organized into five columns. The first column lists the common (convergent) concepts identified between the two theories. The second column classifies these concepts according to the elements studied, as referenced in the first column. The third column outlines the conditions (basic scenario) required for these concepts to be applied effectively. The fourth column aligns these concepts with recent studies - highlighting how certain concepts overlap or complement each other. Finally, the fifth column references specific studies and research that address these concepts within the context of regional planning analysis.

Table 14 - Relationship between the announced common concepts of theories and recent concepts.

(continue)					
<b>Concepts announced by Theories</b>	<b>Classification</b>	<b>Condition</b>	<b>Concept aligned with recent studies</b>	<b>Linkage with Classical Theories</b>	<b>Theories Study Reference</b>
Study of the Territory	Physical	Locality	Territorial	Christaller (1966) Perroux (1955)	Jessop et al. (2008)
Functional Hierarchy	Physical	Scale	Scale	Christaller (1966) Perroux (1955)	Jessop et al. (2008)
Region	Physical	Scope	Place	Christaller (1966) Perroux (1955)	Jessop et al. (2008)
Road Linkage and Dependency	Physical	Urban and rural mobility	Net	Christaller (1966) Perroux (1955)	Jessop et al. (2008)

(continuation)

Urban Networks	Physical	Mobility between urban networks	Net	Christaller (1966) Perroux (1955)	Jessop et al. (2008)
Urbanisation Process	Non-physical	Phenomenon	Urbanisation	Christaller (1966) Perroux (1955)	Santos (1979, 1985); Benko, (2002) and Harrison and Grove, (2014).
Concentration of Investments	Non-physical	Economic Context	Urban Economy	Christaller (1966) Perroux (1955)	Santos (1979, 1985) and Mi and Coffman (2019).

Source: Elaborated by author (2022).

The convergence of foundational theories in territorial and urban studies with emerging concepts of spatial and functional flexibility offers a solid framework for analysing contemporary urban and regional challenges. Traditional ideas, such as territorial studies, functional hierarchy, regional interactions, transportation dependency, urban networks, Urbanisation processes, and investment concentration, remain essential for understanding spatial organization and development. However, as Urbanisation and environmental issues have intensified, theorists have advocated for approaches that transcend rigid spatial divisions. For instance, Sennett (2018) likens cities to sponges, suggesting that porous boundaries enable dynamic exchanges across urban and ecological systems. Aldo van Eyck's emphasis on open, socially integrated spaces aligns with this, as does Ellin (2006) argument for porosity as a foundation of integrated urbanism, a concept realized in Italy's *metromontano* project, which supports economic planning beyond administrative limits (Barbera; De Rossi, 2021).

The *metromontagna* concept by Barbera and De Rossi (2021) further advances this thinking by envisioning a model of urban-rural integration that emphasizes the socio-economic interdependence between metropolitan and mountainous regions. Rather than treating cities as isolated growth centers, *metromontagna* repositions them within a cohesive network, recognizing the productive and cultural value of mountainous areas as equal to that of urban centers. This paradigm shift dismantles traditional models that restrict mountainous areas to roles of recreation or conservation. Instead, it proposes a framework that leverages Italy's polycentric geography - defined by a range of city sizes, from large hubs to small rural towns - and calls for governance that transcends administrative boundaries to foster collaboration. This approach supports sustainable resource management, climate resilience, and balanced economic growth, creating a metropolitan-mountain continuum that mutually benefits urban and rural areas.

The UN (2015) introduced a comprehensive framework titled Transforming Our World: The 2030 Agenda for Sustainable Development, establishing 17 Sustainable Development Goals (SDGs) and 169 targets to drive inclusive and sustainable global development by 2030.

Building on the achievements of the Millennium Development Goals (MDGs), the SDGs aim to eradicate poverty, protect the planet, and ensure prosperity for all by balancing economic, social, and environmental priorities. Central to the agenda is the principle of inclusivity - ensuring that no one is left behind - while promoting universal human rights, gender equality, and peace. The SDGs address critical areas such as poverty eradication, hunger reduction, health, education, gender equality, clean water access, affordable energy, sustainable economic growth, and climate action. To achieve these objectives, the agenda calls for a revitalized global partnership involving governments, the private sector, civil society, and other stakeholders, emphasizing coordinated efforts and resource mobilization. It also highlights the importance of adapting global goals to national and local contexts, encouraging countries to set specific, achievable targets aligned with broader SDG ambitions. The 2030 Agenda is both ambitious and transformative, designed to tackle the complex, interconnected challenges facing humanity. It underscores the urgency of unified global action to ensure a sustainable future, advocating for the integration of sustainable development principles into policy and planning at all governance levels.

Regional planning increasingly addresses climate change impacts, recognizing the role of urbanisation in altering local climates. Lundqvist (2016) examined the Gothenburg Metropolitan Area's (GMA) climate adaptation efforts through local master planning, focusing on how adaptation measures addressed coordination, legitimacy, and effectiveness across jurisdictions. The study identified substantial limitations in current planning frameworks, highlighting the need for enhanced coordination that respects local governance autonomy while enabling effective cross-scale collaboration. This call for a more integrated approach to climate governance underscores the growing recognition that climate change transcends administrative borders and requires unified responses.

Building on these findings, Maheshwari et al. (2020) investigated the impact of urbanisation on climate across three metropolitan areas, analysing trends in temperature, rainfall, and evaporation from 1960 to 2011. The study found that urbanisation significantly intensifies local temperatures, especially in densely populated areas, through the Urban Heat Island Effect (UHIE), which disrupts energy balances and air circulation. The results highlighted notable increases in temperature, reductions in evaporation, and variations in rainfall directly linked to urban expansion. Maheshwari et al. (2020) argued that strategic urban planning could help mitigate these changes and strengthen urban resilience against climate impacts.

The IPCC (2021) report on climate science further emphasized the urgency of addressing human-induced climate change, detailing widespread warming across the atmosphere, oceans, and land, all attributed to human activities. This accelerated warming has led to more frequent and severe weather events, including heatwaves, heavy rainfall, droughts, and tropical cyclones, placing additional pressure on infrastructure resilience, transportation safety, and urban livability. The IPCC report underscores the importance of sustainable mobility strategies, such as expanding public transit, promoting low-emission zones, and adopting electric vehicles, as essential approaches to reducing transportation-related emissions and enhancing resilience to climate extremes.

The IPCC's framework for limiting future climate impacts aligns closely with sustainable mobility initiatives, as low-emission scenarios reveal lower risks of extreme weather, helping to stabilize environmental impacts and improve transportation adaptability. The report calls for a coordinated global and local response, advocating for sustainable mobility solutions - such as active transport networks and resilient public transit - to reduce emissions and foster climate resilience. By prioritizing low-carbon infrastructure, urban planners and policymakers can advance a climate-resilient future, supporting the IPCC's vision for sustainable urban development that mitigates transportation's environmental footprint.

Cities and regions today face unprecedented challenges, including pandemics, technological changes, migration, climate impacts, and economic pressures. In response, urban planners increasingly turn to scenario planning to anticipate future needs. Rooted in military and corporate strategy, scenario planning has been adapted for urban contexts to address the unpredictability of future conditions. This method allows planners to consider diverse futures, facilitating policy evaluation and stakeholder engagement by examining underlying assumptions, values, and potential outcomes. Despite its growing interest, scenario planning has yet to fully harness exploratory methods from environmental sciences, which could enhance its application. Effective scenario planning requires intergovernmental collaboration and a focus on adaptability and resilience. As challenges intensify, the impact of previous visionary plans has diminished, prompting planners to embrace scenario traditions such as visioning, consensus building, forecasting, and scenario analysis. These methods aim to stimulate innovative perspectives and present alternative visions that aid in evaluating decisions and policy implications. Incorporating techniques from environmental sciences can be advantageous in addressing overarching issues like climate change. Although interest in exploratory scenario planning (XSP) is rising, its potential remains largely untapped. Successful implementation necessitates intergovernmental coordination and aligning scenario analyses

with various authority levels. This review serves as a roadmap for planners, emphasizing the importance of evaluation, intergovernmental collaboration, and exploring new techniques to advance scenario planning practices (Abou Jaoude et al., 2022).

In the face of urban sprawl and climate change impacts, scenario planning emerges as a critical tool for navigating complex challenges. Unlike traditional forecasting, this approach acknowledges future unpredictability and promotes thoughtful preparation through the creation and analysis of multiple plausible scenarios. By integrating scenario planning with conventional methods like visioning and consensus building, planners can enhance the adaptability and effectiveness of urban plans. This approach not only facilitates normative processes aimed at specific desired outcomes but also encourages exploratory processes that foster resilience in the face of uncertainty. By prioritizing uncertainties and analysing key variables, scenario planning equips cities to tackle future challenges, improve resilience, and pursue transformative solutions. Planners can leverage normative processes for detailed planning - particularly in land use and transportation - while using exploratory methods to deepen their understanding of complex trends among diverse stakeholders (Goodspeed, 2020).

The Table 15 highlights emerging concepts absent from traditional urban and regional theories, offering new perspectives on spatial dynamics. These concepts, classified as either physical or non-physical, indicate varying study conditions and implications. Culture and Own Identity/Relationality, examined by Barbera and De Rossi (2021), Sennett (2018), and Ellin (2006), represents a non-physical dimension tied to the unique identity of each place, stressing the relational and contextual aspects of urban space. Innovation and Climate Change, both physical classifications, emphasize the profound impact of environmental conditions, drawing on critical studies by the IPCC (2021) and Maheshwari et al. (2020). Finally, Foresight and Future Thinking integrates future studies into urban planning, encouraging forward-looking policies and sustainable development, as explored by Abou Jaoude et al. (2022) and Goodspeed (2020). Together, these concepts underscore the need for adaptable frameworks to address future-focused challenges in urban settings

Table 15 - Concepts not announced by theories

(continue)

	<b>Concepts not announced by the theories</b>	<b>Classification</b>	<b>Condition</b>	<b>Study reference</b>
<b>1</b>	Culture and Own Identity/Relationality	Non-physical	Private, each object is unique	Barbera and De Rossi (2021); Sennett (2018) and Ellin (2006)
<b>2</b>	Innovation	Physical	Environment	SDG 11 - UN (2015, 2020)



(continuation)

<b>Concepts not announced by the theories</b>	<b>Classification</b>	<b>Condition</b>	<b>Study reference</b>
<b>3</b> Climate Change	Physical	Environment	IPCC (2021); Maheshwari et al. (2020) and Lundqvist (2016)
<b>4</b> Foresight, Future Thinks	Future Studies	Future Studies	Abou Jaoude et at.(2022); IPCC (2021) and Goodspeed (2020)

Source: Prepared by the author (2023).

The Figure 10 outlines a reasoning framework constructed from a combination of literature and convergent theoretical references, integrating concepts derived from both classical theories and contemporary perspectives.

Figure 10 – Integration of main concepts



Source: Elaborated by the author (2024)

To conclude the literature review, the theoretical foundation that underpins this study is visually summarized in the figure provided. This framework draws upon classical theories, including Christaller's CPT and Perroux's GPT, while incorporating contemporary perspectives on metropolitan organization and mobility. The figure illustrates the evolution of analytical models for metropolitan regions, highlighting the interplay of physical and non-physical dimensions such as spatial hierarchies, networks, and governance structures.

In the left section of the figure, concepts such as territorial, place, scale, and network are linked to updated definitions and recent studies, showcasing their relevance in modern metropolitan studies. The classification highlights how traditional concepts have evolved to encompass broader physical and non-physical categories, demonstrating their applicability to diverse regional contexts.

The diagrams on the right depict key relationships in metropolitan dynamics, emphasizing the hierarchical structure of urban centers, the connectivity between central and peripheral areas, and the role of governance in organizing these spaces.

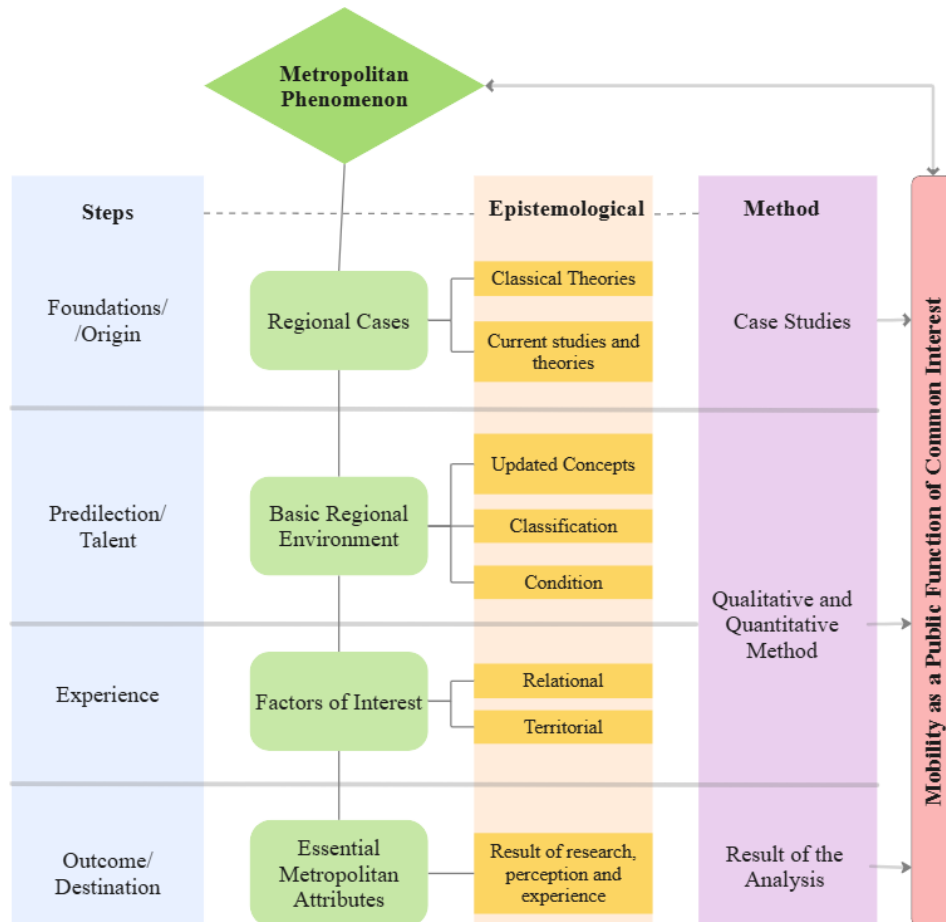
This comprehensive framework not only summarizes the theoretical underpinnings of this research but also serves as the basis for the methodology to be applied. By bridging classical theories with contemporary insights, this figure lays the groundwork for the analytical approach, guiding the identification of sustainable metropolitan attributes and the assessment of mobility's role as a FPIC.

### 3. METHOD

This study employed a mixed-methods approach with a concurrent data triangulation strategy to enhance the reliability and validity of its findings. Focused on three case studies - Greater London, the Metropolitan Region of Porto Alegre (RMPA), and the Metropolitan Region of Serra Gaúcha (RMSG) - the research aimed to deepen understanding of metropolitan dynamics. It utilized bibliographic research, document analysis, field research, surveys, and case studies (Gerhardt; Silveira, 2009), ensuring methodological triangulation, as recommended for case-based research (Yin, 2017).

Triangulation strengthened the study by cross-verifying data from diverse methods and perspectives, reducing biases and inconsistencies. The research framework, illustrated in Figure 11 is structured around identified territorial needs and organized into three interconnected structures of influence: (i) mobility, (ii) epistemological, and (iii) methodological, spanning four interlinked stages.

Figure 11 - Method Framework



Source: Elaborated by the author (2024).

The framework focuses on the concept of the metropolis phenomenon, systematically examining metropolitan attributes with mobility as a public function of common interest at its core. It is organized into four stages: foundations/origin, predilection/talent, experience, and outcome/destination, offering a structured approach to understanding metropolitan dynamics while integrating foundational theories with practical attributes for development.

In the foundations/origin stage, the framework anchors analysis in classical and contemporary theories through regional case studies. This stage highlights the importance of mobility as a public service and sets the groundwork for understanding unique metropolitan contexts. The predilection/talent stage emphasizes the basic regional environment, using updated concepts and classifications to analyse regional factors influencing metropolitan growth. A mixed qualitative and quantitative approach is advocated to capture regional variability effectively.

The experience stage examines relational and territorial aspects, focusing on social interactions, infrastructure, and spatial organization to understand the interconnected dynamics of metropolitan regions. The outcome/destination stage integrates research findings, perceptions, and experiential insights to define essential metropolitan attributes. This stage identifies key characteristics, creating a diagnostic tool for assessing resilience, sustainability, and social cohesion.

This framework balances theoretical foundations with practical application, progressing from foundational analysis to experiential understanding. It provides a comprehensive model for metropolitan analysis, fostering sustainable development and informed decision-making. Further exploration of this framework is presented in Chapter 4.

### 3.1 CASE STUDY

The case study research strategy employed in this study is a well-established method used across various metropolitan themes, including metropolitan planning (Fu et al., 2007), case study methodologies (Flyvbjerg, 2011), service delivery perspectives (Byrne et al., 2012), collaborative planning (Deyle; Wiedenman, 2014), reurbanisation (Duarte Alonso et al., 2018), urban mobility (Melikov et al., 2021), and citizen information mobilization (Uppal, 2021).

Stake (2000) categorizes case study approaches into three types: intrinsic, instrumental, and collective. Intrinsic case studies focus on a specific case of interest, while instrumental studies offer broader insights applicable to other contexts. Collective case studies investigate multiple cases to understand a phenomenon. This study adopts instrumental and

collective approaches, employing systematic and comparative methods. Yin (1981, 1984), Alves-Mazzotti (2006), highlights the utility of case studies in examining contemporary phenomena in natural contexts without experimental control. He identifies three scenarios for case study use: theory testing, analysing unique cases, and conducting revelatory studies. This research links themes to classic theories like Central Place Theory (CPT) and Growth Pole Theory (GPT) while treating metropolitan regions as extreme phenomena, suitable for revelatory analysis.

This research integrates bibliographic reviews, field research, surveys, and case analyses, often supported by resources from global organizations, media publications, and academic literature. Field research targets stakeholders, including public and private sector representatives, citizens, and researchers directly involved with the studied metropolitan contexts.

Eisenhardt's study (1989) propose a structured approach to case study analysis. She identifies seven key steps to ensure a rigorous and systematic process for validating theories and their applications as showed in Table 16. This framework provides a scientific foundation and methodological guidance for conducting robust case studies.

Table 16 - Process of theoretical construction through case study research.

(continue)

<b>Steps</b>	<b>Activity</b>	<b>Rationale</b>	<b>Application at work</b>
Getting Started/ Introduction	Definition of the research question; Possibility of a priori constructions.	Focuses efforts; Provides a better foundation for the construction measured.	The initial phase of qualifying the work. Defining the research question, the objectives, the justification, the study of foundation theories and the theme.
Selecting cases	Selecting cases Neither theory nor hypotheses; Specified population; Theoretical, non-random, sampling.	Maintains theoretical flexibility; Variation restrictions aimed at external validations; Concentrates efforts on useful case theory - i.e. those that reproduce or extend theory by filling in conceptual categories.	Expansion of research; Definition of theories and works that seek current references in them; Searching for and expanding theoretical references; Choice of method, approach, objective and nature of the research; Definition of the Unit of Analysis;
Creation instruments and protocols	Multiple data collection methods; Qualitative and quantitative data combined; Multiple researchers. Multiple researchers.	Reinforces the grounding of theory through evidence triangulation protocols; Synergistic view of evidence; Encourages divergent perspectives and strengthens reasoning.	Definition of the questionnaire and its validation for carrying out the qualitative research; Defining the number of people and profile of the interviews and carrying them out.
Entering the field	Collection and analysis of overlapping data, including field notes;	Speeds up analyses and reveals useful adjustments in data collection; Allows researchers to capitalise on emerging themes	Partial analysis of the qualitative results; Defining the questionnaire and validating it to carry out the quantitative survey; Carrying out the survey in person or using online forms in the case studies.

(continuation)

Steps	Activity	Rationale	Application at work
	Flexible and opportunistic data collection methods.	and unique case characteristics.	
Analysing data within the case	Case by case analysis; Cross-pattern research using divergent techniques.	Gains familiarity with data and preliminary theory generation; Forces researchers to look beyond initial impressions and view evidence through multiple lenses.	Analysing total qualitative and quantitative results, points of approximation and divergence.
Modelling Hypotheses	Iterative tabulation of evidence for each construct; Replication, non-sampling, logic across cases; Looking for 'why' evidence behind relationships.	Deepens the definition, validity and measurability of the construct; Confirms, extends and sharpens the theory; Builds internal validity.	Deepen analyses by seeking answers to the possible partial conclusions of the results. Simulate hypotheses in graphs, tables and maps.
Literature Engaging	Comparison with conflicting literature; Comparison with similar literature.	Builds internal validity, raises the theoretical level and refines construct definitions; Sharpens generalisability, improves construct definition and raises the theoretical level.	Compare and reference the results of the approaches with current literature; Building a model with clear and objective parameters according to the elements studied.
Achieving closure	Theoretical saturation, where possible.	End the process when the marginal improvement becomes small.	Answering the research question and the defined objectives; Finalise with possible new references that will emerge.

Source: Table 1 (EISENHARDT, 1989). Adapted by the author.

Examining multiple case studies on the same topic consolidates and reconciles evidence, often prompting a restructuring of theoretical perspectives. Eisenhardt (1989) argues that integrating evidence from diverse case studies, combined with data and literature, enhances the likelihood of creatively rethinking and refining theoretical frameworks. Although this study does not primarily aim to construct new theories, contradictory or paradoxical evidence, as noted by Camemon and Quinn (1988 *apud* EISENHARDT, 1989), may foster theoretical innovation. The contradictory and/or paradoxical evidence cited in this research arises because regional institutional arrangements, such as Metropolitan Regions, have been recognized similarly on a global scale but with different concepts, approaches, and foundations. Each country addresses this issue according to its own parameters. The contradictions in this context demand scientific skill from this research to converge toward common purposes.

This research focuses on case studies of London, the Metropolitan Region of Porto Alegre (RMPA), and the Metropolitan Region of Serra Gaúcha (RMSG). The analysis follows a structured approach, as proposed by Creswell and Plano Clarrk (2018) o systematically explore strategies within each region. Drawing from established case study methodologies

widely applied in metropolitan research – such as collaborative planning (Deyle; Wiedenman, 2014), reurbanisation phenomena (Duarte Alonso et al., 2018), including Urban Mobility (Melikov et al., 2021), information mobilization for citizens (Uppal, 2021) - this study adopts Yin's (1981, 1984) recommendation to investigate contemporary phenomena within natural contexts without experimental control. Employing Stake (2000 *apud* ALVES-MAZZOTTI, 2006), instrumental and collective approaches, the research compares cases across regional, national, and global scales, revealing nuanced metropolitan dynamics informed by distinct historical and structural characteristics.

This exploratory research uses case studies to analyse the relationship between territorial and relational factors, assessing the maturity and developmental stages of metropolitan regions. Graph 1 identifies four stages of metropolitan development: unregulated (non-operational), bureaucratic (paper-based), superficial (low effectiveness), and essential (high effectiveness). The analysis integrates classical concepts such as territory, scale, networks, urbanization, economy, and cultural identity, alongside emerging factors under review.

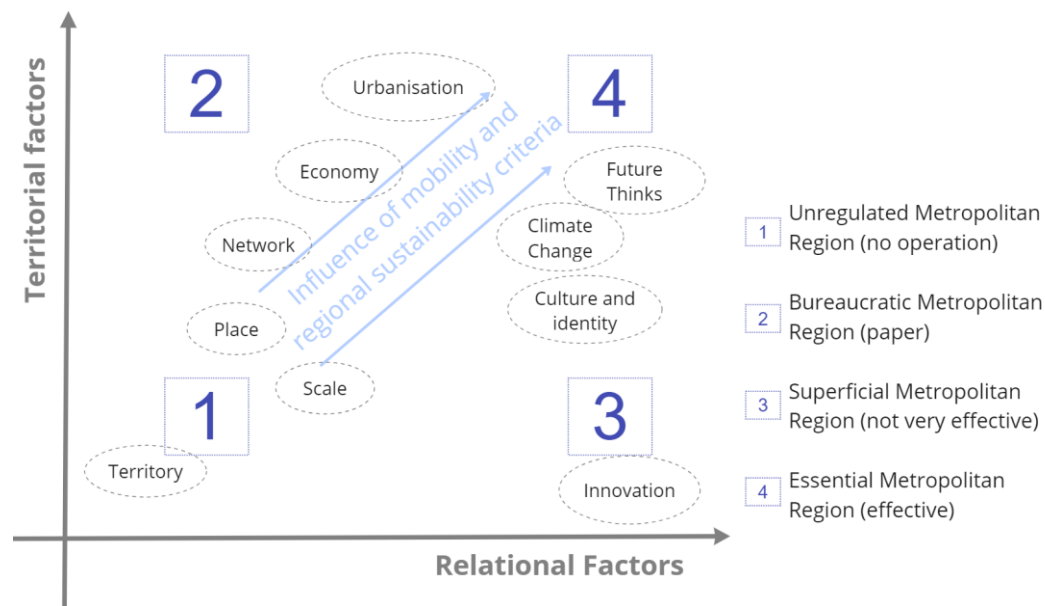
The framework operates along two axes: the horizontal axis represents relational factors like culture and identity, while the vertical axis addresses territorial aspects, including networks, urban economy, and urbanization. The model underscores that sustainable and effective metropolitan regions rely on robust regulatory frameworks, operational capacity, and the integration of relational and territorial components.

Metropolitan regions are classified into four categories based on developmental stage:

- a) Unregulated Metropolitan Region (Non-Operational): At the lowest levels of relational and territorial factors, these regions lack regulation, operational effectiveness, and interconnectivity;
- b) Bureaucratic Metropolitan Region (Paper-Based): Scoring slightly higher in territorial factors but low in relational ones, these regions are characterized by formalized but ineffective bureaucratic frameworks with minimal social and cultural integration;
- c) Superficial Metropolitan Region (Low Effectiveness): These regions achieve moderate territorial factors and incorporate cultural and identity aspects but lack strong operational effectiveness and regional cohesion;
- and d) Essential Metropolitan Region (High Effectiveness): Positioned in the upper-right quadrant, these regions exhibit advanced integration of territorial and relational factors, supported by cohesive regulatory frameworks and strong social-territorial connections, enabling sustainable and effective development.



Graph 1 - Relational factors in the different stages of a Metropolitan Region (MR)



Source: Prepared by the author (2024).

This research analyses the development and challenges of three metropolitan regions: Greater London, the Metropolitan Region of Porto Alegre in Brazil, and the Metropolitan Region of Serra Gaúcha in Brazil. Each case offers distinct insights into metropolitan governance, urban mobility, and regional sustainability.

London, globally recognized for its pioneering role, has embedded metropolitan concepts within its legal and policy frameworks, setting significant precedents that enhance its international standing and influence. Greater London exemplifies a mature metropolitan region with advanced regulatory frameworks, well-developed infrastructure, and a strong integration of spatial and social factors. Its governance reflects a long-standing tradition of structured metropolitan planning, prioritizing sturdy public transportation and sustainable urban policies. This case demonstrates the benefits of cohesive planning for fostering resilience and inclusivity in metropolitan areas.

In contrast, the RMPA and RMSG represent different stages and challenges in Brazilian metropolitan integration. Porto Alegre's metropolitan area, although more developed in terms of regulatory frameworks, faces obstacles in effective implementation and inter-municipal cooperation, often resulting in fragmented policies. Meanwhile, Serra Gaúcha, marked by its industrial base and distinct cultural identity, struggles with both regulatory cohesion and sustainable urban planning.

Porto Alegre, one of Brazil's earliest nationally recognized metropolitan regions, established in 1973, is designated by the IBGE as a critical metropolitan center within Brazil's

urban hierarchy. As the capital of its state, Porto Alegre extends its influence beyond regional borders, positioning it as a crucial hub in Brazil's urban network. The RMSG, while unofficially regulated, is classified by the IBGE as a Level B Regional Capital and was initially considered an Urban Agglomeration from 1991 to 2013. Though legislatively established as a metropolitan region in 2013, Serra Gaúcha's effective implementation is still pending, yet its relevance is emphasized by strong territorial and economic interconnections that mark it as an influential regional actor. Collectively, these cases provide comparative insights into the structures, policies, and frameworks that shape these metropolitan areas, enhancing theoretical perspectives on metropolitan influence and operational dynamics at local, national, and global levels.

### 3.2 METHOD MIXED

Metropolitan areas' complexities demand diverse methodologies for a deeper understanding. These regions require multifaceted approaches to address intricate problems, as mixed methods enable a comprehensive exploration of issues where single data sources prove insufficient (Mertens; Hesse-Biber, 2012, p.77). Creswell and Plano Clark (2018) emphasize integrating perspectives, blending qualitative and quantitative data to confirm findings across contexts. Mixed methods also accommodate diverse participant viewpoints, making them applicable across social and behavioural disciplines

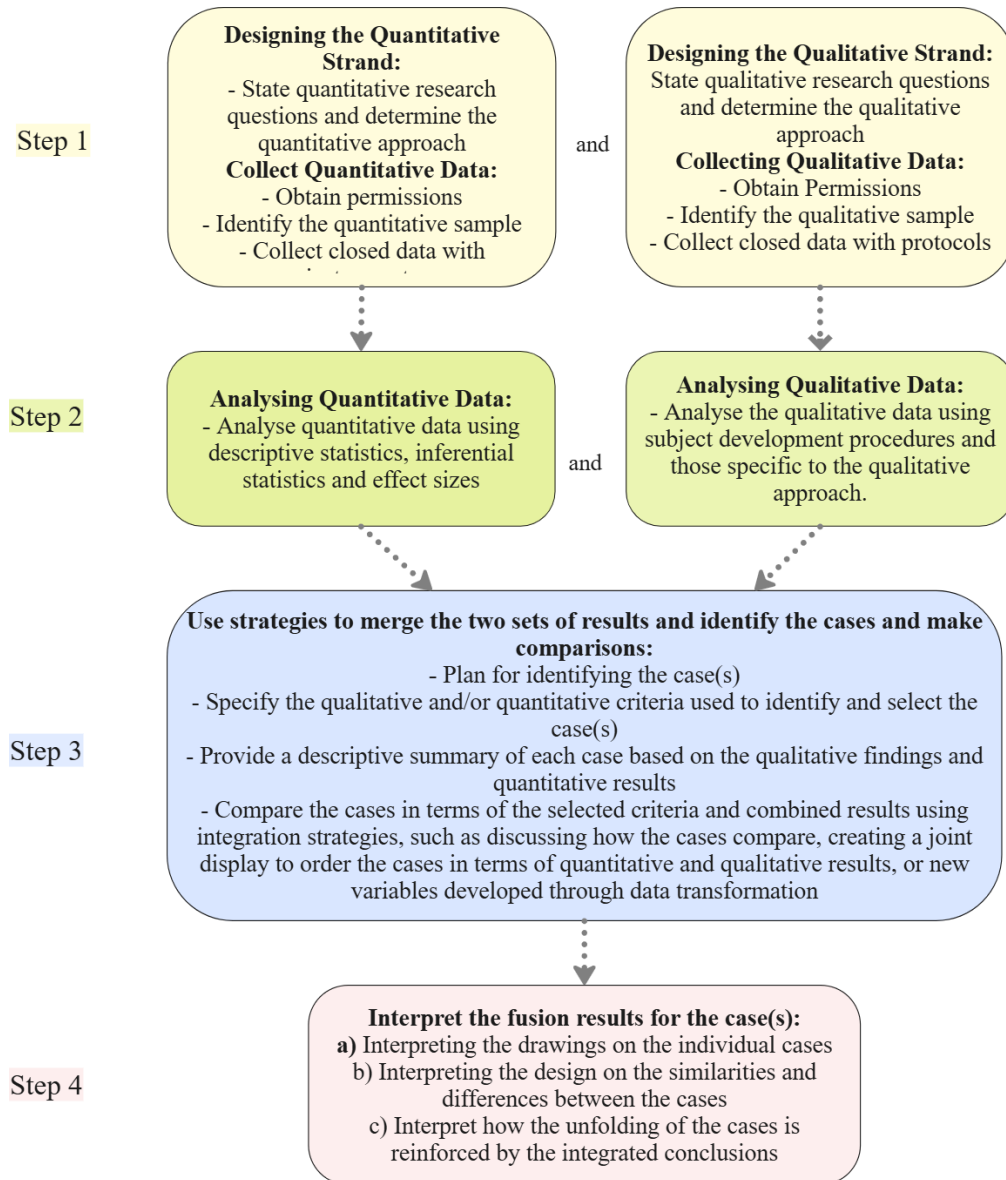
Freitas (2016) highlights that combining methodologies enriches analysis, aligning with Creswell and Plano Clark's assertion that qualitative and quantitative approaches complement each other. This integration offsets one method's limitations with the strengths of the other, providing a fuller understanding of the research problem. Mertens and Hesse-Biber (2012) argue that mixed methods foster dialogue between data types, enhancing interpretation and engagement, while exploratory research generates hypotheses and theories (Gil, 2002).

The study's complexity required the integration of multiple methodologies for real-world application (Gerhardt & Silveira, 2009). Freitas (2016) emphasizes the value of cross-method insights, while Alves-Mazzotti (2006), referencing Yin (2006), highlights the complementarity of research approaches, enabling their effective integration. Literature supports combining qualitative exploration with quantitative variable testing, either sequentially or simultaneously, facilitated by digital tools and human interpretation (Greene et al., 1989; Creswell et al., 2004; Creswell, 2007; Morgan, 2014; Creswell & Plano Clark, 2018).

This study employs a concurrent triangulation strategy, using cross-validation within

case studies to corroborate findings. Mixed methods are justified by their ability to compare complexities across cases, create diverse profiles illustrating the research problem, and align with disciplines valuing qualitative research. The process follows a structured flowchart (Figure 12) integrating data collection, merging results, and interpreting convergence or divergence to deepen understanding of metropolitan phenomena (Creswell; Plano Clarrk, 2018).

Figure 12 - Flowchart of Basic Procedures in the Implementation of a Case Study Design Method with a Convergent Approach.



Source: Figure 4.5 Creswell and Plano Clarrk, (2018, p. 188). Elaborated by author (2024).

### 3.2.1 Qualitative phase of the research

The process of developing or analysing a theory relies on a comprehensive review of

existing literature, empirical observation, and the researcher's capacity to construct increasingly refined theories. Regardless of prior research, topics demand deep knowledge and meticulous analysis for accurate understanding. Alves-Mazzotti (2006) emphasizes that researchers must have mastery over their subject to contribute meaningfully to collective knowledge.

Denzin (2006) identifies two key tensions in qualitative research: sensitivity and understanding lived human experiences. While early qualitative research discouraged direct engagement with lived experiences, later approaches embraced personal interpretations of field narratives. Despite this evolution, researchers are expected to maintain scientific rigor and focus on their study's objectives, even when confronted with personal experiences. John Stuart Mill underscores this neutrality, asserting that "neutrality is necessary to promote autonomy" Mill (*apud* 1865 DENZIN, 2006, p. 143).

Denzin, (2006) describes qualitative research as "a situated activity that locates the observer in the world," involving interpretive practices that bring visibility to phenomena (p.17). This discipline includes diverse methods, such as verbal data collection, content analysis, historical documentation, case studies, ethnography, phenomenology, grounded theory, action research, and observational techniques (Macdonald, 2005; Mariz et al., 2005; Eisendarft; Graebner, 2007; Saldaña, 2009; Souza Leão, de et al., 2013; Camillerie; Neuhofer, 2017; Acun; Yilmazer, 2018; Silva, da, Larentis; Dias, 2018; Turkan; Anil, 2020; Sayfour et al., 2021).

Qualitative research is characterized by depth, rigor, and complexity, allowing for diverse perspectives on the same narrative (Denzin, 2006, p. 13-14). It is conducted in natural, interactive, and human-centric settings, emphasizing the richness of context (Creswell, 2007).

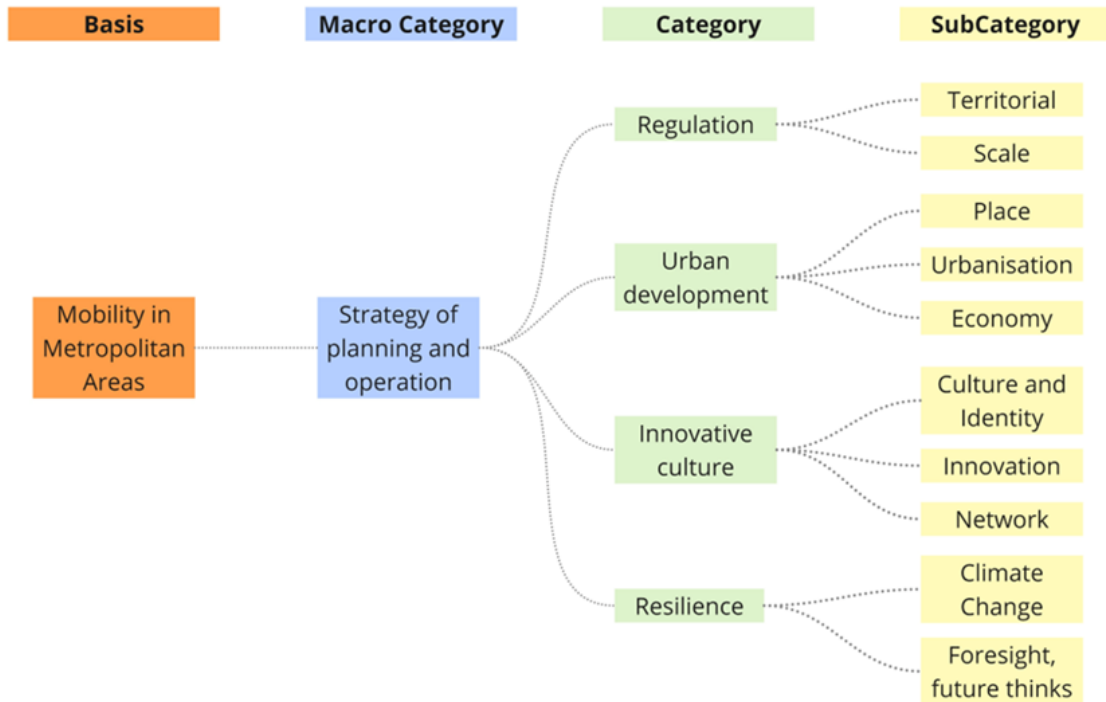
Qualitative methods are widely employed in urban and metropolitan studies across diverse research contexts, including immigration narratives (Ley, 1999) analyses of city-sponsored design competitions (Rantisi; Leslie, 2006), strategies in tourism events (Stokes, 2006), healthcare information and practices (Jordan et al., 2010), trade-offs in organic products (Sirieix et al., 2011), operational models and dynamic systems (Pfaffenbichler, 2011), user perceptions of metropolitan transport (Miralles-Guasch et al., 2014), comparative city analyses (Schmid et al., 2018), and among others.

In this study, the qualitative approach within the mixed-methods framework follows Creswell and Plano Clark (2018), alongside Denzin (2006) five-phase model: (i) defining the research subject, (ii) paradigms and theoretical perspectives, (iii) research strategy, (iv) data collection and analysis, and (v) interpretation and presentation. Each phase was tailored to the study's objectives.

The research design incorporates insights from a panel of 24 experts representing the public sector, academia, NGOs, and private industry, with eight participants from each case study region: Greater London, RMPA, and RMSG. Using ten semi-structured questions rooted in classical theories and contemporary themes such as technology, innovation, sustainability, and climate change (as detailed in Chapter 4), the study aims to provide a comprehensive understanding of metropolitan dynamics. Through targeted interviews across governmental, academic, and business sectors, qualitative data is collected and synthesized within a theoretical framework, enabling an in-depth exploration of mobility and metropolitan issues. This approach aligns the findings with the structural analysis presented in Figure 13, contributing to a report that connects theoretical insights with practical applications.

The analytical categories of the study are based on a pre-existing framework that outlines the key aspects of metropolitan mobility. This framework center on the fundamental elements of mobility in metropolitan areas, connected to the overarching strategic category of planning and operations. Four main categories emerge from this macro category: regulation, urban development, innovative culture, and resilience. Each category is further divided into subcategories. Regulation includes aspects such as territorial, scale; urban development covers place, urbanisation, and economy; innovative culture encompasses culture and identity, innovation and net; and resilience addresses critical factors like climate change and foresight/future thinking. This structured framework offers a clear perspective on the factors influencing urban mobility in metropolitan regions (Ribeiro and Fachinelli, 2024). The interview questions were designed based on this framework, ensuring that each category and subcategory was thoroughly addressed in the qualitative research phase.

Figure 13 - The method employed follows a structured analysis framework



Source: Ribeiro and Fachinelli (2024).

The framework shaped the development of interview questions that bridged theoretical foundations with practical, policy-oriented discussions. To ensure contextual relevance, the questions were tailored to the specific realities of the UK and Brazil, using terms like "borough" and "Greater London" for the UK, and "cities" or "metropolitan region" for Brazil. This adaptation aligned the study with local contexts and relevant documents, enabling a deeper exploration of metropolitan dynamics. The research examined how contemporary data and perspectives align with or diverge from established theories and recent studies. The protocol was validated by a University of Westminster expert and pre-tested, resulting in refinements to the wording. This rigorous approach addressed the study's subcategories and contributed significant insights to urban and metropolitan studies, enhancing the understanding of complex metropolitan challenges (Table 17).

Table 17 - Subcategories and Questions

Subcategory	Questions
Territorial	Q1. What is your connection or relationship with the Greater London, whether it be historical, emotional, or professional? Please, share some insights regarding this connection Q1. <i>Qual é a sua conexão ou relacionamento com a RMPA/RMSG*, seja ele histórico, emocional ou profissional? Por favor, compartilhe algumas ideias sobre essa conexão.</i>

(continue)

(continuation)

Subcategory	Questions
Scale	<p>Q2. What is your perspective on the relationship between the boroughs within the Greater London and how these boroughs collaborate with the Greater London Authority in terms of regional governance?</p> <p>Q2. <i>De que forma deve ser a relação entre os municípios que compõem a RMPA/RMSG* com uma autoridade metropolitana regional?</i></p>
Place	<p>Q3. What are the most distinctive characteristics that make the Greater London unique and diverse?</p> <p>Q3. <i>Quais são os principais desafios sociais enfrentados dentro da RMPA/RMSG*? Por quê? Explorar as FPIC</i></p>
Urbanisation	<p>Q4. In what ways do the interactions among Urbanisation, population concentration, migratory movements, and the dynamics between the urban center and rural periphery affect mobility and management within the Greater London?</p> <p>Q4. <i>Como é a relação entre a área rural e urbana no seu município? Isso afeta a mobilidade, a gestão ou outra área?</i></p>
Economy	<p>Q5. In your perspective, how does London's diversified economic concentration, representing nearly a quarter of the total UK GDP, positively or negatively impact the region?</p> <p>Q5. <i>Em sua perspectiva, a concentração econômica diversificada na RMPA/RMSG*, impacta de forma positiva ou negativamente a região? Você imagina uma economia compartilhada?</i></p>
Culture and Identity	<p>Q6. Does London's cosmopolitan character, as one of the most diverse metropolitan regions globally, contribute to the loss or enrichment of cultures and identities within the region?</p> <p>Q6. <i>A presença do município na Região Metropolitana afeta a preservação ou a diversificação das culturas e identidades nessa região?</i></p>
Innovation	<p>Q7. What are the most recent and innovative initiatives implemented within the Greater London to enhance mobility?</p> <p>Q7. <i>Quais são as iniciativas mais recentes e inovadoras implementadas dentro da RMPA/RMSG*? Alguma relacionada para melhorar a mobilidade?</i></p>
Net	<p>Q8. How do you perceive the strategy of the mobility network within the Greater London, especially concerning integration and management?</p> <p>Q8. <i>Como você percebe a estratégia da rede de mobilidade dentro da RMPA/RMSG*, especialmente no que diz respeito à integração e gestão?</i></p>
Climate Change	<p>Q9. What are the primary challenges arising from climate change in relation to mobility within the Greater London, and what measures are being taken to address them?</p> <p>Q9. <i>Quais são os principais desafios decorrentes das mudanças climáticas na RMPA/RMSG* e que medidas estão sendo tomadas para enfrentá-los?</i></p>
Foresight, Future thinks	<p>Q10. What are the future prospects for mobility within the Greater London, considering current trends and technological innovations?</p> <p>Q10.1. How can you envision the Greater London area in the year 2050?</p> <p>Q10. <i>Quais são as perspectivas futuras para a mobilidade na RMPA/RMSG*, considerando as tendências atuais e as inovações tecnológicas?</i></p> <p>Q10.1. <i>Como você pode imaginar a RMPA/RMSG* em 2050?</i></p>

\* RMPA/RMSG - acronym adapted according to the questionnaire adapted to the case study.  
Source: Elaborated by author (2024).

Over a nine-month period, interviews were conducted with multidisciplinary experts from various sectors, including community, academia, third sector, private, and public sectors, to gather a range of insights (Table 18).

Table 18 - Expert Panel Profile and Sector Affiliation

<b>Interviewee</b>	<b>Profession/Graduate Degree</b>	<b>Experts Linked</b>
(I1)	Editor/Philosophy, Politics and Economics	Community
(I2)	Lecture/Transport (Infrastructure) and city Planning/PHD	Academy
(I3)	Curator, Educator/Architect	Third Sector
(I4)	Politics and International Relations/Marketing	Community
(I5)	Urban Mobility Planner- Chartered Transport Engineer /Civil Engineering	Private Sector
(I6)	Lecture/Head of Economics at Company	Academy/Private Sector
(I7)	Commissioner/Social Anthropology/PHD	Public Sector
(I8)	Chief Office/Human Sciences BSc	Public Sector
(I9)	President of a state authority/Master	Public Sector
(I10)	Superintendent of Planning and Works	Public Sector
(I11)	Mayor	Public Sector
(I12)	Mayor	Public Sector
(I13)	NGO President /Engineer/ Master	Third Sector
(I14)	Local responsible of global organisation /Engineer/PHD	Academy/Third Sector
(I15)	Entrepreneur/ Engineer/ Master	Private Sector
(I16)	NGO President /Engineer/ Master	Private Sector/Third Sector
(I17)	Local representative of a state authority	Public Sector
(I18)	President of the regional organisation/Master	Private Sector
(I19)	City Councillor/Master	Public Sector
(I20)	Mayor	Public Sector
(I21)	Mayor	Public Sector
(I22)	Vice-Mayor	Public Sector
(I23)	Professor/PHD	Academy
(I24)	Professor/ Member of the River Basin Committee /Master	Academy

Source: Elaborated by author (2024).

The first eight interviewees focused on Greater London, the 9th to 16th on the RMPA, and the 17th to 24th on the RMSG. This structured approach ensured comprehensive perspectives on metropolitan issues across distinct regional contexts. All interviews were conducted online and recorded with participants' explicit consent, evidenced by signed informed consent forms, except for one participant who chose to remain anonymous. Audio recordings were transcribed verbatim using the *Nootai.ai* platform to ensure accuracy. Researcher then reviewed each transcription to verify the fidelity of the documented discussions, ensuring a precise capture of the dialogues.



### 3.2.2 Quantitative phase of the research

The quantitative phase of this research aimed to evaluate how the attributes identified by interviewees in the Greater London case study are perceived in other regions, providing a comparative analysis of these perceptions in the subsequent phase of the study. Participants were residents of cities within the municipalities included in the three case studies, and responses were collected through structured questionnaires. The questionnaires were based on attributes identified during the qualitative phase, with each attribute linked to a standard or reference, scale/indicator, description, and specific Likert-scale questions. Some attributes required multiple questions for comprehensive evaluation. These attributes align with standards and references such as ISO 37122, the Capital System, UN (2015, 2020), and foundational theories like Christaller (1966). Additional references include Bebbler et al. (2021), Sennett (2018), Barbera and De Rossi (2021), London (2018), IPCC (2021). Insights from interviews and the FPIC (Brasil, 1988; 2015) were also incorporated, ensuring direct alignment with the study's objectives on mobility and metropolitan regions.

Quantitative analysis in this study involved statistical procedures, a common approach highlighted by researchers such as Malhotra, et al. (2006), Hair, JR. et al. (2014), and Gabriel (2014). Objectivity was ensured using standardized and neutral instruments (Teixeira, 2003), while data validity and reliability were prioritized to support meaningful assessments (Creswell, 2007). Confirmatory Factor Analysis (CFA), applied as a specific case of the common factor model, further strengthened the study's methodological rigor (Price, 2023).

Reference manuals in quantitative studies are widely used across various fields, including territorial planning for instance environment-behavior studies (Lay; Reis, 2005), IT systems in delivery businesses (Blignaut; Thopil, 2015), urban design elements analysis (Nurrokhmi; Widjajanti, 2019), government mobility programs evaluation (Fagundes et al., 2019), population movement mapping (Hanida et al., 2019), where they aid in assessments and comparisons among mid-sized cities (Nope et al., 2020), historic city comparisons (Wardhani; Bahri, 2020), transit-oriented development evaluations (Kristianto et al., 2020), and among others.

Creswell and Plano Clark (2018) propose a structured process for quantitative data collection, which this study adapted into four phases outlined in Figure 14. The first phase involved sampling procedures, obtaining permissions, and data collection. Focused on developing a mobility-centered model for Metropolitan Regions, data were collected between June and November 2024. Participants were randomly sampled, and survey links were

distributed through social media, emails, and QR codes on flyers. Stratification ensured representation by age, gender, and location (FOWLER, 1988 *apud* CRESWELL; PLANO CLARRK, 2018). Questionnaires included consent statements and adhered to ethical guidelines (FINK; NESSBARY, 1995, 2000 *apud* CRESWELL; PLANO CLARRK, 2018). Preliminary testing was conducted with 23 participants from Greater London, RMPA, and RMSG. Following best practices, the final sample included 362 validated responses from 387 collected (93.54%).

The questionnaires featured closed-ended questions and Likert scales, commonly used in regional analyses (Lataena, 2019; Silveira et al., 2015). Analysis matrices assessed relationships between knowledge, habits, and attitudes (Goldfried; Sobocinski, 1975; Ji et al., 2011; Monteiro et al., 2017). Compliance with Brazil's General Data Protection Law (LGPD)<sup>17</sup> ensured adherence to legal standards.

The second phase focused on securely recording and preserving data using cloud storage and physical backups while maintaining ethical transparency. Documentation specified details about data collection processes, ensuring adherence to research protocols. The third phase integrated qualitative and quantitative analysis to identify results and facilitate comparisons. Findings were presented in tables and figures, enhancing clarity and comprehension. Visual tools such as bar graphs, scatter plots, and line charts effectively communicated results. The final phase compared findings with initial research questions and prior studies. Results from qualitative and quantitative analyses were integrated and compared across the three case studies. Limitations were identified, and implications for future research were outlined to guide subsequent studies (Creswell; Plano Clarrk, 2018).

In this thesis, the quantitative phase was developed based on insights gained from the qualitative phase, specifically through case study interviews in Greater London. This process identified thirty-three key attributes to enhance the understanding of sustainable mobility. Each attribute was subsequently linked to a specific standard or reference, scale and indicator, and description, and was used to formulate questions for the quantitative phase (APPENDIX A – COMPOSITION OF THE THESIS SCALE ACCORDING TO THE QUALITATIVE PHASE). Each question was assigned a unique code, reflecting the category and subcategory to which it belonged, such as regulation (R) and territorial (T), followed by the question number. For example, RT 03 indicates a question in the regulation category, territorial subcategory, and third position. A total of 52 questions were developed: 5 for the regulation category, comprising

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<sup>17</sup> Federal Law n° [http://www.planalto.gov.br/ccivil\\_03/\\_ato2015-2018/2018/lei/113709.htm](http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/lei/113709.htm). Accessed on 26 May 2024. Regulated under Law n° 12,965 of April 23, 2014 (the Internet Civil Framework),

3 in the territorial subcategory and 2 in scale; 13 for urban development, with 6 in place, 4 in economy, and 3 in urbanisation; 17 for innovative culture, including 6 in culture and identity, 5 in innovation, and 6 in network; and finally, 17 questions for resilience, with 8 in climate change and 9 in foresight and future thinking. This structured approach facilitated a comprehensive exploration of sustainable mobility across multiple dimensions, ensuring each question aligned with the theoretical framework and contributed to a nuanced analysis. Two spreadsheets were created, one in English and one in Portuguese, tailored to the respective contexts of the UK and Brazil. The questionnaires were administered virtually through Google Forms. While both spreadsheets contained the same content, they were adapted to reflect the specific realities of each region, as previously discussed in the chapter on qualitative questions. Thus, one spreadsheet was designed for Greater London and another for the Brazilian metropolitan regions.

The dataset, comprising 362 respondents, provides critical insights into three principal dimensions: gender distribution, educational attainment, and geographical residence patterns, with data encompassing both Brazilian regions and London. In terms of gender, 50.3% of participants identified as women, 44.2% as men, while 5.5% opted not to disclose their gender. Regarding educational attainment, 41.2% of respondents hold higher education degrees, 23.8% possess master's degrees, 20.4% have incomplete higher education, 8% completed secondary education, and 6.6% attained doctoral qualifications. Geographically, London exhibits a pronounced concentration of higher education and postgraduate qualifications (master's and doctorate), reflecting the city's global standing as a hub of academic excellence. Similarly, Porto Alegre in Brazil demonstrates a notable prevalence of postgraduate qualifications, particularly at the master's and doctoral levels. Caxias do Sul, by contrast, is marked by a significant proportion of respondents with complete higher education, while Flores da Cunha evidences a predominance of secondary education completion.

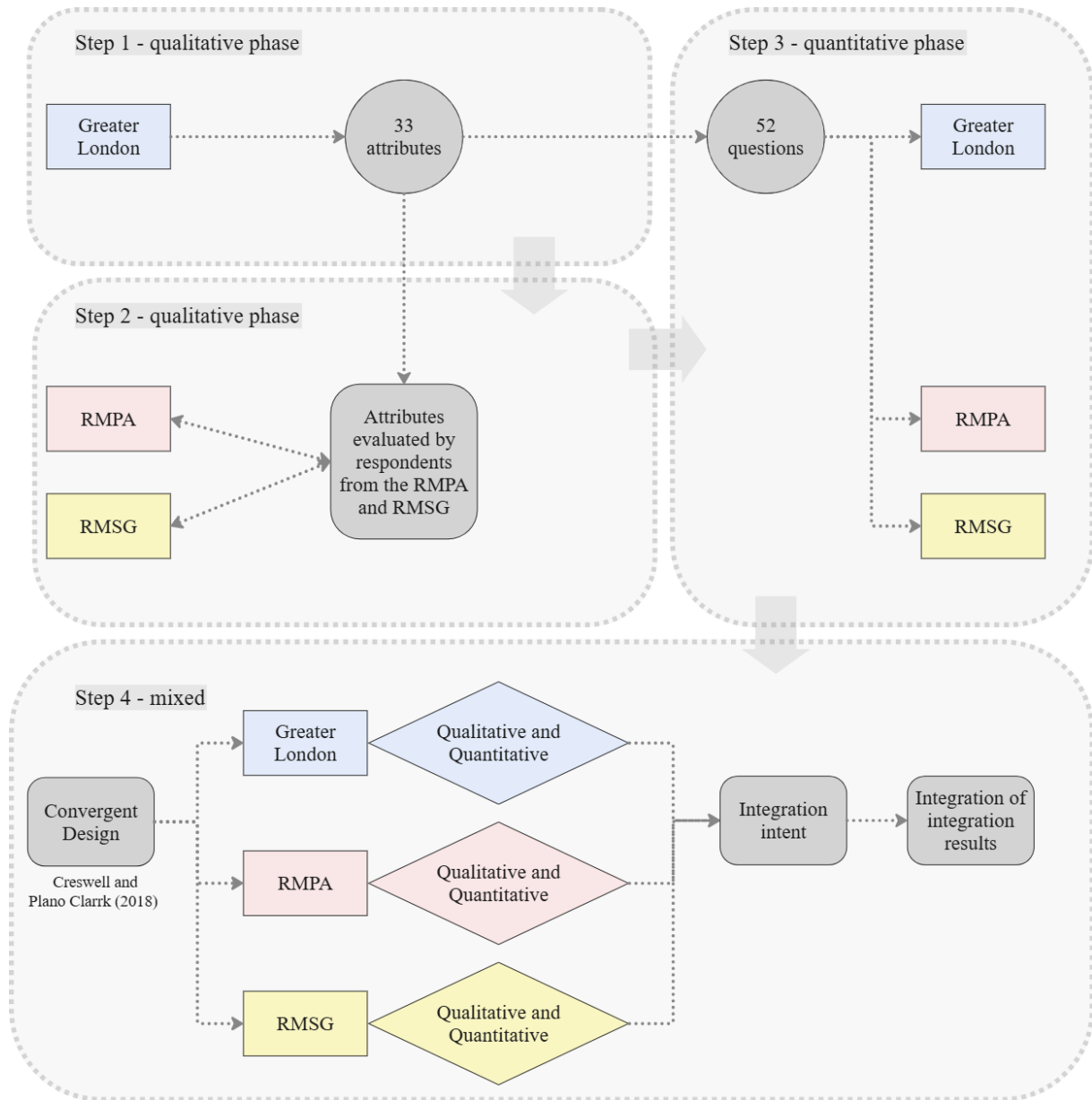
### **3.2.3 Convergent Analyses and Interpretations**

Steps three and four - according to Figure 12 - of the methodology require the integration, comparison, and interpretation of both qualitative and quantitative data strategies. Previous sections outlined specific strategies for each method, while this section delves into the importance of comparing the two data sets or transforming one to align with the other, as suggested by Creswell and Plano Clarrk (2018).

Before conducting the analyses presented in Table 19, this thesis developed a mixed-

methods approach that builds on findings from the qualitative phase on Greater London. Interviews provided key insights, identifying fundamental attributes essential to understanding sustainable mobility in metropolitan regions (Figure 14). These attributes were then analyzed in the RMPA and the RMSG through interviews with local representatives. While all attributes were recognized to some degree, certain attributes were emphasized more than others, and some areas showed gaps in policy action. Based on these findings, a quantitative survey was developed, as outlined in the previous chapter (Quantitative Phase of the Research). This multi-step framework enables systematic comparison of urban characteristics through a convergent mixed-methods design, as described by Creswell and Plano Clarrk (2018). The framework is structured into four sequential steps. Step 1 involves a qualitative analysis of Greater London, offering an in-depth examination of a globally recognized metropolitan model. Step 2 extends this qualitative analysis to RMPA and RMSG, providing a multi-scale perspective with both national and regional case studies. Step 3 introduces a quantitative component with 52 questions across 33 attributes, creating a standardized basis for comparing the three case studies and identifying both commonalities and differences. These attributes likely address key areas of metropolitan governance, infrastructure, culture, and economic factors, providing a broad analytical foundation. Step 4 culminates in a mixed-methods integration phase that synthesizes the qualitative and quantitative findings.

Figure 14 - Initial analysis of the mixed method



Source: Elaborated by author (2024).

According to Creswell and Plano Clarrk (2018), the foundational ideas for this approach were introduced by Caracelli and Greene (1993), Bazeley (2009, 2012) and Onwuegbuzie e Teddlie (2003). To facilitate data integration and interpretation, a Table 19 was created with four key considerations: the intent of integration, integration data analysis procedures, representation of integration results, and interpretation of integration outcomes. This study adopts a convergent design using these four considerations, following the guidelines outlined below.

Table 19 - Integration of data analysis and interpretation for Mixed Methods.

Essence of the design type	Integration intent	Primary Data Integration Procedures	Analysis	Representation of Integration Results	Integration of integration results
Convergent Design	-Use simultaneous integration or fusion to develop integrated results and interpretations that expand without detracting from providing comprehensive results, and/or validating and confirming results.	-Obtain results by analysing quantitative and qualitative data -Look for common concepts through the results -Compare the quantitative and qualitative results for each concept -Determine how the results confirm, disconfirm, or expand on each other; -Interpret and resolve differences -Use different procedures to transform data		-Develop side-by-side comparisons of quantitative and qualitative results through a narrative exposition or joint comparison -Transform quantitative or qualitative results and combine them into databases	-Consider how confirmed, disconfirmed and extended results provide insight into the problem studied and answer the mixed methods research question.

Source: Table 7.2 – Linking integrative data analysis and interpretation to mixed methods projects (CRESWELL; PLANO CLARRK, 2018, pag. 330). Adapted by the author.

The convergence of qualitative and quantitative analyses in a mixed-method approach required a clear and well-defined research protocol, particularly in addressing the study's four specific objectives: a) To identify the attributes of FPIC for mobility; b) To examine policies, practices, and mobility infrastructures as FPIC in the studied regions; c) To analyse the processes of metropolitan region formation in Brazil and the UK, with the aim of proposing indicators for managing sustainable metropolitan regions; and d) To propose a framework for sustainable metropolitan regions, based on sustainability attributes and mobility as a FPIC. For each objective, it was essential to specify the methods, procedures, research subjects, analytical categories, and key literature. The aim was not only to standardize the parameters but also to establish clear reference points within the literature for use in the qualitative and quantitative phases of the study (Table 20). This structured approach ensured methodological rigor and the integration of theoretical and empirical insights.

Table 20 - Summary of the research protocol and specific objectives

Objective	Method	Procedure	Research Subjects	Analysis Categories	Main Literature
To identify the attributes of Public Function of Common Interest (PFCI) for mobility	Qualitative	Legislation and literature review; Interviews with experts	Experts involved in metropolitan region research and management.	Metropolitan formation; Convergent theoretical concepts; Influence of Mobility	IPEA (2014); UN (2015); ABNT NBR ISO 37120:2017

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Objective	Method	Procedure	Research Subjects	Analysis Categories	Main Literature
To examine policies, practices, and mobility infrastructures as FPIC in the studied regions.	Qualitative and Quantitative	Legislation and literature review; Expert interviews; Quantitative research conducted in person or via online forms	Experts involved in metropolitan region research and management; Residents, investors, and visitors of metropolitan municipalities	Convergent theoretical concepts; Influence of Mobility on SDG 11; <i>Observatório de Cidades</i> platform, City Living Lab (UCS)	Christaller (1966); Perroux (1955); IPEA (2013, 2014); Rezende and Sinay (2016); OECD (2018); (UN, 2020); <i>Observatório de Cidades</i> platform, City Living Lab (UCS); ISO 37122:2019
To analyse the processes of metropolitan region formation in Brazil and the UK	Qualitative	Identification of common service provisions; Evaluation of existing legislation and documents; Expert interviews to assess effectiveness	Experts and practitioners; Legislation and document reviewers	Metropolitan formation; Convergent theoretical concepts	IPEA (2014); UN (2015, 2020)
To propose a framework for sustainable metropolitan regions, based on sustainability attributes and mobility as a FPIC.	Qualitative and Quantitative	Legislation and literature review; Expert interviews; Quantitative research conducted in person or via online forms	Experts involved in metropolitan region research and management; Residents, investors, and visitors of metropolitan municipalities	Convergent theoretical concepts; Influence of Mobility on SDG 11; <i>Observatório de Cidades</i> platform, City Living Lab (UCS)	Lexus de Jessop et al. (2008); Santos (1979, 1985); Arrison and Growe (2014); IPEA (2013, 2014); Rezende and Sinay (2016); OECD (2018); UM (2020); City Living Lab (UCS); ISO 37122:2019; Sennett (2018); Barbera and De Rossi (2021)

Source: Elaborated by author (2024).

The table above outlines the study's key objectives, methodologies, procedures, research subjects, analytical categories, and foundational literature. It reflects a structured approach to investigating the complexities of metropolitan regions, employing both qualitative and quantitative methods. By aligning specific objectives with targeted methodologies - such as expert interviews, legislative reviews, and quantitative surveys - the study ensures a comprehensive and methodologically sound exploration of metropolitan sustainability and mobility. The integration of foundational and contemporary literature further reinforces the study's academic rigor and theoretical foundation. This framework not only organizes the research process but also generates actionable insights and tools to advance sustainable metropolitan management.

## 4. RESULTS AND ANALYSES

The results and analysis chapter of the thesis is structured by phase and case study. It begins with an evaluation of the documentary evidence, followed by the results and analyses from the qualitative case studies, and concludes with the results and analyses from the quantitative case studies. After assessing these components, the study integrates the findings using a mixed-methods approach. Notably, the analysis is organized according to predefined subcategories derived from the convergence of classical theories and recent literature, which informed the development of both qualitative and quantitative questions.

### 4.1 DOCUMENTARY ANALYSIS

#### 4.1.1 Greater London, United Kingdom

London is a global city competing for international investment, talent, and tourism. By necessity, the city as spectacle must ramp up its multilevel urbanism to compete with other global cities (Yoos et al., 2016, p. 190).

Greater London has been defined in various ways, particularly in political and administrative contexts. It comprises 32 boroughs<sup>18</sup> along with the cities of London and Westminster (Paul, 2017). According to the 2021 Census<sup>19</sup>, Greater London is home to approximately 8.8 million people. Since its establishment, the region has seen 22 legislatives<sup>20</sup> amendments and expansions, with the most recent recognition adjustments recorded up until 2012, as identified in this research. Each borough within Greater London is required to develop a Unitary Development Plan (UDP)<sup>21</sup> Haywood (1998) and collectively, they form a complex urban entity with a decentralized governance structure. A typical London borough includes around 200,000 residents, governed by an elected council of 45 to 70 members, supported by a workforce of 6,000 to 7,000 employees, and an annual budget of approximately £200 million.

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<sup>18</sup> Borough organisation is the original term appropriated by the London organisation. In the free translation by the DeepL dictionary, it is seen as a city-scale organisation such as 'borough'. In the Cambridge dictionary translation, it is associated with the municipal scale 'a town', or division of a large town". In its case, the term Borough will be recognised on a municipal scale as a municipality.

<sup>19</sup> Data available at <https://data.london.gov.uk/census/>. For more information visit City Intelligence Greater London Authority.

<sup>20</sup> Consult the database of official British legislation at <https://www.legislation.gov.uk/>

<sup>21</sup> The Unitary Development Plan (UDP) is built in two parts with strategic policies and land use details, as well as a Proposals Map with general uses. Supplementary Planning Guidance is issued for development control. Boroughs operate under a decentralised system of central government, aligned to the London Strategic Planning Guidance issued every five years.



This framework underscores the diversity and autonomy of borough governance, each with its own elected council,<sup>22</sup> and executive team<sup>23</sup> contributing to the larger governance model of Greater London.

London's history, dating back over 2,000 years (Keene, 2004), begins with the Roman Empire's northward expansion and the city's establishment under Emperor Claudius in 43 AD. Its Roman legacy still lingers in the City of London's ancient gate names. After the Romans' departure in 410 AD, London faced invasions by the Angles, Saxons, Vikings, and Normans, with the latter making London the capital in 1066. Despite calamities like the Great Fire of 1666, London thrived, especially known for St. Paul's Cathedral and its expansion between the Cities of London and Westminster (Haywood, 1998). From post-Roman invasions to legal recognition as a metropolis, London's history showcases resilience and administrative expansion.

The term *metropolis* was legally recognized in 1855<sup>24</sup>, defining London's administrative reach beyond the City of London and leading to the formalization of the Metropolitan Region of London in 1888. This period saw London's governance evolve, replacing parish councils with the Metropolitan Board in 1885.

The 1888 Local Government Act played a pivotal role in shaping the governance of London, frequently referencing the term Metropolis to signify its importance. The Act states:

In the application of this Act to the Metropolis, the following provisions shall have effect:

(1) The Metropolis shall, on and after the appointed day, be an administrative county for the purposes of this Act by the name of the administrative county of London (LOCAL GOVERNMENT ACT 1888, 40).

This clause officially designated London as an administrative county, thereby centralizing the city's metropolitan services under a single administrative entity. The precise number of times Metropolis is mentioned underscores the legislative focus on London's metropolitan status. According to Haywood (1998), the 19th century marked significant advancements with the introduction of railways in 1836 and the establishment of major train

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<sup>22</sup> College in this case is interpreted as representatives of the community elected by popular vote. In Brazil, the symmetrical analogy is realised by the Municipal Council, i.e. the Chamber of Councillors.

<sup>23</sup> Executive of appointed officials is interpreted in this case in analogy to the Brazilian reality as the mayor and his appointees in positions of trust.

<sup>24</sup> According to item London County Council (LCC) the term "metropolis" in the Metropolis Management Act 1855 indicates the jurisdictional extent of the Metropolitan Board of Works. This encompasses the City of London and its adjacent parishes, marking the area for urban management and the development of essential infrastructure such as roads, sewers, and public utilities. This delineation was critical for the Victorian era governance and the systematic modernization of London's municipal services and urban configuration.

stations and the underground railway by 1862, reshaping London's form and social structure.

In the 19th century, London's population boomed due to industrialization and the emergence of commercial hubs. Morris (1997, p. 28) discusses that “The factory town produced the industrial slum” and highlighting urban design efforts like Regent's Park and Marylebone Park to improve public health and convenience. Significant developments included the rebuilding of Parliament and the inauguration of the British Museum. As per Paul (2017), initiatives like the Green Belt policy in the 1930s and the Greater London Plan of 1944 were designed to better organize housing and development, inspired by garden city ideas.

Post-war London saw significant transformations, including the establishment of the Greater London Council (GLC) in 1965 and suburban expansion until the 1970s. Despite the GLC's dissolution in 1986, London retained a layered administrative framework comprising 32 boroughs and the City of London (Paul, 2017). The late 20th century focused on sustainable development and economic regeneration (Haywood, 1998), with the Modern Architectural Research Group influencing urban modernism and the introduction of elevated pedestrian systems in the 1960s (Yoos et al., 2016). Discussions on urban delineation explored movement patterns, economic, and transportation connections, reflecting London's adaptability and planning evolution (Parr, 2007; Batty, 2014; Coombes, 2014).

The 21st century positions London to engage in global competition through innovative urban strategies, exemplified by "The Developing City 2050" which aims for inward expansion and densification (Yoos et al., 2016). Yet, this ambition sparks debates around urban growth versus the Green Belt's rigidity (Mace, 2018). The Green Belt policy, while protecting against sprawl, faces criticism for economic and flexibility concerns. Effective planning must navigate jurisdictional complexities and align development with public transport (Mace, 2018; Keene, 2004). Moreover, without the Green Belt, the scenic vistas of Greater London might have been compromised, leading to an expansion far beyond its current size (Lloyd Jones, 2000). Amidst climate change, the discourse around urban development versus environmental preservation calls for sustainable urbanisation strategies that balance metropolitan growth with ecological integrity. Research emphasizes the importance of urban planning in mitigating climate impact on biodiversity (Wilby; Perry, 2006; Saganeiti et al., 2023; Lampinen et al., 2023), highlighting the need for policies that incorporate climate strategies into urban development (Dobraszczyk, 2017; Rahman et al., 2019). This pivotal juncture demands integrating urban development and ecological sustainability, leveraging historical insights and contemporary research to navigate the complexities of climate change and urbanisation.

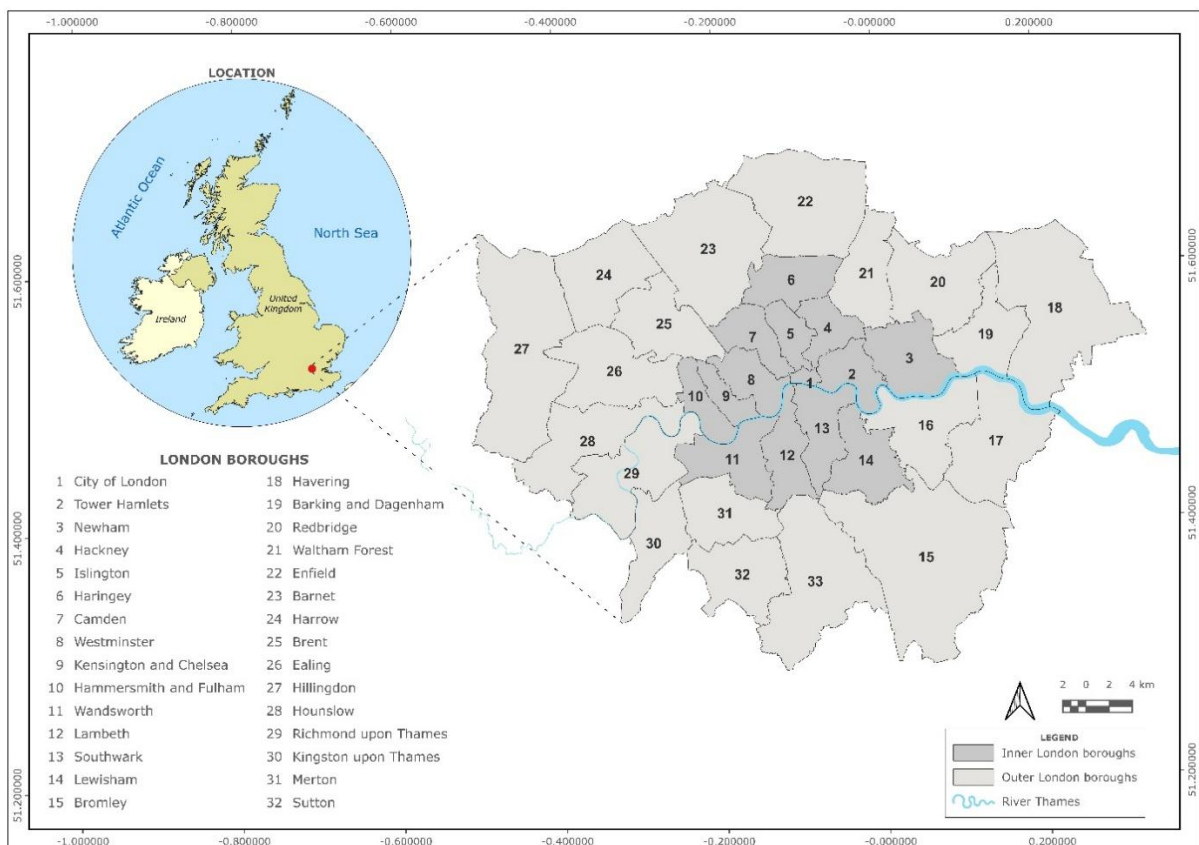
Research links climate change, urbanisation, and biodiversity, noting urbanisation's significant impact on land use, influenced by socioeconomic shifts and population trends (UN, 2020, 2015, 2001, 1993). Historic British studies from the 1940s by Salisbury *apud* (1943 WILBY; PERRY, 2006) highlighted cities as biodiversity sources. Landscape ecology stresses spatial heterogeneity's role in biodiversity conservation, supported by contemporary studies (Riechers et al., 2018; Hrelja et al., 2021; Badura et al., 2021; Langemeyer et al., 2021; Crupi, 2022; Saganeiti et al., 2023; Lampinen et al., 2023; Kato-Huerta; Geneletti, 2023; Hansen et al., 2023). Bridging environmental and urban planning, the shift toward sustainable development integrates ecological considerations with the evolving urban dynamics of metropolises like London. However, this research highlights that the UK has established specific guidelines for regional planning that preceded this transition.

The regional scale in the United Kingdom, particularly in England, has undergone substantial restructuring since the establishment of ten Government Office Regions in 1994 to coordinate departmental functions. These regions were later expanded through regional development agencies (1997) and chambers (1998) to strengthen governance and planning. However, the abolition of regional chambers and the withdrawal of regional strategies in 2010 marked a shift toward localized governance, with coordination now primarily managed by voluntary associations of local authorities. Currently, regions in England function mainly as statistical units, reflecting the decline of regionalism in favor of localized and metropolitan-centered governance. Greater London remains an exception, governed by the directly elected Greater London Authority, comprising the Mayor and the London Assembly. This shift underscores the UK's transition from regionalism to localism, prioritizing metropolitan governance and decentralized decision-making.

London's urban dynamics have shifted, with its population decreasing from 9 million to over 7 million, while the wider metropolitan area holds around 12 million. The UK has seen a decrease in urban dwellers in metropolitan centers from 71% in 1931 to 60% by 1966, attributed to the quest for affordable housing and employment in suburbs. Megacities experience challenges like long commute times, necessitating compact, strategic urban planning to address sprawl and promote sustainable development. Policies should focus on social networks, economic diversity, and public land management to provide affordable housing and prevent the creation of new urban problem areas (Lloyd Jones, 2000). Linking London's evolving urban challenges with focused research in Greater London, this study aims to bridge practical urban management with theoretical insights into sustainable mobility and environmental strategies.

Greater London was chosen as the focal area for this study based on four compelling reasons, reflecting a strategic approach to analysing sustainable mobility and environmental strategies. First, the availability of extensive official data enables a robust empirical examination of urban dynamics and policy impacts, offering a comprehensive foundation for research. Second, the governance model involving the Greater London Authority (GLA), led by the Mayor, and its interaction with constituent boroughs provides a unique framework for studying urban policy formulation, implementation, and evaluation. This governance interplay offers valuable insights into strategies for effective and sustainable urban development. Third, Greater London shares key characteristics with other global metropolises, facilitating meaningful comparisons and enabling the extrapolation of findings to similar urban contexts. This makes it a paradigmatic case for studying urban sustainability. Lastly, the use of Public Transport Accessibility Levels (PTAL) within Greater London serves as a vital metric for evaluating and enhancing mobility infrastructure. PTAL underscores the critical role of public transport accessibility in shaping sustainable and resilient urban environments. Together, these factors establish Greater London as a representative and expansive case study, making it an ideal setting to explore broader issues of urban sustainability and climate change mitigation.

Figure 15 - London Region: London boroughs.



Note: official data available in shapefile files from dataset by data.gov.uk website.

Source: Elaborated by the author (2024).

The map presents the administrative structure of Greater London, distinguishing its division into Inner and Outer London boroughs as of 2018. The Inner London boroughs, highlighted in yellow, include historically significant areas like Westminster and the City of London, characterized by higher population densities, complex governance structures, and concentrated economic activity. In contrast, the Outer London boroughs, shaded in light purple, form a ring around Inner London and encompass larger areas with a blend of suburban and urban features, acting as a transitional zone between the metropolitan center and neighboring counties. This spatial division reflects not only variations in population density and land use but also historical differences in urban planning and socio-economic focus. The map underscores the governance challenges unique to Greater London, where the independence of individual boroughs must align with the need for coordinated metropolitan policies, particularly in public services, infrastructure, and regional development.

#### **4.1.2 Metropolitan Region of Porto Alegre (RMPA), Brazil**

The Metropolitan Region of Porto Alegre (RMPA) traces its historical roots to the 16th century, with the founding of the cities of Viamão, Gravataí, and Porto Alegre. Porto Alegre quickly became a significant center for the distribution of agricultural products from Azorean settlers, aided by the Jacuí River and the Guaíba estuary. The arrival of German immigrants in the 19th century led to a surge in trade and early industrialization, which was further propelled by the world wars and the construction of railways. The construction of BR 116 in 1938 and the expansion of industrial activities fostered growth in the municipalities of São Leopoldo and Novo Hamburgo. Rapid population growth and disordered migration in the 1940s and 1950s prompted Porto Alegre's local government to pass legislation on land division, driving developers to peripheral municipalities such as Viamão, Gravataí, and Guaíba, which subsequently experienced significant population growth as commuter towns. This disordered expansion exemplified the urbanisation and industrialization processes in the region, driven by economic factors, migration, and transportation infrastructure development (Martins, 1990)

According to Alonso (2008), in Edvaldo Pereira Paiva's 1943 work, *Expediente Urbano de Porto Alegre*, the engineer examined the relationships between Porto Alegre and its surrounding region, emphasizing the city's regional importance. Paiva noted the colonial region, encompassing the river basins that form the Guaíba estuary, as the area nearest the capital. While he acknowledged Porto Alegre's dominance over this colonial area, Paiva did not characterize it as a metropolitan phenomenon, though he frequently underscored the capital's

regional significance. In a 1947 article published in *Revista de Engenharia*, Paiva addressed Porto Alegre's master plan, stressing the importance of the city's regional function and economic influence as fundamental to guiding urban planning.

Alonso (2008) also cites four studies conducted during the 1950s and 1960s. The first, by urbanists Paiva, Fayet, Veronese, and Moojen Marques in 1958, identified signs of conurbation in Porto Alegre's urban dynamics, noting that the city's expansion was progressing along access routes to the north and northeast, connecting previously isolated urban areas. A 1959 study by Laudelino Medeiros similarly recognized the conurbation of Porto Alegre and emphasized the need for regional planning to manage urbanisation. Subsequently, studies by Geiger and Davidovich in 1961 described Porto Alegre as a metropolitan urban complex, underscoring its economic and formal significance and defining its place in the urban hierarchy of Rio Grande do Sul. Finally, Medeiros's 1964 restudy reaffirmed the conurbation between Porto Alegre and neighboring urban centers, this time identifying the phenomenon of metropolitanization, suggesting that the expansion of Porto Alegre and adjacent cities would create a metropolitan area.

Conforme Francisconi (1972 *apud* MARTINS, 1990) the metropolitan area of Porto Alegre was delineated for planning purposes in three phases. The first, conducted by the Porto Alegre City Hall in 1967, encompassed 12 municipalities. The second, in 1968, expanded the area to include four additional municipalities as determined by the Brazilian Institute of Geography and Statistics (IBGE). The third and final demarcation, also in 1968, was devised by the State Government's Public Works Department, taking into account transportation, urban functions, and continuity of urbanized spaces. In total, the metropolitan area comprised 14 to 16 municipalities, depending on the demarcation. In 1967, the City of Porto Alegre established the Metropolitan Association of Municipalities (AMEM)<sup>25</sup>.

In 1970, the State Government designated the metropolitan area as a program region, establishing the Metropolitan Municipal Council (CMM) as a deliberative body to develop studies, plans, and projects through inter-municipal agreements. A technical body, the Metropolitan Region Executive Group (GERM), was created to implement CMM policies and guidelines. Supported by West German funding, the metropolitan development plan was initiated in 1971 and completed in 1973 but was largely abandoned by 1980 due to incomplete implementation.

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<sup>25</sup> The association was formed by the municipalities of Alvorada, Canoas, Esteio, Gravataí, Guaíba, Novo Hamburgo, Porto Alegre, Sapucaia do Sul, São Leopoldo, and Viamão.

At the legal level, the *Constituição Federal* of 1967 (Art. 157, §10), along with the 1969 Constitutional Amendment (Art. 164), set forth principles aimed at promoting economic order and social welfare. One paragraph specified that the federal government could, through supplementary law, create metropolitan regions consisting of municipalities that would comprise a single socioeconomic community to facilitate the provision of services of common interest.

The RMPA was officially established under federal complementary Law n°. 14 on June 8, 1973, alongside other metropolitan regions in São Paulo, Belo Horizonte, Recife, Salvador, Curitiba, Belém, and Fortaleza. Initially, the RMPA included 14 municipalities: Alvorada, Cachoeirinha, Campo Bom, Canoas, Estância Velha, Esteio, Gravataí, Guaíba, Novo Hamburgo, Porto Alegre, São Leopoldo, Sapiranga, Sapucaia do Sul, and Viamão, representing approximately 23% of Rio Grande do Sul's population. Porto Alegre served as the metropolitan hub, being the state capital and the oldest city in the arrangement. At the state level, Law n°. 6,656 of December 12, 1973, established the RMPA Deliberative and Advisory Councils, consisting of five members of recognized technical or administrative capability appointed by the State Governor, including one member nominated by the capital city's mayor and another by the remaining metropolitan municipalities. This Council replaced the former CMM. In 1974, the state passed Law n°. 6,748, creating the Metropolitan Planning Foundation (METROPLAN), a technical body to support the Deliberative Council.

The 1989 State Constitution of Rio Grande do Sul established three categories of regional planning areas: metropolitan regions, urban agglomerations, and micro-regions. Metropolitan regions consist of neighboring municipalities with contiguous urban networks and complementary urban functions. Urban agglomerations comprise adjacent municipalities with emerging functional complementarity. Micro-regions, on the other hand, are clusters of bordering municipalities linked by shared physical, socioeconomic, and political-administrative characteristics.

According to the Socioeconomic Atlas of the State of Rio Grande do Sul, several municipalities were incorporated into the metropolitan area over the years. In 1989, Portão, Ivoti, Dois Irmãos, Parobé, Glorinha, Eldorado do Sul, Nova Hartz, and Triunfo joined, bringing the total to 22 municipalities. Charqueadas was added in 1994, followed by Araricá and Nova Santa Rita in 1998. In 1999, Montenegro, São Jerônimo, and Taquara were included, increasing the total to 28. Further additions over the following decades included Arroio dos Ratos and Santo Antônio da Patrulha in 2000, Capela de Santana in 2001, Rolante in 2010, Igrejinha in 2011, and finally São Sebastião do Caí in 2012, resulting in the current

configuration of 34 municipalities (Table 21). This region now represents over one-third of the state's population, with approximately 37% of residents concentrated in this metropolitan area.

Table 21 - Composition of the *Porto Alegre* Metropolitan Region (RMPA). Basic comparison over the past decade.

						(continue)
Municipality	Population in 2012	Population in 2022	Territorial Area 2022 km <sup>2</sup>	Population Density 2022 by km <sup>2</sup>	Population Growth (%) over the Period	Population Density Growth (%) over the Period
1	Alvorada	195.673	71,700	2.612,48	-4,27%	-4,46%
2	Araricá	4.864	35,391	240,88	75,27%	42,94%
3	Arroio dos Ratos	13.606	425,791	34,29	7,31%	6,81%
4	Cachoeirinha	118.278	43,778	3.112,48	15,20%	13,20%
5	Campo Bom	62.091	60,579	1.038,08	1,28%	1,26%
6	Canoas	323.827	130,789	2.658,15	7,36%	6,85%
7	Capela de Santana	10.462	182,756	61,06	6,66%	6,25%
8	Charqueadas	35.320	217,362	161,08	-0,87%	-0,88%
9	Dois Irmãos	27.572	66,114	464,49	11,38%	10,22%
10	Eldorado do Sul	34.343	509,614	77,63	15,19%	13,19%
11	Estância Velha	42.574	51,779	925,32	12,54%	11,14%
12	Esteio	80.755	27,676	2.751,01	-5,72%	-6,07%
13	Glorinha	6.891	323,955	23,64	11,13%	10,02%
14	Gravataí	255.723	468,288	566,04	3,66%	3,53%
15	Guaíba	95.204	376,166	247,03	-2,39%	-2,45%
16	Igrejinha	31.899	138,303	237,22	2,85%	2,77%
17	Ivoti	19.874	63,092	364,28	15,64%	13,53%
18	Montenegro	59.415	425,023	149,70	7,08%	6,62%
19	Nova Hartz	18.324	62,319	322,34	9,63%	8,78%
20	Nova Santa Rita	22.706	218,153	133,04	27,83%	21,77%
21	Novo Hamburgo	239.355	222,536	1.023,35	-4,86%	-5,10%
22	Parobé	51.275	108,707	478,88	1,53%	1,50%
23	Portão	30.868	159,298	213,89	10,38%	9,40%
24	<i>Porto Alegre</i>	1.409.351	495,390	2.689,94	-5,45%	-5,76%
25	Rolante	19.448	296,090	71,78	9,28%	8,49%
26	Santo Antônio da Patrulha	39.722	1.049,583	40,91	8,11%	7,50%
27	São Jerônimo	22.134	935,596	22,48	-5,00%	-5,26%
28	São Leopoldo	214.087	103,009	2.111,59	1,55%	1,53%
29	São Sebastião do Caí	23.134	114,293	213,73	5,59%	5,30%
30	Sapiranga	72.968	136,473	554,31	3,67%	3,54%
31	Sapucaia do Sul	130.957	58,247	2.268,05	0,88%	0,87%
32	Taquara	54.590	452,572	117,64	-2,47%	-2,53%
33	Triunfo	25.793	817,625	33,63	6,61%	6,20%
34	Viamão	239.384	1.496,506	149,76	-6,38%	-6,81%
	<b>RMPA</b>	<b>4.032.467</b>	<b>10.344,553</b>	<b>388,42</b>	<b>-0,36%</b>	<b>-0,36%</b>
	<b>Average Population Density in the <i>Porto Alegre</i> Metropolitan Region (RMPA)</b>			<b>769,71</b>		



Municipality	Population in 2012	Population in 2022	Territorial Area 2022 km <sup>2</sup>	Population Density 2022 by km <sup>2</sup>	Population Growth (%) over the Period	Population Density Growth (%) over the Period
<b>Percentage among RMPA e RS</b>	<b>37,20%</b>	<b>39,83%</b>	<b>3,67%</b>			
<b>Rio Grande do Sul</b>	<b>10.841.000</b>	<b>10.088.506</b>	<b>281.707,151</b>			

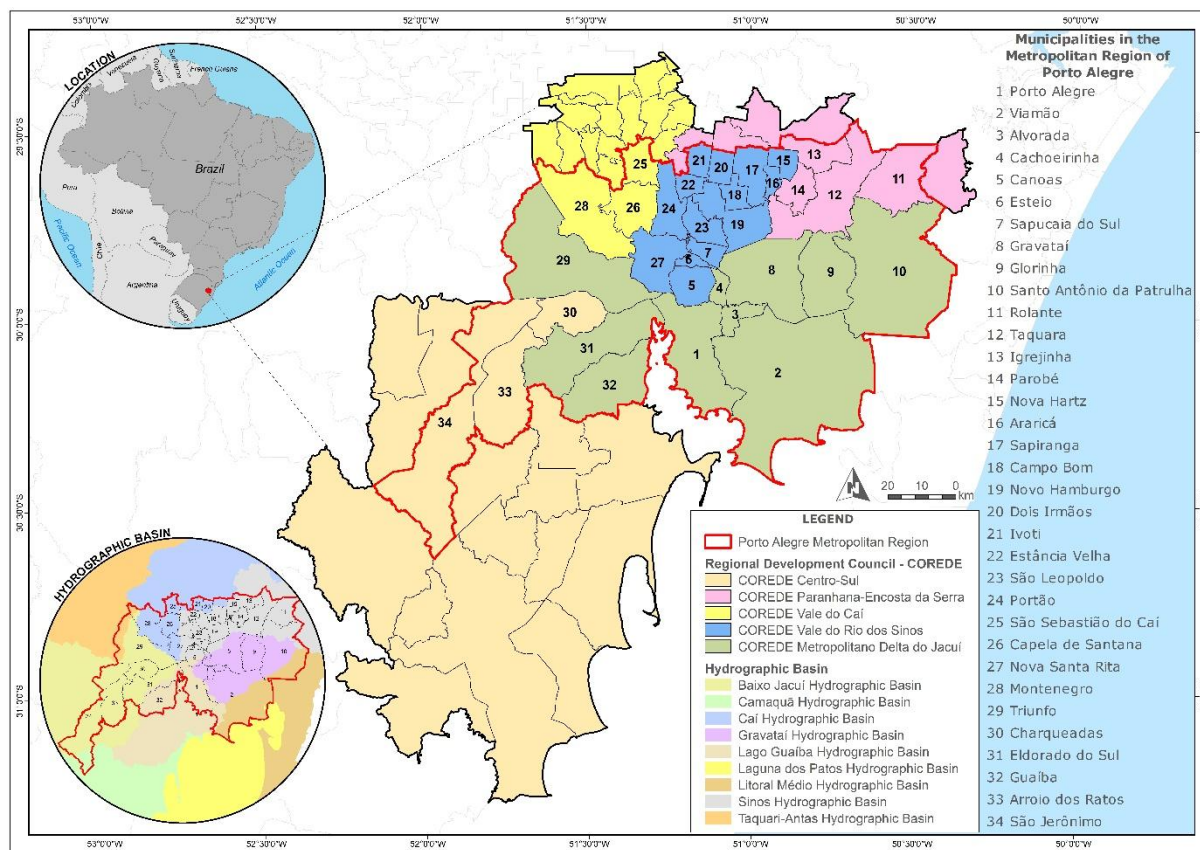
Source: IBGE (2012, 2022). Elaborated by the author

The Porto Alegre Metropolitan Region (RMPA) expanded to encompass 34 municipalities by 2015, covering an area of 10,344.55 km<sup>2</sup>, more than twice the size of the original RM. Although São Sebastião and Igrejinha were included in 2011 and 2012, respectively, they officially became part of the RMPA in 2015, as outlined in complementary law No. 11,740/2002.

The RMPA, located north of the Lagoa dos Patos, encompasses six river basins: Guaíba Lake, Gravataí, Sinos, Caí, lower Jacuí, and parts of the Taquari and Antas basins (Figure 16). The Sinos River basin includes 24 municipalities, the most in the RMPA, followed by the Caí basin with 12. Porto Alegre, the central city, is intersected by the Guaíba and Gravataí basins. Within the metropolitan area, the Jacuí Delta APA<sup>26</sup>, a key conservation site, spans 22,826 hectares, including 14,242 hectares for the Jacuí Delta State Park. Covering Porto Alegre, Canoas, Nova Santa Rita, Triunfo, and Eldorado do Sul, the APA protects natural resources while promoting sustainable use. The Itapuã State Park in Viamão, established in 1973, protects 5,566 hectares of natural resources, wildlife, and archaeological sites.

<sup>26</sup> Environmental Protection Areas (APA), established by Law 6902/81, are conservation units

Figure 16 - Location of the Metropolitan Region of Porto Alegre and its relationship with development councils and river basins.



Note: Geographical Coordinate System. SIRGAS 2000 Geodetic System. Political-administrative boundaries IBGE (2022) and Watersheds SEMA, RS (2018).  
Source: Elaborated by author (2024).

Two federal highways cross the RMPA: BR-116, connecting Jaguarão (Uruguay) to Santa Catarina via key cities, and BR-290, linking Uruguaiana (Argentina) to Osório and BR-101.

The Appendix b – compares legislative frameworks for metropolitan governance compares metropolitan governance laws. Both frameworks emphasize consultative councils, community representation, and Integrated Development Plans, renamed from Metropolitan Development Plan to PDUI, though the original better reflects regional boundaries. FPIC replace "common services." Earlier laws prioritized water, sewage, and pollution control via state concessions; current legislation focuses on macro-zoning, land subdivision, urban regularization, monitoring, and central PDUI areas: housing, sanitation, transport, and mobility.

Martins (2019) highlights the creation of METROPLAN in 1975 as the governing body for Rio Grande do Sul's metropolitan regions. By 1991, METROPLAN's mandate expanded to include planning and managing other regional organizations, though governance remained highly centralized. In 2010, municipal associations and civil society initiatives prompted the

establishment of a deliberative council and governance office for the RMPA, formalized in 2012. The enactment of the 2015 EM initiated discussions on institutional adaptation and the preparation of the PDUI. However, these efforts stalled, leaving the initiatives unfulfilled.

The dissolution of METROPLAN in 2022 created a planning and management void, deepening political disarticulation in the RMPA and weakening intermunicipal cooperation. This fragmentation has impeded the implementation of shared public policies. Martins (2019) identifies key milestones, including METROPLAN's 1991 expansion, the 2010 governance initiatives, the establishment of the deliberative council (CDM) and governance office<sup>27</sup>, and the EM. More recently, Granpal's 2023 efforts to restore metropolitan governance highlight ongoing attempts to address these challenges. Despite these efforts, the CDM and governance office remain inactive, reflecting persistent institutional weaknesses. Barriers to effective metropolitan governance include Brazil's federative system, which restricts intergovernmental cooperation, and the discontinuity of planning structures, which reduces the impact of government initiatives. Issues such as poorly managed contracts, weak partnerships, bureaucratic inefficiencies, and a lack of clear authority further undermine governance. The absence of consensus on metropolitan-scale public policies and public functions exacerbates these challenges, hindering integrated metropolitan planning and development. Despite these obstacles, several entities influence metropolitan governance in the RMPA, including the Metropolitan Parliament, six municipal associations, five regional development councils (COREDES), six watershed management committees, and eight public consortia management committees, and eight public consortia (Martins, 2019). In 2015, a state-level preparatory group was formed to develop the RMPA PDUI. This group emphasized the importance of data collection, methodological foundations, and a strategic vision aligned with societal objectives. It proposed drafting foundational PDUI guidelines to be elaborated across thematic areas. The group also revisited significant historical plans, such as the 1973 urban development master plan, which defined the RMPA, guided METROPLAN's creation, and established zones for urban, rural, and environmental preservation.

In urban mobility, key references include the 1976, RMPA Urban Transport Master Plan (PLAMET), which outlined public transportation development, and the 2006 Integrated Transport and Urban Mobility Plan (PITMurb), which unified transportation and mobility

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<sup>27</sup> Institutional actions created by Complementary Law No. 13,854 of December 26, 2011 and regulated by Decree No. 48,946 of March 26, 2012: the Metropolitan Deliberative Council (CDM) and the Metropolitan Governance Office (GGM).

policies. In environmental planning, the Risk and Disaster Prevention Plan, derived from the Flood Prevention Plan (PAC 2), aimed to mitigate natural disaster risks in the RMPA (Martins, 2019).

For the PDUI, the State Planning Secretary proposed a six-step methodology emphasizing stakeholder participation (Table 22). Martins (2019) highlighted the inclusion of entities such as the Urban Order Coordination Unit of the Public Ministry, municipal associations, and the Legislative Assembly. The group recommended thematic subgroups, analysis of sectoral plans from state agencies, and prioritization of FPIC in the PDUI.

Table 22 - Work plan for the development of the PDUI.

Stage	Description
Preparation	Initial mobilisation, preliminary analyses, methodological definitions, mapping of actors, communication and definition of the form of social participation
Defining the scope	Building the vision - what metropolis do we want - defining the objectives, the main themes to be addressed, the goals, priorities and horizons
Elaboration	Characterisation and diagnosis, strategies and proposals
Consolidating the plan	Systematisation of all the knowledge accumulated in the previous activities
Approval	Final presentation and establishment of the plan
Revisions	Establishment of systematic reviews

Source: Table 4, prepared by Martins (2019).

At the state level, efforts to advance sustainable mobility and address metropolitan demands culminated in two initiatives in 2013: the creation of a state law on sustainable mobility in Rio Grande do Sul and a Special Commission on Urban Mobility. These actions led to the approval of State Law No. 14,960 in 2016. The Final Report of the Special Commission advocates centralizing public transport responsibilities under a Metropolitan Authority and allocating tax revenues to improve efficiency. It highlights METROPLAN's role in regulating urban mobility plans and supporting metropolitan regions.

State Law n°. 14,960 prioritizes pedestrians, non-motorized transportation, and public transit (Art. 2º) while addressing inequality, inclusion, and accessibility (Art. 3º). Both documents emphasize multimodal integration, environmental impact mitigation, and strategies such as car-use restrictions and public transport prioritization, forming a cohesive framework for sustainable mobility.

In 2015, the legislative Assembly of Rio Grande do Sul established a Special Committee on the *Estatuto da Metrópole* to guide legislative discussions on creating and expanding metropolitan regions in the state. The committee proposed several measures to support effective implementation of the Statute: (i) a comprehensive awareness campaign to inform

municipalities of the Statute's provisions; (ii) revisiting and aligning existing metropolitan legislation with the Statute; (iii) establishing a Metropolitan Development Fund supported by municipal contributions; and (iv) strengthening METROPLAN by providing essential human, technical, and financial resources for effective metropolitan governance. These recommendations aim to enable consistent application of the Statute across Rio Grande do Sul and promote metropolitan development statewide.

In 2023 and 2024, the Porto Alegre Metropolitan Region Municipal Association (GRANPAL) revisited the topic, prioritizing the establishment of a metropolitan authority to revitalize the regional agenda and advance strategic projects. To ensure technical and academic rigor, GRANPAL surveyed the RMPA municipalities via an online questionnaire, collecting insights on current and prospective municipal priorities.

Eight of the 34 RMPA municipalities, approximately one-quarter of the region, responded to the survey. The questionnaire gathered information on each respondent's role, contact details, and included both open-ended and targeted questions on relevant issues.

Preliminary results showed broad consensus among municipal representatives on the advantages of RMPA integration. Respondents highlighted shared benefits, with comments such as "Lower logistical costs, (...) greater influence in dialogues with other entities"; "We share common life and challenges in the metropolitan region"; "Common problems, joint solutions, better outcomes"; and "Alignment of interests between neighboring cities and the capital supports both individual and collective growth, fostering an excellent urban economy."

However, when asked about potential drawbacks of RMPA membership, six respondents saw none, while two cited issues like "Concentration of poverty, violence, and unemployment; loss of time in daily commutes" and "Lack of investment and planning in energy and infrastructure over the years."

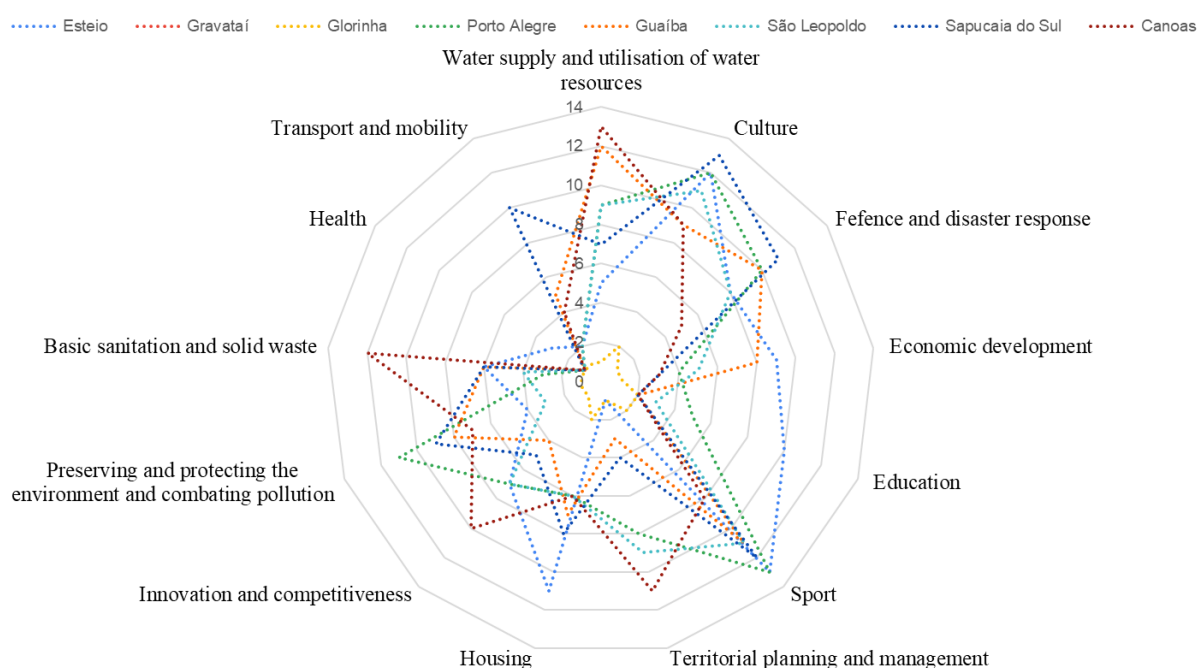
Significant agreement emerged on prioritizing FPIC for RMPA. Health, transport, and mobility were identified as top priorities by all municipalities, with water supply, basic sanitation, territorial management, water conservation, and solid waste management also frequently noted. Secondary priorities included civil defense, education, innovation, economic development, housing, and environmental protection, which are interlinked with the primary FPIC.

Feedback further indicated that health services and transport/mobility require renegotiation with the state. Health services need specific programs and funding adjustments to address longstanding deficits, while transport requires improved integration of municipal and state intermunicipal services.

The survey also asked participants to rank FPIC for regional agreement among RMPA municipalities. The FPIC included water supply and resource management, culture, civil defense and disaster prevention, economic development, education, sports, territorial management, housing, innovation and competitiveness, environmental preservation and pollution control, basic sanitation and waste management, health, and transport/mobility, with options for municipalities to add other relevant services.

Figure 17 illustrates the prioritized FPIC identified by respondents. Here, lower vertical bars indicate a higher priority for inter-municipal agreement on the respective service. Health is ranked as the highest priority, followed by transportation and mobility, education, and economic development. In the secondary tier, territorial management and planning, basic sanitation and solid waste management, innovation and competitiveness, housing, and environmental preservation are emphasized as significant but less immediate needs.

Figure 17 - Priority level of municipalities regarding the FPIC that should be agreed upon among themselves



Source: Elaborated by author (2024).

In an open-format survey on the ideal metropolitan governance structure for RMPA, municipalities stressed the need for a collaborative approach between the State and municipalities. They advocated for establishing or revitalizing a jointly managed public body as a statewide solution. Autonomy for both state and municipal authorities, supported by public funding from both government levels, was identified as essential. Municipalities expressed strong support for creating a metropolitan authority, envisioned to operate at the municipal

level, utilize public and private resources, and make decisions in partnership with the State and municipalities to implement shared public policies.

In official communication n°. 28/2023, dated May 31, the association presented a priority agenda to the State Governor, with the "Establishment of a Metropolitan Authority (Metropolitan Governance)" as its primary item. The document noted the association's efforts to develop a proposal for a metropolitan authority to present to the State Government. It also urged the state to reconstitute and activate inactive institutional bodies like the CDM and GGM. The association emphasized:

“The institutional arrangement is essential for advancing intergovernmental cooperative governance in our region on matters of common interest and significant relevance, not only for municipalities but also for the State of Rio Grande do Sul.”  
(GRANPAL, 2023, our translation)

Reflecting GRANPAL's concerns, the National Front of Mayors has scheduled a meeting on August 7, 2023, focusing on "Public Service Management and Metropolitan Governance: Building a Municipal Agenda." Representatives from the Institute for Applied Economic Research (IPEA) and the Barcelona Metropolitan Area (AMB) will participate in this meeting, indicating the importance of both national and international perspectives on metropolitan governance.

*The Metropolitan Affairs Authority (ASSUME)*

On November 30, 2023, the municipalities comprising GRANPAL reached a consensus on a new model for metropolitan governance. They proposed creating a metropolitan authority led by the municipalities with support from the state, marking a shift from the current model, where the state leads with municipal assistance. This approach redefines metropolitan governance in Brazil, promoting a decentralized and collaborative framework in which municipalities assume primary responsibility, with the state playing a supportive role.

The Metropolitan Affairs Authority (ASSUME) represents a significant step forward in this evolving governance model, focusing on collaborative management in critical areas such as transportation and land management. Originating from an agreement among GRANPAL municipalities, ASSUME seeks to overcome traditional fragmentation in metropolitan governance through a cooperative structure involving contributions from both municipal and state entities. This initiative is designed to optimize resources, reduce costs, and respond more effectively to regional needs, fostering innovation and competitiveness that benefits both the public sector and the wider community.

A consolidated metropolitan governance model is essential for the harmonious and sustainable development of urban regions. Such a model enables efficient public policy coordination, optimal use of shared resources, and a sustainability-driven approach that considers the interconnected nature of metropolitan areas. By adopting an integrated approach, ASSUME is positioned to address common regional challenges, improve service delivery efficiency, and transcend the administrative limitations of individual municipalities. Coordinated strategies can further stimulate economic growth, while integrated urban mobility management enhances transportation systems. Intermunicipal cooperation and adherence to specific legislative frameworks allow metropolitan regions to develop as cohesive, competitive entities.

ASSUME's governance approach combines both general and specialized management, reflecting a multi- and single-sector perspective on metropolitan development. With a mixed public composition, ASSUME brings together representatives from various government levels alongside private, social, and academic stakeholders, fostering a robust ecosystem for metropolitan governance. This entity's shared, interjurisdictional, and public nature emphasizes the strategic management of collective interests and the protection of human rights. ASSUME addresses key issues in sustainable development by leveraging technical expertise and promoting intersectoral and territorial integration. It acts as a proactive and visionary coordinator, anticipating future challenges and fostering innovative solutions within a regulatory framework that ensures its operational and strategic legitimacy.

To advance metropolitan cooperation and effective management, several administrative steps are necessary to formalize agreements among municipalities. First, municipalities must ratify amendments to the protocol of intentions through specific municipal legislation, followed by statutory changes to reflect the new governance structure. Engaging the state government to highlight the importance of these changes is essential. Additionally, collaboration with the Legislative Assembly is needed to draft a complementary law project. Finally, clearly defining initial competencies and restructuring administrative frameworks are crucial steps in establishing metropolitan governance.

As a new entity, ASSUME is progressing in its internal discussions on FPIC, a central aspect of metropolitan organization and governance, as outlined in Article 25, §3 of the *Constituição Federal*. Defining these functions requires both political and technical decisions, supported by in-depth studies to identify areas of common interest. Effective implementation of these functions depends on robust intergovernmental governance that promotes cooperation among federal entities.



As ASSUME matures, it is developing a basic organizational framework focused on prioritizing FPIC. This framework centers around three core areas: "Territorial Organization," "Community Resilience," and "Regional Mobility." Each area is associated with a set of "Actions/Deadlines/Budgets/Indicators," signifying planned actions with set deadlines, allocated budgets, and specific performance metrics. Additionally, "Metropolitan Management" is linked to the "PDUI," which could serve as a vital tool for implementing metropolitan management policies. By the end of 2024, ASSUME aims to advance this foundational analysis, setting the stage for further progress in the coming year.

#### **4.1.3 Metropolitan Region of Serra Gaúcha (RMSG), Brazil**

The occupation of Rio Grande do Sul occurred in distinct phases. Initially, Jesuit missions and Indigenous settlements marked the region. The Jesuits expanded into Argentina, and after 40 years, established the Sete Povos das Missões, focusing on yerba mate production and livestock farming. In the 18th century, the Portuguese Crown established military defenses to secure these lands, while the growth of *charque* (jerked beef) farms stimulated cities like Bagé, Pelotas, and Rio Grande. The arrival of Azorean settlers in 1752 introduced agriculture and formed urban centers. European immigration in the 19th century, especially from Germany (1824) and Italy (1875), greatly influenced the state's development. Industrial and urban growth around Porto Alegre and Caxias do Sul made the region attractive to entrepreneurs. In the North, German and Italian colonization and land parceling led to a more distributed political-administrative structure and a denser urban network compared to the South, where extensive agricultural practices dominated. This history of settlement explains the population distribution differences across the state (RIO GRANDE DO SUL, 2021).

Italian colonization in Brazil, beginning in the 19th century, responded to several territorial needs, including a labor shortage in coffee plantations after the abolition of slavery, southern expansion, strengthening the internal market's middle class, and the desire to "whiten" the largely Black and mixed population. To support this project, Brazil cooperated with the Italian government, offering incentives to immigrants. Italy, grappling with economic problems and instability during unification, saw this as an opportunity; Brazil financed travel and provided subsidies, with extended deadlines for land debt repayments (Manfio; Pierozan, 2019).

According to Mioranza and Frosi (2009) the government allocated public lands in northeastern Rio Grande do Sul and near Santa Maria to settle Italian immigrants, establishing

what are now the municipalities of Serra Gaúcha and Quarta Colônia. Italian culture and identity became deeply rooted in these areas, fostering a strong cultural attachment. This appreciation of history and traditions generated a sense of belonging, even as cultural exchanges with other groups led to some evolution in these traditions.

These regions are distinguished by traits such as Catholicism, traditional vine-trellising, Italian cuisine, and festivals celebrating the colonial past. Culinary practices, winemaking, and daily life customs have shifted over time. Many orally transmitted recipes have evolved or become unique to specific locales, yet retain a cultural connection. Serra Gaúcha, with economic growth driven by agriculture and artisanal industry, plays a significant role in the national wine and tourism sectors (Manfio; Pierozan, 2019).

Before Italian colonization, French and Swiss immigrants attempted to settle in Serra Gaúcha, but challenging conditions led most to relocate. Note that isolation and distance from urban centers prompted these early immigrants to move to other areas of the state. The arrival of Italians in 1875 marked a new period, with settlements emerging from Colônia Nova Palmira, forming colonies such as Colônia Caxias, Dona Isabel, and Conde D'Eu. By this time, Rio Grande do Sul had expanded to 28 municipalities, up from just four in 1809 (RIO GRANDE DO SUL, 2021).

Italian migration continued on a large scale, leading to the establishment of new colonies in the following decades. With the subdivision of these colonies, Serra Gaúcha now includes 55 municipalities and is recognized as the Italian Colonization Region (Manfio; Pierozan, 2019). Busato and Mayer (2016) describe the Italian settlers in Serra Gaúcha as poor but not destitute. They rarely spoke of the hardships they faced in Italy before emigrating to Brazil. As noted by Manfio and Pierozan (2019), these settlers integrated by introducing Italian customs to preserve their identity and traditions in a new homeland. Grapevine cultivation and winemaking became central activities, which significantly influenced viticulture in Serra Gaúcha and spurred vineyard expansion in other parts of Brazil.

Italian colonization in northeastern Rio Grande do Sul began in 1871 with Colônia Conde d'Eu, with a notable arrival of settlers in 1875. The original headquarters in Nova Milano included the "Barracão," a key distribution point for immigrants and supplies. Roads of the time, known as picadas, connected the colonies, starting from sitio Caxias (now Caxias do Sul) and Dona Isabel (now Bento Gonçalves). Colônia Caxias established a distinctive urban hierarchy, with Júlio de Castilhos Road serving as a main route for immigrants traveling to Dona Isabel. The opening of Buarque de Macedo Road in 1881 enabled further northward settlement, while Júlio de Castilhos Road directly linked Bento Gonçalves and Caxias do Sul

(Alcântara et al., 2012).

In 1884, Colônia Caxias became part of the municipality of São Sebastião do Caí, divided into three settlements: Dante, Nova Trento, and Nova Milano. The Visconde do Rio Branco road connected São Sebastião do Caí to Campo dos Bugres, entering through the present-day Rio Branco neighborhood and extending to Nova Trento (now Flores da Cunha). Nova Milano became a landmark for the three colonies' migration. The construction of the Porto Alegre-Caxias railway in 1910 transformed the regional economy, making Caxias the primary economic center, while Nova Trento and São Marcos stagnated, and Farroupilha grew. Caxias' strategic location between former German colonies and newer Italian settlements proved advantageous (Giron; Nascimento, 2010).

The introduction of the railway in 1919 spurred urban expansion south of Bento Gonçalves, creating a new development hub. Areas such as Santa Tereza, Monte Belo do Sul, and Pinto Bandeira, close to rivers, emerged as major grape production centers. However, inadequate infrastructure impacted settlement in Conde d'Eu, and the railway altered product distribution dynamics. The relocation of *Sede* Caxias, driven by entrepreneur Luiz Antônio Feijó Júnior, also redefined connections among the colonies over time (Alcântara et al., 2012).

By this period, Rio Grande do Sul had 66 municipalities, which grew to 232 by 1966, 333 by 1991, and currently stands at 497 (RIO GRANDE DO SUL, 2021). It is organized into several regional divisions for public planning purposes, covering areas such as sanitation, state transportation, communication, and regional tourism routes. The area surrounding Caxias do Sul is shaped by multiple official planning bodies, each aiming to coordinate public policy efforts in specific domains. Caxias do Sul, the second-largest city in the state (IBGE, 2024), is located in northeastern of the state. Its economic, political, institutional, and geographic significance requires adept organization and management across local, regional/state, and national levels.

Government responsibilities across levels are defined by various laws, including the CF. While this study focuses on the RMSG, Caxias and its immediate surroundings also fall under additional institutional arrangements (Figure 18), including: a) Serra Regional Development Council (COREDE-SERRA), encompassing 32<sup>28</sup> municipalities with a population of 940.465 (IBGE, 2022); b) Taquari-Antas Watershed Committee, part of the Guaíba Basin Region,

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<sup>28</sup> SIEGFRIED EMANUEL HEUSER ECONOMICS AND STATISTICS FOUNDATION. Socio-economic Profile: COREDE Serra. Available at: <https://arquivofee.rs.gov.br/perfil-socioeconomico/coredes/detalhe/?corede=Serra>. Accessed on: 7 Nov. 2024.

encompassing 119 municipalities<sup>29</sup> serving a population of 2,179.081 (IBGE, 2022); c) Caí Watershed Committee, also within the Guaíba Basin Region, covering 41 municipalities<sup>30</sup> and population of 1.256.467 (IBGE, 2022); and d) Metropolitan Region of Serra Gaúcha (RMSG), comprising 14 municipalities and a total population of 804.707 (IBGE, 2022). According to legislation, RMSG includes the municipalities of Caxias do Sul, São Marcos, Flores da Cunha, Nova Pádua, Nova Roma do Sul, Ipê, Antônio Prado, Farroupilha, Garibaldi, Carlos Barbosa, Bento Gonçalves, Santa Teresa, Monte Belo do Sul, and Pinto Bandeira. The Table 23 provides key information on these municipalities.

Table 23 - Municipalities that make up the Metropolitan Region of Serra Gaúcha

Municipality	Population (2010)	Population (2022) *	Area Km <sup>2</sup>	Inhabitant Km <sup>2</sup>	Growth % 2010/2022
Antônio Prado	12.833	13.045	347,617	37,53	1,65%
Bento Gonçalves	104.700	123.151	381,958	322,42	17,62%
Carlos Barbosa	25.192	30.420	228,669	133,03	20,75%
Caxias do Sul	435.564	463.501	1.644,30	281,88	6,41%
Farroupilha	63.635	70.286	360,39	195,03	10,45%
Flores da Cunha	27.126	30.892	273,452	112,97	13,88%
Garibaldi	30.689	34.335	169,237	202,88	11,88%
Ipê	6.016	5.399	599,247	9,01	-10,26%
Monte Belo do Sul	2.670	2.557	68,369	37,40	-4,23%
Nova Pádua	2.450	2.343	103,238	22,70	-4,37%
Nova Roma do Sul	3.343	3.466	149,14	23,24	3,68%
Pinto Bandeira	2.578**	2.723	105,072	25,92	-4,94%
São Marcos	20.103	21.084	256,252	82,28	4,88%
Santa Tereza	1.720	1.505	72,389	20,79	-12,50%
<b>Total</b>	<b>738.619</b>	<b>804.707</b>	<b>4606,11</b>	<b>174,70</b>	<b>8,95%</b>
<b>RS</b>	<b>10.693.929</b>	<b>11.088.065</b>	<b>281.731,45</b>	<b>39,36</b>	<b>3,69%</b>

Source: Elaborated by author (2024)

\*Censo IBGE 2022 – dados parciais

\*\*Estimativa divulgada pela Prefeitura Municipal local, pois o município surgiu somente em 2012.

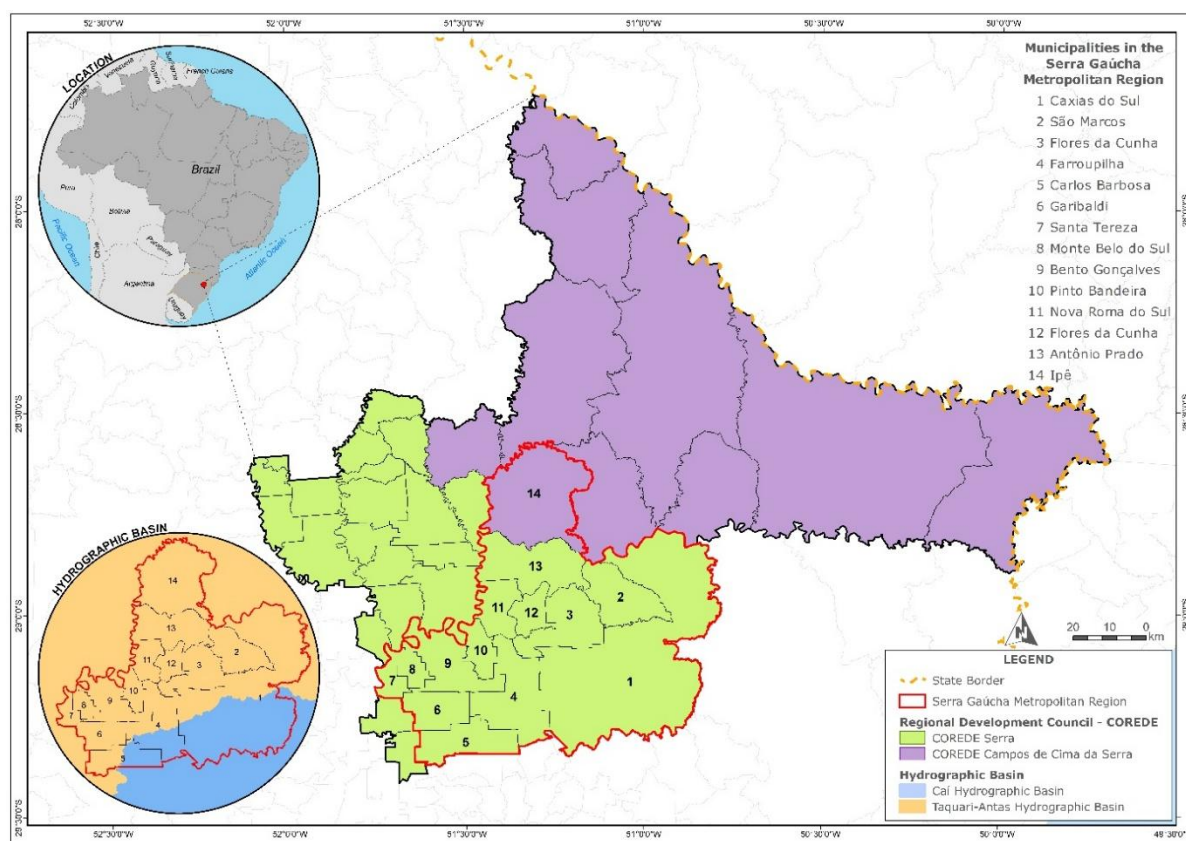
The region's geographic, environmental, and cultural diversity results from its varied morphological characteristics. This diversity is reflected in both urban and rural production, contributing to economic growth above the state average. The region's economy has also supported a significant population increase of 16.50%, compared to Rio Grande do Sul's overall growth of 3.69% during the same period. These characteristics are essential for understanding the region's dynamics.

<sup>29</sup> RIO GRANDE DO SUL. Secretariat for the Environment and Infrastructure. Taquari-Antas Hydrographic Basin (BH-Taquari-Antas). Available at: <https://sema.rs.gov.br/g040-bh-taquari-antas>. Accessed on: 7 Nov. 2024.

<sup>30</sup> RIO GRANDE DO SUL. Secretariat for the Environment and Infrastructure. Caí Hydrographic Basin (BH-Caí). Available at: <https://sema.rs.gov.br/g030-bh-cai>. Accessed on: 7 Nov. 2024.

The origin of the RMSG dates back to the *Aglomeração Urbana do Nordeste* (AUNE), a regional arrangement that emerged in the 1990s. The AUNE was based on studies conducted in the 1980s by the National Urban Development Council (CNDU), the IBGE, and the Metropolitan Planning Foundation (METROPLAN). These studies identified the AUNE as a cluster of neighboring municipalities with continuous urban development, complementary functions, and a minimum urban population of 200,000 at the time, necessitating integrated planning and coordinated public actions. In addition to the RMSG, Rio Grande do Sul includes three other regional arrangements: the RMPA, the Northern Coastal Urban Agglomeration (AULN), and the Southern Urban Agglomeration (AUS).

Figure 18 - Location of the Metropolitan Region of Serra Gaúcha and its relationship with development councils and river basins



Note: Geographical Coordinate System. SIRGAS 2000 Geodetic System. Political-administrative boundaries IBGE (2022) and Watersheds SEMA, RS (2018).

Source: Elaborated by author (2024).

Eleven years have passed since the formation of the RMSG, yet it remains unregulated and has not been implemented according to the guidelines set forth in the EM. This gap highlights critical challenges that go beyond institutional alignment; the RMSG must first build a thorough understanding of its current dynamics through targeted research and studies. Such

data is essential not only to inform policy decisions but also to support regional agreements that enable sustainable development in line with its metropolitan potential.

A key regulatory challenge lies in harmonizing the interests of diverse municipalities within the RMSG, which vary significantly in terms of economic priorities, infrastructure needs, and local governance capacities. The lack of a formal regulatory framework hinders coordinated planning, which is essential for addressing shared issues like public transportation, environmental management, and social services. The current absence of standardized metropolitan governance structures under the EM further complicates efforts to pool resources, optimize service delivery, and leverage economies of scale. Moreover, without clear legislative backing and funding mechanisms, municipalities within the RMSG struggle to prioritize regional goals over local interests, slowing down collective action on pressing issues such as mobility, housing, and environmental conservation. Effective implementation of the EM would offer a roadmap for shared decision-making and resource allocation, enabling a governance model that balances municipal autonomy with regional cohesion.

For the RMSG to progress toward official regulation and effective metropolitan governance, a sustained commitment to inter-municipal cooperation is needed, reinforced by empirical data and targeted policies. Such steps are crucial to fostering a metropolitan identity that supports sustainable growth, inclusivity, and resilience across the entire region.

## 4.2 QUALITATIVE RESULTS AND ANALYSES

The analyses were conducted based on a structured framework of predetermined subcategories, including territorial, scale, place, urbanisation, economy, culture and identity, innovation, net, climate change, and foresight/future thinking, as outlined in this thesis. The ten primary questions are identified according to Table 17, and the analysis framework is illustrated in Figure 13. Primary analyses by case study and category are presented in Appendix D – Quantitative dates and results. This study emphasizes that the analyses were systematically organized by aggregating information within each subcategory for each case study, ensuring consistency and comprehensive evaluation.

### 4.2.1 Greater London

#### *Subcategory territorial results*

The narratives provided by all interviewees collectively offer a rich tapestry of insights

into the socio-spatial dynamics of Greater London. These personal and professional testimonies light on the complex relationship between individuals and the territory, revealing how emotional connections, professional engagements, and participatory actions in urban spaces shape and are shaped by the territorial configurations of London.

**Principle of Socio-Spatial Structuring.** The principle of socio-spatial structuring within London emerges vividly from the active engagement of individuals with the city's urban landscape, alongside the narratives that underscore the interplay between socio-economic developments and spatial restructuring. The guided walks and community project involvements of interviewee one, for instance, illuminate a deep, reciprocal relationship between personal activities and the city's spatial organization, evidencing a dynamic interaction with the territory. Similarly, Interviewee II's insights into urban regeneration projects further exemplify this principle by shedding light on the ongoing transformation of territorial boundaries and their socio-spatial implications. These reflections collectively emphasize the complexity of London's socio-spatial fabric, revealing how individual and collective engagements contribute to and are shaped by the evolving contours of the city, thereby underlining the intricate relationship between socio-economic evolution, spatial restructuring, and individual experiences within the urban environment.

**Construction of Internal/External Partitions.** Emotional and professional connections to London, as shared by interviewees, delineate internal/external partitions, with personal and career developments within the city fostering a profound sense of belonging and identity in relation to the urban territory.

**Fields of Operation. Past, Present, and Emerging Borders:** The evolving experiences of the interviewees with London's urban environment highlight the dynamic nature of territorial borders. The collective narratives reveal how historical legacies, current initiatives, and future aspirations continuously reshape the socio-spatial landscape of London, influencing individual and collective experiences of the city's territory.

This analysis presents a nuanced understanding of the multifaceted nature of territory, as experienced through the lived realities of individuals within the urban context of Greater London, contributing to the broader academic discourse on geography and urban studies.

#### *Subcategory scale results*

The insights shared by the interviewees intricately map onto the concept of "scale" within the context of London's governance and spatial organization, resonating with the theories of functional hierarchy, central place theory, and the principle of socio-spatial structuring. These narratives underscore the complexity of London's territorial and administrative

landscape, revealing the multifaceted interactions between different levels of governance and the spatial hierarchies within the city.

**Governance Dynamics and its Organization in Greater London.** The governance of Greater London is distinguished by its autonomy, varied administrative practices, and the dynamic relationship between collaboration and independence among its boroughs. Insights from key stakeholders reveal the unique governance frameworks of the City of London and other boroughs, emphasizing the delicate balance between centralized authority and localized governance. This complexity is accentuated by the mixed effects of governance, transport, and infrastructure developments on the socio-economic and cultural life of local communities, leading to a range of both positive and negative outcomes.

Central to this discussion is the concept of functional hierarchy and central place theory, highlighted by Interviewee's one observations on the City of London's governance and the collaborative efforts behind significant infrastructure projects like the Elizabeth Line. These efforts illustrate the hierarchical and functional distinctions in the city's governance system, stressing the importance of the spatial distribution of services and the relationship between settlement size and function.

Additionally, the creation of scalar divisions of labor, especially in the context of transport strategy coordination, indicates the need for boroughs to align with city-wide policies led by the Greater London Authority (GLA) and Transport for London (TfL). This requirement illustrates the differing levels of responsibilities and authority across scales, from local borough governance to regional oversight, and demonstrates the multi-layered management of London's spatial and functional organization.

The concept of vertical ontology and hierarchical imbalance further deepens the analysis of London's governance. Stakeholders such as I4 and I5 draw attention to a governance system characterized by both collaboration and independence. This complex hierarchy, with varying degrees of engagement and autonomy among boroughs, presents both challenges and opportunities for governing a city as varied and dynamic as London.

**Principle of Socio-Spatial Structuring in Greater London.** The Principle of Socio-Spatial Structuring in Greater London reveals the complex relationship between the city's governance, infrastructure developments, and the dynamics of collaboration and disparity among boroughs. Central to this discussion is the role of TfL and significant projects like the Elizabeth Line, which are crucial in enhancing urban mobility and promoting collaboration across boroughs. These efforts reflect a commitment to improving connectivity and accessibility throughout London's diverse communities.



Discussions on socio-spatial structuring, informed by insights from I5, I6, I7 and I8 highlight the layered nature of London's urban fabric, marked by socio-economic diversity and strategic collaborations. This framework reveals the intricate play of governance structures, transport initiatives, and inter-borough relationships, shaping the city's spatial organization. It underscores the need for an urban planning approach that acknowledges London's socio-spatial complexities, aiming for an integrated and equitable urban environment responsive to the city's multifaceted socio-spatial dynamics.

#### *Subcategory place results*

The insights shared by the interviewees provide a rich tapestry of perspectives on the concept of "place," particularly within the context of Greater London. These narratives highlight the multifaceted nature of London as a territory imbued with diversity, historical depth, cultural richness, and socio-spatial dynamics that resonate with Christaller's principles of the CPT and Perroux's GPT. Through these accounts, common points emerge that are essential for the academic exploration of place in relation to London's unique socio-spatial structure.

**Market, Traffic, and Administrative Separation.** I1's emphasis on London's multiculturalism, commitment to dense housing, and progressive transport policies illustrate the Market principle of Christaller's theory, showcasing London as a central place that serves a wide complementary region through diverse services and cultural offerings. The narratives also touch on Traffic, with the mention of London's efficient public transport system, including the Elizabeth Line, indicating a sophisticated network that supports the city's role as a regional hub. Administrative Separation is implicitly addressed through the unique governance structures and the cooperative yet complex relationship between London's boroughs and the Greater London Authority, highlighting the city's internal administrative nuances.

**Principle of Socio-Spatial Structuring.** The testimonies collectively underscore Proximity, spatial incorporation, and area differentiation, with each interviewee articulating how London's diverse boroughs, with their unique histories, cultures, and physical geographies, contribute to the city's complex socio-spatial fabric. This principle is vividly represented in the narratives, which describe London as a patchwork of central and peripheral places, each with its own identity yet interconnected within the larger urban ecosystem. This principle is further enriched by contributions from stakeholders such as I2, I3, and I8, who detail London's commitment to multiculturalism, inclusivity, and blending its historical heritage with modern advancements. Notably, the city's linguistic diversity, with "225 mother tongues," (I1) and its "commitment to dense housing and low traffic neighbourhoods," (I1) underscore London's

dedication to fostering a tolerant and dynamically interconnected urban environment. These narratives collectively paint London as an evolving city that cherishes its multiplicity, connectivity, and historical legacy, thus defining its global identity and continuous transformation. The Principle of Socio-Spatial Structuring, therefore, captures the essence of London's attraction - its diverse community, innovative mobility solutions, and deep-seated historical values - reaffirming its status as a constantly adapting global city that respects its past.

**Place-Centrism.** The discourse surrounding London, as articulated by I2 and I3, encapsulates the concept of Place-Centrism within the broader context of urban development and regeneration. Their insights into the city's efforts towards preserving its rich historical tapestry, while simultaneously embracing the inclusion of diverse communities, underscore the importance of place in catalysing regional development. This Place-Centrism, a profound appreciation and attachment to London's distinctive character - marked by its diversity, history, and dynamism - serves as a cornerstone for fostering an environment that attracts skilled labor and disseminates cultural and economic activities, akin to the dynamics observed in Growth Poles. In addition, according to the interviewees, London encapsulates different kinds of centrism, presenting a city celebrated for its unique diversity and historical richness, global prominence, and robust interconnections. These aspects highlight London's regional significance, international influence, and vibrant urban dynamism through its extensive transport network and collaborative boroughs.

#### *Subcategory urbanisation results*

The discussions by all interviewees provide a rich tapestry of perspectives on urbanisation processes within London, illustrating the intricate dance between urban growth, mobility, socio-economic dynamics, and spatial planning. Their insights offer a practical examination of the theoretical underpinnings of urbanisation phases, economic globalization, metropolization, and the challenges and strategies identified by Benko (2002) and Harrison and Grove (2014).

**Urbanisation and Urban Planning (dynamic land use planning and its infrastructure).** The interviewee's insights into urbanisation and its land use planning infrastructure underscore the intertwined nature of London's growth with its sophisticated public transport systems. This highlights the pivotal role of infrastructure in shaping urban mobility and expansion, affirming London's status as a significant economic hub, as supported by Benko's observations on economic concentration in metropolitan areas. Interviewee's 7 discussion on the Green Belt Policy and urban sprawl further emphasizes the importance of spatial management tools in curbing the city's outward expansion and advocating for a denser, more sustainable urban core.

This deliberate policy approach aims to balance urban and rural developmental pressures, ensuring a harmonious spatial dynamic that respects both ecological boundaries and growth imperatives.

Interviewee 2 and 3's examination of the occupancy of land and its reflection on spatial dynamics and socio-economic factors delves into the nuanced implications of demographic shifts, migration, and housing policies within the urbanisation narrative. Their observations illuminate the socio-economic stratifications and spatial disparities between London's inner and outer boroughs, revealing the city's socio-spatial fabric as a product of complex economic and geopolitical currents. Aligned with Harrison and Growe's focus on urban challenges, this aspect underscores the multifaceted strategies required to navigate the socio-economic intricacies inherent in metropolitan development.

**Mobility and Urban Planning.** The importance of mobility in shaping urbanisation processes is a recurrent theme, with all interviewees discussing how public transport facilitates urban integration and accessibility. Their insights point towards the need for innovative solutions to urban mobility issues, echoing Harrison and Growe's advocacy for addressing urban planning challenges. This topic integrates urban planning with mobility, emphasizing the intrinsic relationship between the two aspects.

The insights from the interviewees provide a view of urbanisation in London, revealing the dynamic interplay between infrastructure development, socio-economic factors, spatial planning, and community engagement. These discussions not only exemplify the theoretical concepts of urbanisation phases and economic metropolization but also highlight the importance of innovative and inclusive urban planning in addressing the complex challenges posed by urban growth and mobility.

#### *Subcategory economy results*

The insights shared by the interviewees illuminate the multifaceted dynamics of economic concentration and investment in London, offering a prism through which to explore the intersections of urbanisation, economic development, and sustainability. These reflections resonate with the academic frameworks provided by Harrison and Growe (2014) and Mi and Coffman (2019), particularly regarding the challenges and opportunities presented by urban growth, the sharing economy, and sustainable urban planning.

**Investment and infrastructure to Mobility.** The development of transportation infrastructure, as discussed by I3 and I7, exemplifies public investment's role in facilitating urban mobility and economic growth. The Elizabeth Line, for example, enhances connectivity within London and between its urban and peripheral areas, echoing Harrison and Growe's

advocacy for innovative urban planning solutions to mobility challenges. This investment not only supports economic activities but also contributes to the environmental sustainability goals highlighted by Mi and Coffman, through reduced emissions and the promotion of green mobility options.

Economic Concentration Spatial Inequality. I1 and I6 highlight London's role as a hub for financial, technological, and creative industries, emphasizing the city's capacity to attract talent and resources. This concentration of economic activities fosters innovation and drives GDP growth, underscoring the city's significance in the global economy. Such dynamics align with Mi and Coffman's discussion on the sharing economy's potential to enhance sustainability and urban mobility, suggesting that cities like London can leverage their economic concentration to pilot innovative, environmentally efficient solutions. I2 and I8 address the spatial inequalities exacerbated by economic concentration, pointing to the disparities between London and other UK regions, as well as within the city itself. The need for balanced investment and governance strategies to mitigate these inequalities is evident, reflecting Mi and Coffman's emphasis on the importance of aligning commercial interests with social welfare. This underscores the role of governance in ensuring that the benefits of economic concentration and the sharing economy extend beyond central business districts to support broader social and economic equity.

Sustainability and the Sharing Economy. I4 and I5 touch on the challenges and opportunities presented by London's economic model, including the potential for the sharing economy to address urban sustainability concerns. The emphasis on understanding the right kind of investment and the planning required to harness economic concentration for community benefit resonates with Mi and Coffman's findings on the environmental and social advantages of the sharing economy. These insights suggest that London, with its significant economic resources, has the potential to lead in integrating sustainable practices with economic development, leveraging the sharing economy to enhance urban resilience and livability.

#### *Subcategory culture and identity results*

The reflections offered by the interviewees on the impact of diversity on culture and identity in London align closely with the academic discourses on urban adaptability and the concept of the open city as discussed by Sennett (2018), Ellin (2006), and the project by Barbera and De Rossi (2021). These academic frameworks and the interviewees' insights converge on the idea that cities, much like sponges, have the capacity to absorb diverse influences while maintaining their structural integrity and identity, thus fostering environments of cultural richness and inclusivity.

Governance and metropolitan cosmopolitan character. In their insightful discussions, I4 and I5 underscore the pivotal role of governance and urban planning in either facilitating or impeding the beneficial aspects of diversity within metropolitan contexts. They focus on the importance of equitable infrastructure development and critically analyze policies that might limit cultural exchange. This exploration aligns with scholarly debates advocating for governance frameworks that promote adaptability, engagement, and cohesion within urban environments. Their contributions shed light on the necessity of designing governance structures that are conducive to fostering a cosmopolitan character in metropolitan areas, emphasizing the significance of inclusivity and cultural diversity in enriching urban life.

Enrichment through Diversity. The narratives provided by the interviewees vividly illustrate the profound enrichment that cultural diversity brings to London's identity, resonating with Richard Sennett's concept of the open city, characterized by permeable boundaries that encourage integration and interaction. "London is open" (I8) symbolizes the city's embracing nature, fostering a diverse and dynamic environment for all who call it home. Here there is connection between the last common idea with this. This idea is exemplified in the reflections of I2 and I3, who highlight London's capacity to preserve historical legacies while accommodating modern transformations. Their insights reveal how urban spaces can foster a vibrant cultural and social landscape, dynamically interweaving the past with the present. This discussion contributes to the broader understanding of urban diversity not just as a demographic fact but as a potent source of cultural enrichment and social vitality, affirming the value of inclusivity and multiculturalism in shaping the character of metropolitan areas.

Cultural Integration and Identity. Interviewee's one and eight insights delve into the historical richness of London's diversity, underscoring how the city's enduring cosmopolitan character significantly contributes to its dynamism, creativity, and economic vitality. Their observations align with the concept of urban porosity, which champions cities as flexible and adaptive entities, conducive to the seamless integration of varied cultures. This approach promotes a cohesive sense of belonging and community among diverse populations, highlighting the indispensable role of cultural integration in fostering urban identity. The discussion brings to light the importance of creating urban environments that not only accommodate diversity but also actively engage with it to enrich the social fabric and identity of the city, showcasing London as a model of successful cultural integration and identity formation.

### *Subcategory innovation results*

Connecting the interviewees' insights on urban mobility and infrastructure innovations in London with UN Habitat's emphasis on sustainable urbanisation (2015, 2019) and SDG 11 reveals a multifaceted approach to fostering innovation in metropolitan regions. These perspectives collectively underscore the necessity of adaptive city planning and the implementation of sustainable practices to achieve inclusive, safe, resilient, and sustainable cities.

**Infrastructure (cycling and walking) and Mobility Innovations.** The Elizabeth line's introduction, highlighted by multiple interviewees, marks a transformative advancement in London's urban mobility, bolstering city-wide connectivity and access. This development aligns with SDG 11 by upgrading public transport infrastructure to foster sustainable urban environments. The emphasis on electric mobility options, including e-scooters and e-bikes, coupled with efforts to enhance pedestrian and cycling infrastructure, signifies a strategic move towards environmentally friendly transportation solutions. This approach supports the global initiative for sustainable cities and communities by promoting green, accessible modes of transport.

**Public Spaces and Accessibility.** The reallocation of highway space for walking and cycling and the development of low traffic neighbourhoods, highlighted by majority of interviewees, embody sustainable urbanisation principles. These actions demonstrate the city's commitment to creating safer, more accessible environments conducive to social interaction and physical well-being, essential for resilient community development.

**Inclusive Urban Planning** enhances social cohesion and public accessibility. Initiatives to improve access for individuals with disabilities - such as curb removal and the installation of tactile paving for safe crossings – exemplify a comprehensive approach to urban design. This focus on inclusivity aligns with the objectives of SDG 11, aiming to build inclusive, accessible cities that cater to the needs of all residents, especially those most vulnerable.

**Social and Economic Equity.** The dialogue around the social and economic ramifications of significant infrastructure projects, such as HS2 and the Crossrail (Elizabeth line), as discussed by I3, emphasizes the importance of governance that harmonizes innovation with social justice. This underscores innovation's dual role in stimulating economic development and promoting the social and ecological welfare of urban communities, advocating for a balanced approach to urban development that equally prioritizes innovation, social equity, and sustainability.

Behavioural Change and Environmental Sustainability. The efforts to enhance air quality through the ultra-low emission zone (ULEZ) and the electrification of the bus network, highlighted by I8 and colleagues, exemplify forward-thinking approaches to environmental challenges. Coupled with the encouragement of cycling and walking, these strategies play a pivotal role in diminishing urban emissions and fostering environmental sustainability. This approach is in harmony with the SDG 11's ambitions for sustainable cities and communities, showcasing a commitment to behavioral change and ecological stewardship.

#### *Subcategory net results*

The insights from the interviewees, when juxtaposed with the theoretical underpinnings of networks, particularly through the lenses of road and functional connections and urban networks, highlight essential areas of study and action in the realm of urban planning and infrastructure. These insights align with Christaller's CPT, Perroux's logic of planned hub growth, and the broader principles of socio-spatial structuring and networks of networks, offering a rich tapestry for examining the dynamics of urban connectivity and integration.

Integrated Transport Networks. Interviewee's 1 observations highlight London's efficient and integrated transport system, including the implementation of "Legible London", which plays a crucial role in enhancing urban mobility through visual and physical connectivity. This integration, vital for effective urban networks, embodies the concept of nodal connectivity, enabling straightforward navigation and access throughout the city. This approach aligns with theoretical frameworks on urban planning, emphasizing the importance of cohesive transport networks in facilitating movement and improving the quality of urban life.

Governance and Collaboration Across Boroughs. Interviewee's 2 insights into the diverse socio-economic landscapes across London's boroughs underscore the principle of socio-spatial structuring, emphasizing the need for greater collaboration between boroughs and the GLA. This unified approach to urban mobility is essential for overcoming the challenges posed by administrative boundaries and leveraging opportunities to build a cohesive urban network. Interviewee's 2 observations advocate for a governance model that fosters cooperation and coordination across the city, ensuring that mobility solutions are equitable, effective, and responsive to the varied needs of London's communities.

Accessibility and Inclusivity. Interviewee's 4 observations on the inclusivity of London's mobility network, particularly regarding individuals with disabilities, underscore the need for an urban framework that embraces 'rhizomatic' differentiation, ensuring access and mobility for all segments of the population. This principle demands that urban planning and infrastructural developments are rooted in social equity, catering to the diverse needs of the

community. Similarly, Interviewee's 3 concern about the lack of fast public transport in certain areas of Greater London highlights the necessity for an extensive and equitable mobility network. This highlights the importance of overcoming planning-induced disparities to ensure all areas, urban and suburban alike, are well-connected and accessible, thus advocating for a mobility network that is truly inclusive and comprehensive, ensuring equitable access across the city.

*Forward-Looking Mobility Strategies and Policy Influence.* I5 and I6 highlight TfL role in pioneering mobility innovation, underscoring the importance of integrating technology-driven services like Uber and Bolt into London's transport matrix. This approach exemplifies a “networks of networks” concept, where traditional and novel mobility services coalesce to form a dynamic, adaptive urban transport system responsive to technological advancements and evolving societal demands. I7 complements this perspective by discussing the legislative and strategic underpinnings that facilitate a harmonized transport strategy, emphasizing the significance of uniform socio-spatial relationships in urban planning. The dialogues also navigate the intricacies of aligning disparate management practices across boroughs under TfL's strategic guidance, illustrating the complex task of orchestrating and implementing unified mobility policies within a sprawling urban landscape.

#### *Subcategory climate change results*

The insights shared by the interviewees on addressing climate change through various urban mobility and planning initiatives reflect a comprehensive approach towards mitigating and adapting to the effects of climate change within metropolitan regions. These insights can be connected with the broader discussions on climate change, urban planning, and sustainable development, identifying key areas for further exploration:

*Climate Change and Sustainability.* Decarbonization and electrification of transport, along with the development of pedestrianization and cycling infrastructure, are key components of the comprehensive strategy for addressing climate change and enhancing sustainability in mobility. This multifaceted approach underscores the importance of implementing diverse, yet interconnected solutions to foster a sustainable, low-carbon future.

*Decarbonization and Electrification of Transport.* The drive towards decarbonization and electrification of transport is a critical response to the urgent call for action outlined in the IPCC (2021) report, aiming to reduce urban areas' substantial greenhouse gas emissions. The transition away from petrol and diesel vehicles towards electric vehicles (EVs) and the expansion of EV charging infrastructure signifies a crucial shift towards cleaner, sustainable transport modes. This strategy is complemented by efforts to improve public transport



accessibility across outer London boroughs, as noted by several interviewees, underscoring the importance of providing equitable access to sustainable mobility options. Ensuring comprehensive access to quality public transport across the metropolitan area is vital for diminishing carbon emissions and bolstering urban resilience, making sustainable mobility a cornerstone of environmental stewardship and urban planning.

**Pedestrianization and Cycling Infrastructure.** The prioritization of pedestrian and cycling infrastructure, highlighted by total interviewees, is a cornerstone of sustainable urban planning, fostering non-motorized modes of transport. This strategy underpins efforts to develop inclusive, safe, resilient, and sustainable urban environments. By minimizing car dependency, these initiatives contribute significantly to mitigating urban heat island effects and curbing greenhouse gas emissions, thereby enhancing the ecological footprint of metropolitan regions. Such investments are essential in the transition towards more sustainable and livable cities, emphasizing the role of infrastructure in shaping healthier urban landscapes.

**Integrated Planning Beyond Administrative Boundaries.** The significance of transcending administrative boundaries for effective climate change mitigation and adaptation is underlined by the insights from interviewees. These perspectives highlight the necessity of integrated planning that exceeds the confines of individual boroughs, stressing the importance of a unified, metropolitan-wide approach. By pooling resources and capabilities across different areas, cities can more effectively combat climate change through coordinated efforts. This collective approach not only streamlines the implementation of sustainability measures but also amplifies their impact, showcasing the critical role of collaboration in achieving environmental objectives.

**Climate Change Mitigation Strategies.** The adoption of initiatives like the ULEZ, congestion charging, and the encouragement of low traffic neighbourhoods demonstrates innovative strategies for climate change mitigation. Such measures are integral to the vision of fostering sustainable urban mobility, ultimately steering cities towards achieving carbon neutrality. By actively reducing emissions through these targeted strategies, urban centers commit to a sustainable future, emphasizing the crucial role of policy and urban planning in environmental stewardship and the collective effort to combat climate change.

**Adaptation to Climate Change Impacts.** The proactive development and execution of climate change adaptation plans, as discussed by I8, underscore the necessity for metropolitan areas to fortify against the direct ramifications of climate change, including heatwaves and surface water flooding. These strategies embody the critical measures cities must adopt to anticipate, prepare for, and mitigate the impacts of evolving climatic conditions. By prioritizing

resilience-building and adaptive planning, cities can ensure the protection of their infrastructure, the well-being of their inhabitants, and the preservation of their natural ecosystems against the unpredictable challenges posed by climate change.

*Subcategory foresight/future thinks results*

The insights from the interviewees on urban mobility, planning, and climate change adaptation strategies provide a rich foundation for integrating the concept of foresight and future thing into the discourse on urban development and resilience. These reflections can be synthesized with the principles of scenario planning and adaptability highlighted by Abou Jaoude et al. (2022) and Goodspeed (2020), focusing on the following key areas for future-oriented urban studies:

**Innovative Urban Mobility Solutions.** The discussion surrounding autonomous vehicles, electric cars, and the expansion of public transport highlights a consensus on the need for innovative urban mobility solutions. These initiatives are part of scenario planning efforts that anticipate various technological roles in addressing climate change and enhancing urban transport systems. The emergence of technologies like metaverse applications and augmented reality for remote work and leisure indicates a trend towards digital urban experiences. This trend aligns with scenario planning's focus on navigating uncertainty and fostering innovation, preparing cities for technological advancements that transform human-environment interactions.

**Adapting to Climate Change.** The emphasis on decarbonizing transport and addressing the Urban Heat Island Effect resonates with the foresight approach of preparing cities for climate change impacts. Interviewees' focus on sustainable urban planning measures, such as increasing green spaces and implementing low-emission zones, underscores the importance of integrating climate adaptation strategies into scenario planning to create resilient urban environments.

**Enhanced Public Transport and Non-motorized Mobility.** The idea of creating a more interconnected and accessible public transport network, along with improving pedestrian and cycling infrastructure, aligns with the goal of reducing reliance on private vehicles. This approach supports scenario planning by considering future urban landscapes that prioritize sustainable and inclusive mobility options.

**Stakeholder Involvement and Collaborative Planning.** The need for stakeholder involvement in planning processes, as highlighted by the concept of scenario planning, is echoed in the interviewees' insights on community engagement and collaboration. This

emphasizes the significance of inclusive decision-making in envisioning and implementing adaptive and participatory urban development strategies.

**Addressing Socio-Spatial Inequalities.** The discussion on the disparities in transport accessibility and quality of life between central and peripheral areas of cities calls for a nuanced understanding of urban networks and their impact on social equity. Scenario planning offers a framework to explore the consequences of different spatial and infrastructure development strategies, aiming to mitigate inequalities and enhance urban connectivity.

#### **4.2.2 Metropolitan Region of Porto Alegre (RMPA)**

##### *Subcategory territorial results*

The analysis of interviews with key stakeholders in the RMPA reveals critical insights into urban mobility and sustainability. Four main topics emerge from these discussions: the study of the territory, the principle of socio-spatial structuring, the construction of internal and external partitions, and fields of action. These themes highlight the complex interplay between land use, governance, infrastructure development, and sustainable practices, offering a comprehensive framework for understanding and improving urban mobility in the region.

**Study of the Territory.** The stakeholders' insights emphasize the intricate relationship between land occupation and service provision. Extensive work in urban mobility projects across various government levels underscores the profound impact of transportation planning on the territorial landscape. Similarly, roles in urban planning, particularly in land parcelization, demonstrate the critical influence of municipal actions on territorial structuring. These efforts highlight the necessity of a strategic approach to land use to optimize service provision and enhance urban functionality.

**Principle of Socio-Spatial Structuring.** The interviews underscore a focused approach toward boundary delineation and land parcelization as essential components of urban planning. The importance of defining municipal boundaries and coordinating efforts with regional planning authorities is discussed to ensure cohesive land use and transportation projects. This structuring is vital in managing urban sprawl and promoting a cohesive metropolitan development strategy, facilitating better service delivery and infrastructural coherence across the region.

**Construction of Internal/External Partitions.** The role of external entities is evident in stakeholders' efforts to integrate diverse transportation systems within the region. The development of sustainable transportation solutions, such as the *aeromóvel*, which requires

meticulous coordination between municipalities and external organizations, is highlighted. This integration blurs internal boundaries and fosters a unified metropolitan transportation network, enhancing connectivity and promoting a holistic approach to regional mobility.

**Fields of Operation. Past, Present, and Emerging Borders.** The interviews reflect a comprehensive engagement with the evolving borders and limits of urban planning. Experiences illustrate how historical and current projects shape future urban planning and mobility strategies. This work underscores the importance of understanding territorial evolution to address contemporary and future challenges in urban mobility and land use. It necessitates an integrated approach that combines urban planning, transportation, and environmental sustainability, prioritizing green transportation options and reducing the carbon footprint to promote sustainable metropolitan development.

#### *Subcategory scale results*

The insights provided by the interviewees intricately align with the concept of "scale" within the governance and spatial organization of the RMPA, resonating with theories of functional hierarchy, central place theory, and the principles of socio-spatial structuring. These accounts highlight the complexity of the territorial and administrative dynamics in the RMPA, shedding light on the multifaceted interactions between various levels of governance and the spatial hierarchies that shape the region.

**Governance Dynamics and its Organization.** The analysis of urban mobility and sustainability in the RMPA underscores the necessity of a unified metropolitan planning authority to address challenges posed by overlapping and fragmented transportation systems. This need is amplified by the importance of municipal cooperation and equitable representation in decision-making processes, which ensures that policies reflect the diverse needs of the region's municipalities. Furthermore, the emphasis on sustainable and rationalized transportation solutions highlights the critical role of cohesive, environmentally friendly infrastructure in enhancing metropolitan efficiency and environmental sustainability. These insights collectively illustrate the intricate dynamics of governance and the organizational structures required to foster coherent and integrated urban development.

**Principle of Socio-Spatial Structuring.** The interviews underscore the need for vertical differentiation and the construction of scalar divisions of labor. This involves differentiating social relations vertically between dominant, nodal, and marginal scales, aligning with the socio-spatial structuring principles. The establishment of a unified metropolitan planning authority would facilitate the standardization of socio-spatial relations, ensuring that the

dominant central places effectively coordinate with nodal and marginal scales to promote cohesive regional development.

*Subcategory place results*

The analysis of public transport integration, social inequities, and sustainable development within the RMPA underscores the importance of coordinated governance structures and strategic regional planning. The principles of Market, Traffic, and Administrative Separation highlight the need for seamless connectivity and institutional integration to enhance service efficiency. Addressing socio-spatial structuring focuses on equitable access to essential services and the integration of marginalized communities, emphasizing horizontal differentiation between central and peripheral areas. Finally, Place-Centrism and Scale-Centrism emphasize the significance of long-term, inclusive planning, fostering sustainable regional growth through coordinated efforts across various urban networks and scales.

Market, Traffic, and Administrative Separation. The need for institutional integration to reduce transportation inefficiencies highlights the principles of Market and Traffic. The optimization of public transport systems is crucial to address the over-dependence on individual car use, as effective integration can minimize system overlaps and enhance service utilization, particularly in underserved neighbourhoods. Seamless connectivity between rural and urban areas and coordinated actions across different government levels are necessary for efficient regional governance. This aligns with the GPT, where strategic investment and regional cooperation stimulate regional growth and cohesion, fostering a complementary relationship between local centers and their surrounding regions.

Principle of Socio-Spatial Structuring. Addressing social inequities directly relates to the Principle of Socio-Spatial Structuring, involving proximity, spatial incorporation, and area differentiation. High transport costs burden residents due to inefficiencies, highlighting the need for equitable access to essential services such as housing, education, and public transport. Substandard housing conditions in peripheral areas underscore the importance of horizontal differentiation of social relations between central and peripheral places, ensuring marginalized communities are integrated into the broader urban framework. This differentiation is crucial for reducing social inequities and fostering inclusive development, aligning with the standardization of socio-spatial relations and constructing spatial divisions of labour.

Place-Centrism. The emphasis on a long-term vision and sustainable development aligns with Place-Centrism and Scale-Centrism. A cohesive, sustainable urban transport system is essential for competing with individual car use, reflecting the integration of local and regional scales. This vision supports Place-Centrism by promoting strategic investment and skilled

labour migration to stimulate regional growth, as posited by the GPT. Rationalizing transportation networks enhances efficiency and connectivity, supporting Network-Centrism, where coordinated efforts across various urban networks are essential for sustainable metropolitan development. Emphasizing inclusive, long-term regional planning underscores the importance of a holistic approach to sustainable development, considering the interplay between central and peripheral areas, various scales, and interconnected urban networks.

#### *Subcategory urbanisation results*

Urbanisation and mobility in metropolitan areas are complex, shaped by various socio-economic and spatial factors. Harrison and Growe (2014) describe urbanisation as driven by population concentration in urban centers, which fuels economic growth and infrastructural development. Benko (2002) notes that this concentration necessitates comprehensive planning to address spatial restructuring. Champion (2001), Geyer and Kontuly (1993), Van der Berg et al. (1982), and Klaassen et al. (1981) assert that urban growth involves phases of suburbanisation, counterurbanisation, and reurbanisation, each uniquely contributing to metropolitan dynamics. These phases require a holistic approach to planning and policy-making to promote sustainable development and efficient mobility.

**Urbanisation Phases and Mobility.** The interviews highlight the ongoing processes of urbanisation and suburbanisation, with significant movement between rural and urban areas posing challenges for transportation infrastructure. I9 mentions the vast distances involved and the need for services in rural areas. I11 emphasizes the importance of paving rural roads to integrate these areas with urban centers. Counterurbanisation and reurbanisation efforts are crucial for revitalizing urban centers and enhancing the quality of life in less dense areas. Efficient rural-urban connectivity through innovative transport solutions supports economic activities and addresses the diverse needs of metropolitan populations.

**Mobility and Urban Planning.** Effective urban planning must address the physical and socio-economic interactions between urban and rural areas, including transportation infrastructure, economic diversification, and environmental sustainability. I12 highlights the need for maintaining infrastructure to support a diversified economy. Integrating urban and rural areas into a cohesive planning framework is essential, with efficient mobility systems connecting peripheral areas to economic hubs. Programs like Tarifa Zero enhance rural mobility, demonstrating the importance of sustainable planning that balances socio-economic and environmental factors while promoting green spaces and efficient land use.

**Innovative Solutions for Urban Mobility.** Modernizing transport systems to address urbanisation challenges is a recurring theme. Innovative programs and better infrastructure

planning are essential for connecting rural and urban areas. I10 discusses the potential of *tarifa zero* in enhancing mobility. I9 underscores the need for comprehensive integration across institutional, political, and economic spheres. Such solutions not only improve connectivity but also support sustainable urban development, ensuring that mobility systems are adaptable to future demands and environmental considerations.

#### *Subcategory economy results*

The intricate relationship between economy and mobility in metropolitan contexts is underscored by scholars like Harrison and Growe (2014) and Mi and Coffman (2019). Harrison and Growe explore the challenges of urbanisation, particularly the interaction between physical and socio-economic aspects, emphasizing the need for comprehensive planning in both urban and border regions. They argue that economic activities and mobility must be synchronized to address the complexities of metropolitan development. Mi and Coffman, on the other hand, highlight the transformative potential of the sharing economy on urban sustainability, noting its significant role in improving urban mobility and environmental efficiency. They assert that integrating sharing economy practices can substantially contribute to achieving Sustainable Development Goals by enhancing resource utilization and reducing environmental footprints. Together, these perspectives provide a framework for understanding the dynamic interplay between economic activities, mobility, and sustainable urban development.

Investment and Infrastructure to Mobility. Ensuring balanced investment in infrastructure is crucial for supporting both urban and rural areas, thereby avoiding economic disparities. A strategic approach to developing efficient transportation systems is necessary to bolster economic activities and ensure seamless mobility across regions. This involves not only improving urban infrastructure but also preserving rural areas and promoting sustainable practices such as organic farming. Uncontrolled urban expansion must be curtailed to maintain ecological balance and ensure equitable development. The balanced development approach, as suggested by experts, ensures that rural and urban regions are integrated into a cohesive economic and infrastructural framework, promoting sustainable growth and mitigating the adverse effects of economic concentration in metropolitan centers.

Economic Diversification and Equitable Public Policies. Promoting a diversified economy is essential for reducing dependence on any single industry, thereby enhancing regional resilience. Interconnecting economic hubs fosters stability and supports inclusive growth, addressing the diverse needs of socio-economic groups. Effective public policies must be implemented to promote equitable growth, ensuring that different economic sectors and demographic groups benefit. Collaboration between public and private sectors is pivotal in

embracing innovative economic models that drive diversification and resilience. A clear governmental policy is necessary to define the objectives for economic and transportation development, ensuring that services are accessible and affordable for all. Such policies can help balance economic development across various metropolitan areas, bridging the gap between well-developed and underdeveloped regions.

**Sustainability and the Sharing Economy.** Promoting sustainable development practices, such as the sharing and circular economies, is crucial for enhancing resource efficiency and minimizing environmental impact. Economic policies must align with sustainability goals to create resilient and livable urban areas. The integration of institutional, political, and economic spheres is essential to provide quality services tailored to diverse user profiles. A diversified and productive economy, as seen in the metropolitan region, supports the manufacturing of various components and specialized services, fostering regional economic stability. Embracing models that integrate urban and rural development into a unified framework helps maintain ecological balance and promotes a sustainable urban future. The focus on sustainability ensures that urban mobility systems are not only efficient but also environmentally friendly, contributing to the long-term viability of metropolitan regions.

*Subcategory culture and identity results*

The concept of cities as sponges, as discussed by Sennett (2018), aligns with the interviewees' observations on the integration and exchange facilitated by Porto Alegre. Sennett's idea of an open city, where borders are porous and facilitate integration rather than division, resonates with the dynamic cultural exchanges seen in metropolitan areas. This approach challenges traditional urban planning by advocating for flexibility and interaction within urban spaces, akin to Aldo van Eyck's designs that encourage child play without constraints. Furthering the discussion on urban adaptability, Ellin (2006) and Barbera and De Rossi (2021) emphasize the importance of porosity in urbanism, which supports the integration and movement of diverse populations within a city, enriching its cultural and economic landscape.

**Governance and Specific Metropolitan Character.** The centralization of cultural activities in Porto Alegre enhances its role as a cultural hub but raises concerns about preserving local identities and cultural expressions in surrounding municipalities. I13 highlights the benefits of cultural centralization in Porto Alegre, noting that the metropolitan region benefits from the city's cultural activities. However, I16 cautions against the homogenization of cultures, suggesting that the dominance of central urban cultures can overshadow regional and local identities. Developing cultural tourism and attracting investments in diversified economic sectors are crucial strategies for enhancing the cultural and economic vitality of the region. I12



supports this notion by emphasizing the potential for tourism and economic development in the region, advocating for open and flexible urban spaces that adapt to economic and cultural pressures.

**Enrichment through Diversity.** The importance of cultural diversification within the metropolitan region is highlighted by several interviewees, aligning with the concept of "porosity" in urbanism, which emphasizes transcending administrative boundaries to foster integration and interaction. I10 observes that cultural diversification positively impacts the community. Similarly, I11 emphasizes that even within the metropolitan region, each municipality can preserve its unique cultural characteristics. This cultural enrichment through diversity is vital for creating a vibrant and inclusive metropolitan area.

**Cultural Integration and Identity.** The concept of cities acting as sponges is evident in Porto Alegre, which serves as both a cultural and economic hub, attracting diverse populations and enabling dynamic cultural exchanges. I9 notes that the daily interactions and exchanges between residents and visitors highlight the city's role in fostering a shared cultural identity while maintaining individual cultural expressions. The centralization of cultural activities in Porto Alegre further enriches the region, drawing from both local and international influences. I14 adds that Porto Alegre attracts people from various places, enhancing its cultural vibrancy.

#### *Subcategory innovation results*

Innovation in metropolitan mobility is crucial for sustainable urban development, as emphasized by UN Habitat (2020, 2015). The organization underscores the role of urban areas in achieving SDG 11, which aims to make cities inclusive, safe, resilient, and sustainable. Innovations in transportation enhance the efficiency and sustainability of urban mobility, contributing to broader socio-economic and environmental goals. This highlights the interconnectedness of urban planning, infrastructure development, and technological advancements.

**Unified Governance and Integrated Planning.** Establishing a metropolitan transport authority is essential for coordinating transport planning across jurisdictions and ensuring effective mobility solutions. This addresses current governance fragmentation and lack of political will, which I9 identifies as major barriers: "Political will is lacking. For this to happen, it's important to have a metropolitan organisation, a metropolitan authority, a metropolitan consortium". A unified governance structure would facilitate comprehensive planning, integrating policies and initiatives across municipal, regional, and national levels, thus enhancing the overall effectiveness of metropolitan transportation systems.

**Infrastructure and Mobility Innovations.** Significant investments in infrastructure, including roadways, rail systems, and new mobility technologies, are necessary to accommodate growing urban populations and improve efficiency. Embracing advancements such as smart transport systems, real-time tracking apps, and promoting micromobility solutions can enhance the overall mobility experience and sustainability. I14 highlights the potential of establishing a mobility hub with innovative implementations: "Thinking of a mobility hub there, expressive... with innovations in implementation". I15 notes the conservative nature of current mobility planning and the need for greater investment: "Mobility in the Porto Alegre metropolitan area is very conservative... there is a lack of investment in infrastructure and encouragement for these new forms of mobility".

**Public Transport Efficiency.** Improving public transport through better integration, unification of transport lines, and ensuring reliable services for all socio-economic groups is critical. Interviewees discuss the challenges of public transport, including the need for unified transport lines and better service integration. I11 underscores the importance of such integration: "METROPLAN... alternative proposal for unifying these public transport lines". I13 stresses the necessity for comprehensive metropolitan transport planning: "As long as this doesn't happen, it's going to be a huge difficulty for our metropolitan users". These perspectives highlight the need for coordinated efforts to improve public transport efficiency and user experience.

**Social and Economic Equity.** Addressing the socio-economic impacts of mobility, including equitable access to transport services and mitigating negative effects on marginalized communities, is crucial for sustainable development. I16 emphasizes the need for innovation to improve lives, especially in peripheral areas, by integrating transportation with social and economic development projects. I12 discusses the importance of public-private partnerships in infrastructure projects, highlighting how collaboration can enhance the quality and reach of transportation services, supporting inclusive growth and addressing the diverse needs of the metropolitan population.

**Behavioural Change and Environmental Sustainability.** Encouraging collaboration between government, the private sector, academia, and civil society is essential for fostering innovation and ensuring transport solutions meet the diverse needs of the metropolitan population. I16 advocates for a comprehensive social pact to address the challenges in peripheral regions: "A great social pact... a great selective social pact... a project called innovative territories... aims to look specifically at territories in peripheral regions". Such collaboration can drive behavioural change and promote sustainable mobility practices,

ensuring innovations are effectively implemented and contribute to the overall well-being and resilience of metropolitan areas.

#### *Subcategory net results*

The concept of net and functional road networks in the metropolitan context is best understood through the CPT, which emphasizes the interconnections between cities and their surrounding regions. Christaller's (1966) Traffic Principle outlines how communication between cities is influenced by both planned and natural territorial factors. Perroux (1955) supports this by emphasizing the importance of concentrated regional infrastructure in fostering service diversification. According to the CPT, urban networks are seen as natural and independent, influenced by population density and connectivity. These networks can be connected through continuous land occupation or infrastructural links. The Growth Poles Theory views urban networks as centralizing geographic spaces influenced by a dominant pole. Both theories highlight the significance of structured planning and infrastructure in enhancing urban functionality and service provision.

**Integrated Transport Networks.** Integrated transport networks are crucial for ensuring efficient mobility within metropolitan regions. Christaller's Traffic Principle (1966) and the CPT emphasize the need for robust connections between cities and human settlements, which impact service provision and economic activities. I9 and I11 underscore the necessity for better coordination and integration to enhance these connections. Urban networks, based on the CPT, are perceived as natural and independent, influenced by population density and infrastructure connectivity. I14 and I15 stress the importance of investing in infrastructure and adopting new technologies to improve the functionality of urban networks. This integration is essential for creating a seamless and efficient transport system that meets the diverse needs of metropolitan populations.

**Governance and Collaboration Across Municipalities.** The absence of unified governance and collaboration across municipalities poses significant challenges to metropolitan mobility. Establishing a metropolitan transport authority is crucial for overseeing and integrating transport planning across different jurisdictions. I9 and I14 highlight the need for political will and institutional coordination to address these challenges. They emphasize the importance of integrating different transport systems, such as buses and trains, and achieving collaboration among municipalities and regions. I9 points out that "we have more than 5 or 6 ticketing systems in the regions, none of which communicate with each other", illustrating the fragmented nature of the current system. I10 notes that current integration efforts do not meet all demands, underscoring the need for expanded and interconnected transport lines. I11 calls

for a coordinated public policy approach at federal, state, and municipal levels to achieve effective integration and minimize issues.

**Forward-Looking Mobility Strategies and Policy Influence.** Forward-looking mobility strategies and policy influence are essential for developing innovative and effective solutions to metropolitan transport challenges. Collaboration among government entities, the private sector, and civil society is crucial for fostering innovation and ensuring that transport solutions meet the diverse needs of the population. Significant investments in modern infrastructure and technological advancements are necessary to enhance the efficiency and appeal of public transport systems. I15 notes the conservative nature of current mobility planning and the need for greater investment: "The public transport system is poorly structured and technologically obsolete". Socio-spatial structuring, involving interconnectivity, interdependence, and differentiation within networks, is vital for creating efficient urban networks. I13 and I16 discuss the importance of rationalizing and modernizing current systems to create more efficient and interconnected networks. User-centric design, focusing on convenience, accessibility, and affordability for all, including those in remote areas, is essential for making transport systems more attractive and sustainable.

Addressing the broader socio-economic impacts of mobility is crucial for sustainable development. Equitable access to transport services and mitigating negative effects on marginalized communities are fundamental aspects of inclusive growth. I16 emphasizes the need for innovation to improve lives, particularly in peripheral areas, by integrating transportation solutions with social and economic development projects. I12 highlights the importance of public-private partnerships in infrastructure projects, showcasing how collaborative efforts can enhance the quality and reach of transportation services. These partnerships can support inclusive growth and address the diverse needs of the metropolitan population, ensuring that mobility solutions contribute to broader socio-economic goals.

Encouraging collaboration among government, the private sector, academia, and civil society is essential for fostering innovation and ensuring that transport solutions meet the diverse needs of the metropolitan population. I16 advocates for a comprehensive social pact to address the challenges faced by peripheral regions. He emphasizes the importance of creating a strategic approach through dialogue and collaboration with experts: "There is a lack of strategy... I do not see the public authorities proposing this discussion and moving towards a constructive debate". Such collaboration can drive behavioural change and promote the adoption of sustainable mobility practices, ensuring that innovations are effectively implemented and that they contribute to the overall well-being and resilience of metropolitan

areas. By fostering a cooperative environment, stakeholders can develop and implement forward-looking mobility strategies that are inclusive, efficient, and sustainable.

*Subcategory climate change results*

The interplay between urbanisation and climate change profoundly affects metropolitan mobility, necessitating a multifaceted approach to urban planning. Maheshwari *et al.* (2020) examine how Urbanisation impacts climate variables such as temperature, rainfall, and evaporation, highlighting its role in intensifying the urban heat island effect. They urge urban planners to address broader environmental impacts. Lundqvist (2016) advocates for integrated planning beyond administrative boundaries to tackle climate change effectively, aligning with IPCC (2021) findings on the need for cohesive strategies. CPT views urban networks as natural and independent, influenced by population density and infrastructure. GPT sees these networks as centralizing geographic spaces influenced by a dominant pole. Both theories emphasize structured planning and infrastructure's role in enhancing urban functionality and service provision.

**Flood Management and Urban Planning.** Effective flood management and urban planning are critical for enhancing resilience to climate change. I9 highlights the importance of long-term flood prevention projects and their impact on urban mobility and land use: “Prevention against floods in large river basins impacts urban mobility where road networks become submerged”. I10 discusses strategic measures to manage water flow from higher regions, suggesting retention basins to slow down water and reduce flood impact. I11 stresses the necessity of preventive policies at multiple government levels, calling for a coordinated approach: “What preventive work has been initiated or planned for such magnitude of problems? We must have a preventive policy to minimize the impact”. These insights underscore the need for comprehensive flood management strategies, including retention basins and improved drainage systems, to reduce urban flooding risks.

**Integrated Planning Beyond Administrative Boundaries.** Addressing climate change impacts on metropolitan mobility requires integrated planning that transcends administrative boundaries. Coordinated efforts among municipalities and state agencies are essential. I9 highlights institutional challenges in integrating services: “We have an institutional problem where we lack public policy and institutional will for integration”. I10 underscores the need for inter-municipal and statewide cooperation to develop strategic plans: “It is time for the State as a whole to sit down and think about alternatives”. I11 emphasizes the role of a coordinating body for the metropolitan region: “We need a regulatory body coordinating the municipalities in the metropolitan region to seek measures.” I14 and I15 discuss the need for a unified

approach to climate actions, with I14 advocating for nature-based solutions and I15 emphasizing the importance of electrification. Effective integration of climate considerations into metropolitan planning, coupled with unified policies for flood prevention and environmental preservation, can significantly mitigate climate change impacts on urban mobility.

**Adaptation to Climate Change Impacts.** Adaptation to climate change impacts is crucial for maintaining urban mobility and service continuity. I13 focuses on nature-based solutions and urban green infrastructure, highlighting their efficiency and cost-effectiveness: “Nature-based solutions are the cheapest and most efficient... creating green corridors and urban forests”. I12 emphasizes environmental preservation as a key strategy for climate resilience: “My [city]’s situation helps with climate issues due to environmental preservation”. I14 discusses adapting urban infrastructure to climate impacts, stressing the importance of nature-based solutions. I15 highlights the need for sustainable practices and technological advancements to combat pollution: “Air pollution, noise pollution, and microplastic pollution need to be addressed with electric and energy-efficient solutions”. I16 points out the lack of structured strategies for climate adaptation in the metropolitan region, calling for comprehensive planning and implementation. Adopting green infrastructure and promoting sustainable transportation are essential steps to mitigate the urban heat island effect, reduce greenhouse gas emissions, and improve air quality in metropolitan areas.

#### *Subcategory Foresight/Future Thinks results*

The interviewees' insights align with the broader concepts of foresight and future thinking in urban planning, emphasizing innovation, sustainability, integration, and governance. Addressing the complex nature of metropolitan mobility issues requires reevaluating planning approaches and increasing stakeholder involvement. Scenario planning traditions, such as visioning, consensus building, forecasting, and scenario planning, have emerged as effective tools in urban design and planning (Abou Jaoude et al.; 2022). These tools provide a framework for cities to navigate modern complexities, promoting resilience and proactive change without requiring complex methodologies (Goodspeed, 2020). This approach fosters a forward-looking perspective, ensuring that urban mobility strategies are adaptable and inclusive, addressing both present challenges and future uncertainties.

**Integration and Coordination.** A centralized, coordinated approach is crucial for managing mobility in metropolitan regions. Establishing a strong metropolitan entity that can synchronize policies, contracts, and projects across different municipalities is essential. Such an entity would ensure that all regions work together towards common goals, leading to more

efficient and effective resource management. I9 emphasizes the need for synchronized policies and contracts to improve service management. I12 envisions a perfectly integrated public transport system, highlighting the importance of collective transportation. I14 underscores the necessity of advancing regulatory frameworks and establishing metropolitan governance to achieve a cohesive vision. I16 advocates for a comprehensive agreement focused on new mobility solutions, underscoring the importance of collective effort in achieving effective integration.

**Innovative Urban Mobility Solutions.** Innovative solutions are essential for addressing future urban mobility challenges. I9 envisions a 2050 landscape with unified resources, projects, and electronic ticketing systems under strong metropolitan governance. I14 discusses the long-term cost benefits of electric buses over diesel ones, emphasizing the role of technology in enhancing urban mobility. I15 highlights the importance of segregated, automated, and efficient transport systems. I10 foresees the decline of combustion vehicles, and I13 supports the adoption of electromobility to improve urban quality of life. These perspectives collectively highlight the necessity for sustainable infrastructure investments and the adoption of cutting-edge technologies to create resilient urban mobility systems.

**Adapting to Climate Change.** Adapting urban mobility systems to climate change is vital for maintaining urban resilience and quality of life. I9 suggests adopting electric and biodiesel technologies to reduce environmental impact. I12 emphasizes the need for improved procedures in public transport and disaster prevention. I13 stresses the importance of green spaces and ecological corridors, arguing that mobility alone cannot enhance life quality without environmental considerations. These insights highlight the need for comprehensive strategies that integrate climate adaptation measures into urban planning. Implementing sustainable practices, investing in green infrastructure, and promoting active mobility are essential steps to ensure that urban mobility systems are both resilient to climate impacts and capable of supporting sustainable urban growth.

**Stakeholder Involvement and Collaborative Planning.** Future-oriented mobility planning necessitates stakeholder involvement and collaborative planning. I9 envisions a future with centralized and cohesive transportation management, emphasizing the need for strong metropolitan governance to facilitate integration and improve service quality. I10 and I11 stress the importance of expanding transport infrastructure and implementing sustainable mobility solutions to enhance connectivity and address disparities. I13 highlights the role of active mobility and green infrastructure in creating an inclusive urban environment. These combined perspectives call for a holistic approach to urban mobility planning that prioritizes equity,

sustainability, and stakeholder collaboration to ensure a resilient and inclusive metropolitan future.

**Addressing Socio-Spatial Inequalities.** Addressing socio-spatial inequalities within metropolitan areas requires a nuanced understanding of urban networks and their impact on social equity. I9 highlights the importance of a sustainability fund for public transport to ensure quality infrastructure and services. I10 underscores the necessity for expanding transport networks to improve connectivity between central and peripheral regions. I13 emphasizes the importance of focusing on active mobility and green infrastructure to enhance urban connectivity and quality of life. These perspectives highlight the need for scenario planning to explore various spatial and infrastructure development strategies that mitigate inequalities and enhance urban connectivity.

**Forward-Looking Mobility Strategies and Policy Influence.** Future mobility strategies must incorporate technological innovation, infrastructure investment, and sustainable practices to create a resilient and efficient transport system. I9 stresses the importance of advanced infrastructure and technology to enhance service offerings. I14 envisions the expansion of metropolitan areas and the need for macro-metropolitan planning. I15 points out the critical role of investing in key transport corridors managed by public entities to ensure efficiency. I16 advocates for participatory planning to develop a long-term vision for urban mobility, emphasizing the importance of community engagement in shaping future transport policies. These insights collectively underscore the necessity of integrating technological advancements, sustainable practices, and inclusive planning to shape the future of metropolitan mobility.

### **4.2.3 Metropolitan Region of Serra Gaúcha (RMSG)**

#### *Subcategory territorial results*

The interviewees' insights align closely with the concept of territory through the subcategories of governance, socio-spatial structuring, and regional identity. Their reflections emphasize the importance of regulatory frameworks, the complexity of uniting fragmented municipalities, and the construction of internal and external partitions. These elements collectively highlight the evolving dynamics of governance and cooperation in the RMSG, underscoring territory as a critical socio-spatial construct that shapes regional sustainability and development.

**Study of the Territory.** The emphasis on governance, infrastructure, and services within the RMSG demonstrates a critical study of the territory. As noted by I17 and I22, the need for



regulatory frameworks, such as law 14.293, alongside well-structured governance, underscores the importance of coordinated territorial management. This focus suggests that the effective organization of governance is pivotal for ensuring optimized service delivery and sustainable territorial occupation.

**Principle of Socio-Spatial Structuring.** The principle of socio-spatial structuring emerges in the interviewees' discussion of regional boundaries, subdivisions, and governance complexities. I19 and I22 particularly highlight the challenges of uniting municipalities under a cohesive governance structure, reflecting the territorial fragmentation that must be addressed for socio-spatial coherence. Political and administrative boundaries play a central role in defining how resources and responsibilities are distributed, directly impacting regional planning and cooperation.

**Construction of Internal/External Partitions.** The interviewees also reflect on the construction of internal and external partitions, particularly in discussions of regional identity and emotional connections to the territory. I18 and I21 express deep emotional ties to the land, shaping their community identity in relation to both internal history and external regional dynamics. These symbolic and physical partitions influence how local communities perceive and interact with the broader regional structure, framing their sense of belonging and external relations.

**Fields of Action.** The interviewees identify critical fields of action concerning historical, present, and emerging territorial borders. I24 and I23 emphasize the long-standing efforts to form regional alliances and the need for ongoing strategic planning to navigate both historical divisions and future integration. This indicates that the region is undergoing a transformation, where historical legacies intersect with contemporary governance challenges. The evolving borders, in both physical infrastructure and political cooperation, reveal a dynamic process of territorial evolution critical to the region's sustainability.

#### *Subcategory scale results*

The concept of functional hierarchy, central to territorial governance and socio-spatial structuring, underpins the interviewees' insights into the dynamics of the Serra Gaúcha region. Rooted in CPT and GPT, this framework emphasizes the unequal distribution of influence among municipalities, with primary hubs driving regional development. This hierarchical arrangement informs how localities coordinate their roles, resources, and governance to foster integrated, region-wide growth and cohesion. The region's socio-economic interdependence highlights the necessity of collaboration across scales, ensuring sustainable and inclusive.

Governance Dynamics and Its Organization. The interviewees consistently highlight the need for democratic and collaborative governance within the Serra Gaúcha region. I17 emphasizes the importance of a "democratic" relationship where all municipalities share equal power, fostering balanced governance across the region. I19 advocates for a "consortium" model, stressing the need for unified leadership to ensure joint decision-making, particularly when accessing regional funding. I20 underscores the need for a central regional authority to address shared challenges and prevent the fragmentation of resources and policies. I24 reinforces this view by stressing that regional cooperation and complementarity are vital to overcoming individualism and promoting collective socio-economic and environmental growth. The issue of hierarchical challenges and solutions arises in the governance structure, as noted by I22, who points to the proliferation of multiple regional bodies like COREDE and AMESNE, questioning their effectiveness without a unified metropolitan authority. I23 proposes the establishment of a regional office to coordinate planning across municipalities, ensuring that all local governments align with a comprehensive metropolitan master plan. The tension between centralized governance and local autonomy is raised by I22 and I23, who both acknowledge the potential risks of municipalities losing local authority when adopting regional standards. While they support regional integration, they caution against the erosion of local governance powers, advocating for a balance that ensures broader efficiency without undermining municipal independence.

Principle of Socio-Spatial Structuring. The functional hierarchy and integration of the Serra Gaúcha region is evident in how municipalities operate as an interconnected unit, despite formal political boundaries. I18 and I21 emphasize that the region's economic and social ties transcend these borders, fostering a collective regional identity that requires vertically integrated governance. I22 adds that problems like mobility and infrastructure must be addressed regionally, aligning with GPT, where central regions drive development and influence surrounding areas. The concept of vertical differentiation of roles within the region is implicitly recognized by I17, who promotes equal power distribution but acknowledges the need for a leading municipality to guide decision-making. I23 highlights the necessity of standardization across municipalities through shared regulations, underscoring a hierarchical governance structure where certain municipalities take on dominant roles, leading others toward integrated regional planning. Finally, the scalar division of labour is addressed by I19 and I24, who highlight the region's economic functions - such as production, transportation, and tourism - requiring coordination across different scales. This aligns with socio-spatial

structuring, where various municipalities fulfill complementary roles in a larger, hierarchically organized regional system, ensuring coordinated development across the Serra Gaúcha.

*Subcategory place results*

The interviewees' perspectives on regional cooperation, mobility, and socio-infrastructure challenges in the RMSG align closely with theoretical concepts like Market, Traffic, and Administrative Separation, the Principle of Socio-Spatial Structuring, and Place-Centrism. These concepts reveal the intricate relationships between central and peripheral places, regional development, and governance, making them essential frameworks for understanding the region's dynamics.

**Market, Traffic, and Administrative Separation.** The integration of markets, services, and infrastructure across municipalities is a common concern among the interviewees. I17 emphasizes the need for a regional governance framework, particularly the regulation of development through law 14.293, highlighting the necessity of coordinated governance to foster economic interdependence. I18 and I21 point to serious logistical issues, including overloaded roads and underdeveloped airports, which hinder regional connectivity and exacerbate the separation between central and peripheral areas. As I18 observes, “we face enormous mobility problems, relying solely on overburdened roads”. I19 stresses the importance of collaboration across municipalities in sectors like tourism, healthcare, and water management, reflecting the idea that administrative separation limits the region's ability to solve shared problems effectively.

**Principle of Socio-Spatial Structuring.** The differentiation between central and peripheral places in the region aligns with the concept of socio-spatial structuring, where certain cities serve as hubs for services, while smaller municipalities depend on them. I24 highlights how Caxias do Sul functions as a central node for healthcare, serving 48 municipalities, underscoring the vertical differentiation of services within the region. “Health issues are no longer purely municipal; they have become regional”, I24 states, illustrating the centrality of Caxias do Sul in the regional service network. Similarly, I21 and I22 reflect on the migration of labor to central cities, reinforcing the hierarchical structure where central places attract skilled workers and investments, while peripheral areas depend on these centers for socio-economic stability. This dynamic reflects Perroux’s (1950) idea of Growth Poles, where the development of core regions drives regional growth.

**Place-Centrism.** Place-centrism, which emphasizes the relationship between local centers and their complementary regions, is evident in the interviewees' focus on the region's socio-spatial dynamics. I23 stresses the need for coordinated infrastructure planning to prevent

unplanned urban sprawl, advocating for a regional approach to spatial incorporation. “Circulation routes across the metropolitan area need to be planned, even if not immediately constructed”, I23 suggests, emphasizing the role of place-based planning in ensuring balanced regional development. I22 also points out the challenges of population migration, noting that many new residents arrive in the region seeking economic opportunities, thereby influencing the socio-spatial configuration of both central and peripheral municipalities.

*Subcategory Urbanisation results*

The process of Urbanisation is a complex phenomenon influenced by various socio-economic and spatial factors, as noted by scholars such as Champion (2001) and Benko (2002). As urban areas expand and economic globalization centralizes power in metropolitan regions, new challenges emerge in the form of regional mobility and sustainability. The interviewees emphasize the interconnected nature of urban and rural areas, highlighting the ongoing shifts in population and infrastructure. These reflections align with various phases of Urbanisation, the critical role of mobility in ensuring regional cohesion, and the necessity for innovative approaches to address modern challenges. Their insights provide valuable perspectives on how rural and urban areas must collaborate for sustainable growth and development.

**Urbanisation Phases and Mobility.** The interviewees offer insights into urbanisation, particularly the phases of urbanisation, suburbanisation, and reurbanisation. Many highlight the shift from urban to rural areas due to improved infrastructure and quality of life in rural regions. I20 discusses the reverse migration trend from cities to rural areas, driven by enhanced services, which mirrors the counterurbanisation phase where rural areas begin to absorb urban populations. I18 and I19 also note that urban expansion brings new challenges, particularly with zoning regulations and land use, as cities grow closer to agricultural lands. I23 points out the absence of adequate zoning regulations in rural areas, making coordinated development more difficult. This convergence between rural and urban areas underscores the need for comprehensive zoning and urban planning that can address the impact of urbanisation on rural communities.

**Mobility and Urban Planning.** Mobility is consistently cited as a critical issue for maintaining regional sustainability, particularly in facilitating connections between urban and rural areas. I17 and I21 emphasize the significance of road infrastructure in enabling the flow of goods, services, and people, especially in rural areas where roads are essential for economic integration and cohesion. I22 stresses that mobility remains a widespread challenge despite significant investments in rural road paving. The need for coordinated development across municipalities is also highlighted, with I19 emphasizing regional cooperation and I23 pointing

out the lack of integration between rural and urban zoning regulations. This demonstrates the centrality of mobility within urban planning frameworks, where infrastructure plays a vital role in sustaining regional connectivity and growth.

*Innovative Solutions for Urban Mobility.* The interviewees recognize the growing pressure on transportation systems and the urgent need for innovative mobility solutions. I22 and I19 point out the strain on transportation infrastructure in rural areas as populations grow and demand better services. Public transportation affordability and accessibility are also concerns raised by I22, who notes the challenges posed by subsidies and the car-centric culture of the region. Respondents like I20 stress the importance of integrating digital infrastructure in rural areas to support the evolving urban-rural dynamic. The rising trend of land subdivision in rural zones requires modernized urban plans to address this transformation effectively. The interviewees' reflections highlight the broader need for innovative mobility and urban planning solutions, extending beyond physical infrastructure to address societal changes and the movement of people between urban and rural areas.

#### *Subcategory economy results*

The concept of investment concentration plays a pivotal role in analysing the economic dynamics of metropolitan regions, highlighting the influence of public and private investments on regional growth. Understanding how investments affect urban mobility, infrastructure, and economic diversification allows for the assessment of regional resilience. As Harrison and Grove (2014) and Mi and Coffman (2019) have shown, aligning investments with urban sustainability, governance, and mobility innovations is essential for addressing modern challenges. This analysis demonstrates how strategic investment can promote equitable, resilient development in the face of urbanisation and global economic shifts.

*Investment and Infrastructure for Mobility.* Several interviewees emphasize the critical need for investments in infrastructure, particularly transportation, to ensure efficient mobility across the region. This view aligns with Harrison and Grove's (2014) argument that urbanisation must adapt to physical and socio-economic challenges through substantial infrastructure investment. I18, notes the region's vulnerability during crises, remarking, "there was a shortage in the capital [...] because we couldn't access these cities". I24 stresses the urgency of infrastructure development, pointing out that floods recently isolated parts of the region: "With the floods, it became clear. We were cut off as a region". I23 advocates for decentralized urban planning through "decentralized occupation hubs" connected by efficient transportation systems. Interviewees collectively suggest that effective mobility is central to economic growth and resilience, especially in the context of natural disasters.

**Economic Diversification and Equitable Public Policies.** Economic diversification is seen as key to the region's resilience, with interviewees stressing that a variety of industries can shield the economy from crises. This view is supported by Mi and Coffman's (2019) argument that diversified economies provide the foundation for socio-economic stability. I18 states that "the greater the diversification [...] the more self-sufficient we become", emphasizing the importance of diverse sectors in securing economic stability. I20 highlights how diversification acts as a safeguard during crises, ensuring municipalities "maintain employment and revenue levels". I19 underscores the region's dependence on various sectors, noting that "we rely heavily on the metal-mechanic sector, while other cities depend on tourism and agriculture". The common consensus is that diversification, supported by equitable public policies, is essential for regional economic economy.

**Sustainability and the Sharing Economy.** Sustainability, is a key concern, closely tied to the sharing economy, particularly in the context of urban mobility. This perspective is consistent with Mi and Coffman's (2019) assertion that sharing platforms reduce emissions and resource consumption. I24 emphasizes the need for regional cooperation to advance sustainability: "we need to work together." I22 points out that underutilized resources, especially in tourism, could be better exploited: "This diversity we have [...] there's more to explore." I23 highlights the importance of planning for collective transportation solutions to ensure long-term sustainability. Interviewees suggest that strategic investments in shared infrastructure and mobility can promote both sustainability and regional resilience

#### *Subcategory culture and identity results*

The interviewees' perspectives align with academic themes of "culture and identity" in metropolitan regions, particularly regarding urban adaptability, governance, diversity, and integration, as suggested by scholars like Sennett and Ellin. Below, the key common points of convergence in these themes are discussed, supported by relevant quotations from the interviewees.

**Governance and Specific Metropolitan Character.** Governance plays a central role in maintaining the cultural identity of the Serra Gaúcha region. The interviewees emphasize that governance must balance regional development with the preservation of each municipality's unique cultural heritage. I17 highlights how governance strengthens regional unity by supporting tourism and cultural preservation policies. Similarly, I18 stresses the importance of maintaining local traditions while promoting collective development. I19 emphasizes the critical role of municipal participation in the metropolitan region, asserting that this collaboration impacts all areas of governance. I23 adds that regional planning must consider

cultural diversity to ensure the preservation of traditions and customs. These insights collectively reflect how governance shapes and protects the cultural identity of Serra Gaúcha while fostering regional cooperation.

*Enrichment through Diversity.* The rich cultural diversity of Serra Gaúcha, influenced by Italian, German, and other immigrant communities, emerges as a prominent theme. Interviewees emphasize that this diversity is a source of strength and resilience but also requires careful management to balance cultural preservation with modernization. I17 notes the distinct Italian and German heritage in the region, underscoring the importance of preserving these cultural roots. I20 highlights that over half of the municipality's population was born elsewhere, underscoring the need to value and integrate diverse cultural backgrounds. I22 reinforces the idea that the region's cultural diversity extends beyond its Italian roots, encompassing a broader mix of influences. I23 echoes the sentiment that cultural diversity is positive and should be preserved. This emphasis on diversity aligns with academic discussions of cultural pluralism in urban regions, where integration must occur alongside the preservation of local identities.

*Cultural Integration and Identity.* Cultural integration within the metropolitan framework is another key theme, particularly in the context of migration and increasing mobility. Several interviewees discuss the need to blend diverse cultures while safeguarding the region's identity. I20 refers to the region's evolution into a cosmopolitan area, emphasizing the importance of strengthening Italian cultural roots and ensuring that newcomers understand and adapt to local culture. I21 adds that collaboration among municipalities facilitates this integration process, especially in smaller towns where shared visions are more easily implemented. I24 highlights that regional cooperation benefits all municipalities, encouraging joint solutions to shared problems. These perspectives resonate with the academic concept of "porosity" in urbanism, which advocates for the exchange of ideas and cultures across boundaries while maintaining local identity.

#### *Subcategory Innovation Analysis*

Urban areas play a vital role in achieving sustainable development, particularly in metropolitan regions where growth demands innovative urban planning. The UN Habitat (2020) underscores the importance of city adaptation, infrastructure, and mobility innovation in fulfilling SDG 11's goal of sustainable urbanisation. Key elements like green spaces, efficient transport, and equitable public services are essential to shaping inclusive, resilient cities. In the context of the RMSG, these principles highlight the critical need for unified governance, strategic infrastructure, and environmental sustainability to address regional development challenges.

**Unified Governance and Integrated Planning.** Frequently highlighted as essential to fostering innovation and sustainable development in the region. I17 notes the progress made in uniting the 14 municipalities under a single council to address regional issues such as housing and sanitation. Similarly, I21 calls for strengthening metropolitan governance, admitting that the region has been slow to coordinate efforts effectively. I23 emphasizes the importance of macro-planning and regional public policies, lamenting that regional priorities have often been overlooked. These insights collectively underscore the need for cohesive governance structures to support long-term development.

**Infrastructure and Mobility Innovations.** Is seen as critical to enhancing the region's sustainability. I18 stresses the importance of investing in road infrastructure, particularly in expanding and duplicating key highways to improve regional connectivity. I22 discusses projects like the Vila Oliva airport, designed to address logistical and mobility challenges. However, both I19 and I20 express concerns over the lack of innovation in regional mobility, with Siqueira pointing out the need for a regional, rather than municipal, approach. Their perspectives reflect the need for strategic infrastructure improvements to advance sustainable urbanisation, in line with the goals of SDG 11.

**Public Transport Efficiency.** The region faces significant challenges in public transport due to fragmented planning and a lack of regional coordination. I19 highlights a leadership gap that impedes the implementation of cohesive transport systems. I20 echoes this, pointing out that transportation remains siloed within individual municipalities, leading to inefficiencies. I17 advocates for integrated transport systems, stressing the importance of cohesive networks for sustainable urban mobility. These comments indicate the urgent need for regional leadership to create an efficient and sustainable public transport system across the metropolitan area.

**Social and Economic Equity.** Equitable development is a recurring concern among the interviewees. I17 argues that regional collaboration can help ensure equitable access to resources and services, particularly in housing and sanitation. I21 discusses the unequal access to key infrastructure, such as airports, which limits economic opportunities. I22 notes that competition between municipalities has hindered collaboration, exacerbating regional disparities. Through integrated governance and innovation, the region can address these disparities, fostering greater social and economic equity.

**Behavioural Change and Environmental Sustainability.** A shift in behaviour toward environmental sustainability is another central theme. I22 emphasizes the need for urban planning that prioritizes people and sustainability, reflecting a shift in mindset, particularly among younger generations. Both I18 and I20 stress the importance of environmental



stewardship in infrastructure development, particularly in transport and waste management. These views point to the need for a cultural shift toward sustainability, aligning with SDG 11's objectives to create inclusive, sustainable, and resilient cities.

#### *Subcategory Net Analysis*

The concept of net in urban theory emphasizes the essential connections between cities and their surrounding areas, highlighting their dependence on transport and functional infrastructure. This relationship, discussed in the context of Christaller's CPT and Perroux's GPT, underscores the importance of integrating transport systems, infrastructure, and communication between urban hubs to foster economic diversification and regional development. The structure of these networks, influenced by innovations, technology, and global trade, calls for strategic planning to address the complexities of modern urban and regional connectivity.

The interviewees collectively highlight several key challenges and opportunities related to mobility and sustainability in the RMSG. Their insights emphasize the importance of integrated transport networks, regional governance, forward-looking policies, and collaborative planning. These elements are critical to fostering sustainable growth and enhancing urban mobility across the region.

**Integrated Transport Networks.** Interviewees stress the need for well-integrated transport networks in the region. I17 emphasizes the establishment of a governance framework through the "*Conselho Deliberativo da Região Metropolitana*" to unify regional planning and address transportation needs. This call for better connectivity aligns with I18, who highlights the long-standing struggle for essential infrastructure projects, such as road duplications, to improve accessibility and reduce risk. I24 advocates for exploring alternative transport systems like rail and water transport to create resilient networks. These views support the idea of connecting urban centers through strategic infrastructure to foster regional development and sustainability, resonating with Christaller's CPT and Traffic Principle.

**Governance and Collaboration Across Municipalities.** The interviewees express concern over the fragmented governance among municipalities, which hampers the development of cohesive transport networks. I21 points out that "each municipality has acted in isolation", resulting in uncoordinated mobility solutions. This lack of collaboration is echoed by I23, who stresses that municipalities must cooperate to avoid irregular land use and high costs from unplanned development. I22 criticizes the ineffectiveness of METROPLAN in strategizing regional mobility. The absence of unified governance prevents the creation of

standardized socio-spatial relations and undermines the potential for building interconnected urban networks, as emphasized by both Christaller's and Perroux's theories.

**Forward-Looking Mobility Strategies and Policy Influence.** Several interviewees call for forward-looking mobility strategies and adaptive policies to address both current and future challenges. I20 highlights the impact of ride-sharing services like Uber, suggesting the need for adaptable policies that support public transportation amidst changing socio-economic conditions. I24 advocates for innovative transport alternatives, such as high-speed trains and enhanced port facilities, to bolster regional connectivity. These ideas align with Perroux's GPT, which stresses strategic infrastructure concentration to stimulate regional development. The interviewees emphasize that technological advancements and flexible policies are necessary to ensure sustainable growth in the metropolitan network.

**Need for Strategic Investment in Mobility Solutions.** All interviewees agree that long-term investments in mobility infrastructure are essential for sustainable development. I24 underscores the need for alternative transportation methods like rail systems, while I21 highlights recent investments in airports and ports as crucial to economic resilience. However, both I19 and I22 point out that the lack of leadership is delaying the implementation of critical infrastructure projects. “We are still facing very precarious mobility issues”, says I24, emphasizing the need for strategic investments and coordination to overcome mobility challenges and drive sustainable urban growth.

#### *Subcategory climate change results*

Climate change presents substantial challenges for urban and regional planning in the RMSG, particularly as its impacts transcend administrative boundaries, affecting infrastructure, mobility, and sustainability. Research by Maheshwari et al. (2020) highlights how urbanization intensifies climate change effects, such as the Urban Heat Island Effect (UHIE), necessitating strategic planning to mitigate environmental degradation. Similarly, Lundqvist (2016) underscores the challenges of implementing coordinated climate adaptation measures across jurisdictions, exemplified by the Gothenburg Metropolitan Area. These findings stress the importance of regional collaboration in addressing climate risks. The IPCC (2021) further emphasizes that metropolitan regions, as significant contributors to greenhouse gas emissions, must adopt integrated climate strategies to bolster resilience and sustainability.

In the RMSG context, interviews reveal critical concerns related to mobility and sustainability under the lens of climate change. Key themes include flood management, the urgency of integrated regional governance, and the need for adaptation strategies to combat the increasing frequency of extreme weather events. These discussions underline the imperative of

coordinated efforts in urban planning, infrastructure development, and governance to enhance the region's resilience to climate challenges.

**Flood Management and Urban Planning.** The interviewees stress the growing urgency for effective flood management strategies as climate change intensifies rainfall, leading to landslides and blocked roads. I17 notes frequent landslides and road closures, while I18 underscores the need to proactively prepare for future flooding. Both I18 and I20 criticize the reactive nature of current governance, with I18 pointing out that this exacerbates problems. I23 emphasizes the need for better city permeabilization to naturally manage rainwater, and I24 highlights the importance of desilting rivers and protecting infrastructure. The consensus is that urban planning must prioritize infrastructure capable of handling extreme weather, focusing on improved drainage, sustainable land use, and flood prevention systems.

**Integrated Planning Beyond Administrative Boundaries.** The fragmented nature of governance across municipalities is a major obstacle in addressing climate risks. I19 and I20 argue that individual municipal actions are insufficient, advocating for a regional, integrated approach to climate adaptation. I19 notes the inefficiency of current metropolitan governance in coordinating essential actions like flood prevention. I20 adds that when municipalities act independently, inefficiencies and higher costs result. This mirrors Lundqvist's (2016) findings on the need for integrated planning beyond administrative boundaries. I24 emphasizes the need for consolidated regional tools and resources, advocating for a coordinated flood management strategy. To effectively tackle climate risks, a regional governance model must unite municipalities under a shared adaptation plan.

**Adaptation to Climate Change Impacts.** All interviewees agree on the importance of proactive adaptation measures to address the increasing frequency of extreme weather events. I20 acknowledges the reality of climate change and calls for significant adaptations in infrastructure planning, such as neighbourhoods and roadways. I22 stresses the importance of a strategic approach to climate resilience, emphasizing the use of data, technology, and planning tools to mitigate climate impacts. This aligns with the IPCC's (2021) recommendations for integrating both mitigation and adaptation strategies. I24 further highlights proactive environmental programs like the payment for environmental services and reforestation initiatives, which are crucial for restoring ecosystems and improving land-use sustainability. The collective view is that adaptation strategies must be comprehensive, combining infrastructural improvements and environmental conservation to create a resilient region capable of withstanding climate impacts.

*Subcategory foresight/future think results*

Future urban planning must tackle increasingly complex challenges, including climate change, technological advancements, economic shifts, and population growth. Traditional forecasting methods, while useful, often fall short in addressing the uncertainty of these evolving dynamics. Scenario planning has emerged as a critical tool, enabling cities and regions to anticipate multiple futures and prepare for various outcomes. As urban areas expand, integrating innovative planning methods, sustainability principles, and regional governance is vital to ensuring resilience and growth. Insights from interviews highlight the importance of infrastructure development, sustainable transport, and collaborative governance as key pillars for achieving long-term urban sustainability and adaptability (Abou Jaoude et al., 2022). These approaches promote resilience and proactive change without requiring overly complex methodologies (Goodspeed, 2020).

**Integration and Coordination.** Effective regional integration and coordination are essential to addressing urban mobility challenges and promoting sustainable development in the RMSG. Interviewees emphasized the need for governance structures that unify cities under a common regional vision. I24 noted that “the metropolitan region can be the leader of all these efforts because it stands above them”, while I22 stressed the need for leadership, stating, “We must take on this leadership role to see the region as a whole”. Scenario planning, as proposed by Abou Jaoude et al. (2022), highlights the importance of intergovernmental coordination, aligning policies across authority levels to tackle regional issues like transport and infrastructure. Collaborative leadership is crucial for fostering cohesive urban policies that address cross-jurisdictional challenges.

**Innovative Urban Mobility Solutions.** The need for innovative urban mobility solutions, such as high-speed rail, electric transport, and AI-driven systems, was consistently mentioned by the interviewees. I17 envisioned “a regional high-speed rail” and “the application of artificial intelligence”, while I18 expressed the potential for electric transport, stating, “It would be amazing if we could have some form of electric train here”. Foresight practices like scenario planning enable cities to explore future mobility scenarios, allowing them to adopt emerging technologies and ensure that urban mobility strategies remain adaptable and innovative (Goodspeed, 2020). These forward-looking solutions are critical to enhancing the region’s sustainability and long-term growth.

**Adapting to Climate Change.** The need to adapt to climate change is central to the interviewees' discussions, with a focus on the impacts of floods, droughts, and the need for resilient infrastructure. I22 noted that “climate warming is already a reality. We will

increasingly face either droughts or excessive rainfall” while I24 warned that “unchecked urban expansion will only exacerbate these issues”. Scenario planning, according to Abou Jaoude et al. (2022), helps cities prepare for uncertain environmental futures by integrating climate resilience into urban development strategies. By examining multiple scenarios, planners can better equip urban areas to withstand the impacts of climate change, ensuring long-term resilience.

**Stakeholder Involvement and Collaborative Planning.** A key element of scenario planning is inclusive decision-making, which requires the involvement of diverse stakeholders to ensure that plans are both comprehensive and feasible. The interviewees highlighted the importance of collaboration across public, private, and civic sectors to tackle mobility and sustainability challenges. I18 underscored the need for significant investment, stating, “It requires a lot of investment for this to happen. It’s a dream for us; we want our Serra Gaúcha to grow stronger”. I22 stressed the need for organization, noting, “We need to organize for this to happen”. These collaborative approaches align with foresight methods such as consensus-building, which integrates varied perspectives to develop more adaptable and inclusive future plans (Goodspeed, 2020). Involving stakeholders fosters a shared vision for the region’s future and ensures that development aligns with the needs of all communities.

**Addressing Socio-Spatial Inequalities.** Addressing socio-spatial inequalities was a common theme among interviewees, with a focus on equitable access to infrastructure, employment, and services. I21 expressed concerns, saying, “I envision a highly developed region, but I’m not sure we’ll be able to achieve that without solid planning”. I23 emphasized the need to balance land use, stating, “We need to try to balance the use of the territory”. Tackling inequalities through scenario planning involves creating inclusive urban designs and policies that prioritize spatial and social equity. Proactively addressing potential disparities helps ensure that urban development does not only focus on economic growth but also fosters social justice and inclusivity.

**Forward-Looking Mobility Strategies and Policy Influence.** Scenario planning facilitates the development of adaptive mobility strategies that prepare regions for future uncertainties, such as population growth, technological advancements, and economic shifts. I20 noted, “We will manage to have double the population... with a 1.5% annual growth in larger municipalities”, while I18 emphasized the need for transport integration, stating, “Mobility integration between municipalities, particularly via roadways, is crucial”. Foresight techniques, including scenario planning, provide urban planners with structured methods for forecasting future transportation needs and informing policy decisions. Focusing on uncertainties helps

cities create resilient mobility systems that can adapt to demographic, economic, and technological changes (Goodspeed, 2020).

#### **4.2.4 Condensed Speech Overviews**

This framework represents the integration and synthesis of the qualitative phase of the research, capturing the nuanced perspectives of stakeholders and citizens across diverse metropolitan contexts. By consolidating these insights into a cohesive structure, the framework bridges theoretical and practical dimensions, offering a robust tool for analysing and addressing the complexities of metropolitan governance and mobility.

The framework presented in the thesis is a comprehensive and multidimensional analytical structure designed to understand mobility in metropolitan regions through an integrated perspective, directly aligning with the central objective of the study (Figure 19). Organized into macro-categories, categories, and subcategories, it encompasses critical aspects of metropolitan mobility such as resilience, regulation, urban development, and innovative culture. Within these categories, subcategories include territorial, scale, place, economy, urbanisation, culture and identity, innovation, net, climate change, and foresight/future thinking. This hierarchical organization not only provides clarity but also distinguishes between varying levels of maturity and regional challenges, as evidenced in qualitative analyses conducted in three distinct contexts: Greater London, RMPA, and RMSG.

For instance, attributes such as Integration and Coordination and Unified Governance and Integrated Planning are particularly relevant in RMPA and RMSG due to administrative fragmentation and the pressing need for centralized planning. Conversely, in Greater London, more advanced attributes like Enhanced Public Transport and Non-motorized Mobility highlight the successful integration of public policies, technologies, and sustainable practices. At the same time, the framework identifies gaps and opportunities, such as the low spontaneous awareness of sustainability and integrated planning in the Brazilian regions, underscoring communication and educational challenges that hinder the implementation and perception of more advanced strategies.

Figure 19 - Structure of qualitative analysis between case studies



Source: Elaborated by author (2024).

The inclusion of interdisciplinary attributes like Adaptation to Climate Change and Integrated Planning Beyond Administrative Boundaries further enhances the framework’s scope, enabling the analysis of emerging issues such as climate change impacts on mobility and structural factors like connectivity and governance. Moreover, the framework’s comparative approach, which evaluates interactions across regions at varying levels of development, fosters a deeper understanding of metropolitan dynamics. It provides insights into how advanced models, such as Greater London’s, can inform the development of tailored solutions for less structured contexts like RMPA and RMSG.

#### 4.3 QUANTITATIVE RESULTS AND ANALYSIS

The quantitative phase of this thesis was informed by qualitative case study interviews conducted in Greater London, which identified 33 key attributes central to sustainable mobility. These attributes guided the development of 52 questions distributed across four dimensions: regulation, urban development, innovative culture, and resilience. Each question was systematically coded by category, subcategory, and sequence to facilitate structured analysis. Two region-specific spreadsheets, created in English and Portuguese, addressed the unique contexts of the UK and Brazil and were administered via Google Forms. This methodological framework ensured alignment with theoretical constructs and enabled a thorough exploration of sustainable mobility across diverse regional settings.

The Confirmatory Factor Analysis (CFA) was conducted using JASP software, configured to adhere to rigorous methodological standards and ensure statistical robustness. Fit measures included the Kaiser-Meyer-Olkin (KMO) test for sample adequacy and Bartlett's test of sphericity to assess the suitability of the data for identifying significant factor structures. Average Variance Extracted (AVE) and other reliability metrics were incorporated to enhance the depth of the analysis.

The Diagonally Weighted Least Squares (DWLS) estimation method was chosen due to its effectiveness with categorical and ordinal data, ensuring precise coefficient estimates. All variables were standardized to enable consistent interpretation of factor loadings, and modification indices with a cut off of 3.84 were applied to identify potential adjustments for improving model fit. To address missing data, a listwise deletion approach was employed, ensuring that only complete responses were analysed.

Reliability was further ensured through solid standard error calculations and a 95% confidence level, providing precision and validity in the findings. These configurations reflect a stringent methodological approach, offering empirical foundation for validating the proposed model.

Unlike other subcategories, territorial and scale within the regulation category were analysed at the category level rather than individually. This decision was necessitated by the limitations of CFA, as the territorial subcategory contained only three questions and the Scale subcategory only two, making individual analysis impractical.

The detailed quantitative analysis of each subcategory included in this research, comparing the performance of Greater London, RMPA, and RMSG. Through a comprehensive breakdown of key statistical metrics, including model fit indices (e.g.,  $\chi^2/df$ , GFI, RMSEA, CFI)



and reliability measures (Cronbach's  $\alpha$ ), the appendix systematically evaluates, validity, and limitations of the construct across regions. From Table 24 to Table 32 highlight variations in the adequacy of the models and the contributions of specific items, identifying areas where regional contexts influence outcomes. By addressing challenges such as low factor loadings and inconsistencies in reliability, the appendix underscores the importance of refining certain items to enhance the construct's applicability and comparability across diverse metropolitan contexts. This structured approach provides critical insights into the model's adaptability, offering a foundation for interpreting the study's findings.

#### *Territorial and scale (regulation category) results*

The regulation category (Q1–Q5) assesses governance frameworks shaping regional development and sustainable mobility, focusing on territorial and scale-related factors across Greater London, RMPA, and RMSG. It provides critical insights into the consistency, reliability, and applicability of regulatory structures in metropolitan contexts.

Regarding model fit, all regions demonstrated strong performance, with RMSG achieving the best results, as evidenced by its  $\chi^2/df$  (1.256), GFI (0.992), and RMSEA (0.043), all within ideal thresholds. RMPA also performed well, with a  $\chi^2/df$  of 1.543, GFI of 0.989, and RMSEA of 0.069. Greater London exhibited acceptable fit, with a  $\chi^2/df$  of 2.088 and GFI of 0.987, though its RMSEA (0.097) slightly exceeded the ideal range, indicating minor residual issues.

Table 24 - Quantitative analysis of the regulation category

Regulation	Q1-Q5								
5 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
Category	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Regulation	Greater London	10,441	5	2,088	0,988	0,098	0,938	0,655	Todas sign.
Regulation	RMPA	7,715	5	1,543	0,990	0,070	0,972	0,585	Q5 no sig.
Regulation	RMSG	6,283	5	1,257	0,992	0,044	0,984	0,507	Q4 and Q5 no sig
<b>Take Q4 and Q5 off</b>									
Regulation	RMSG							0,646	

Source: Elaborated by the author (2024)

Reliability, assessed through Cronbach's  $\alpha$ , varied significantly, raising concerns about internal consistency. While Greater London achieved marginal reliability ( $\alpha = 0.654$ ), RMPA ( $\alpha = 0.584$ ) and RMSG ( $\alpha = 0.507$ ) fell below acceptable thresholds, reflecting limited coherence among items. Factor loadings highlighted poor performance for Q4 and Q5 in RMPA

and RMSG, with minimal contributions to the construct. Similarly, Q1 underperformed in RMSG. Removing Q4 and Q5 in RMSG improved reliability to  $\alpha = 0.645$ , confirming their misalignment with the construct and reinforcing the need for item revision or exclusion.

#### *Place subcategory results*

The analysis of the place subcategory (Q6–Q11) demonstrates the model's suitability for metropolitan contexts, confirming its capacity to consistently capture the latent construct. Model fit indices across all regions were strong, with  $\chi^2/\text{df}$  values below 3, GFI above 0.95, and RMSEA within the optimal range of less than 0.08.

Greater London exhibited the best fit, with a  $\chi^2/\text{df}$  of 0.527, while RMPA and RMSG also showed solid performance, achieving GFI and CFI values above recommended thresholds. These findings confirm the model's adaptability to different metropolitan contexts. Reliability, assessed through Cronbach's  $\alpha$ , was acceptable (above 0.7) across all regions.

However, item-level analysis identified consistently low factor loadings for question 7 (which asks about residing in areas of risk). This underperformance may be linked to approximately one-quarter of respondents being unsure or unaware of whether their residence is located in a risk area, highlighting participants' limited knowledge on the subject.

Table 25 - Quantitative analysis of the place subcategory

Place	Q6-Q11									
6 Questions	Reference	<3	>0,95	<0,08	>0,95	>0,6/0,7				
Subcategory	Region	$\chi^2$	df	$\chi^2/\text{df}$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings	
Place	Greater London	4,749	9	0,528	0,995	0,000	1,000	0,725	Q7, Q9 low	
Place	RMPA	10,219	9	1,135	0,989	0,035	0,993	0,714	Q7 low	
Place	RMSG	11,727	9	1,303	0,989	0,048	0,988	0,730	Q6, Q7 low	

Source: Elaborated by the author (2024)

#### *Urbanisation subcategory results*

The analysis of the urbanisation subcategory (Q16–Q18) revealed that reliability, measured by Cronbach's  $\alpha$ , fell below the acceptable threshold ( $\alpha < 0.6/0.7$ ), with values of  $\alpha = 0.489$  for Greater London,  $\alpha = 0.457$  for RMPA, and  $\alpha = 0.500$  for RMSG, indicating low internal consistency for these items.

In RMPA and RMSG, Q18 (use of alternative transport modes) showed low factor loadings, reflecting limited contribution to the construct. Removing Q18 significantly improved reliability in RMPA, increasing Cronbach's  $\alpha$  to 0.682 in the first iteration and 0.665 in the second, nearing acceptable levels. Responses to Q18 indicated that 62% of participants in RMPA and RMSG disagreed with replacing car usage with alternative transport modes for

commuting. This finding aligns with the qualitative phase, where respondents also expressed resistance to adopting active transport modes for work. In contrast, only half of respondents in Greater London shared this resistance, suggesting a greater acceptance of alternative transport modes.

Table 26 - Quantitative analysis of the Urbanisation subcategory

Urbanisation	Q16-Q18								
3 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	X <sup>2</sup>	df	X <sup>2</sup> /df	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Urbanisation	Greater London	0,000	0	0,000	1,000	0,000	1,000	0,489	Q16
Urbanisation	RMPA	0,000	0	0,000	1,000	0,000	1,000	0,457	Q18 low
Urbanisation	RMSG	0,000	0	0,000	1,000	0,000	1,000	0,500	Q18 low
<b>Take Q18 off</b>									
Urbanisation	RMPA							0,682	
Urbanisation	RMPA							0,665	

Source: Elaborated by the author (2024)

These findings highlight the importance of further analysing Q18 to better understand the urbanisation construct. A more nuanced examination of this item is crucial to ensuring greater validity and consistency in metropolitan regional analyses and supporting more precise and context-specific interpretations.

#### *Economy subcategory results*

The performance of the economy subcategory (Q12–Q15) was assessed across model fit, reliability, and item performance in the regional contexts of Greater London, RMPA, and RMSG. While model fit indices were generally satisfactory, significant challenges emerged regarding construct reliability and individual item contributions.

Greater London demonstrated excellent model fit, with  $\chi^2/\text{df} = 0.099$ , GFI = 0.999, RMSEA within acceptable limits, and CFI = 1.000, indicating near-perfect construct representation. However, reliability was negative ( $\alpha = -0.093$ ), suggesting that Q12 (city infrastructure) and Q13 (high cost of living) were unrelated to the other items. In RMPA, the model fit was strong ( $\chi^2/\text{df} = 0.878$ , GFI = 0.995, RMSEA = 0.000, CFI = 1.000), but reliability was extremely low ( $\alpha = 0.0613$ ). Removing Q12 and Q13 significantly improved internal consistency, raising Cronbach's  $\alpha$  to 0.757, an acceptable level.

In contrast, RMSG exhibited weaker model fit, with  $\chi^2/\text{df} = 3.319$ , GFI = 0.988, and RMSEA = 0.132, indicating residual issues, while CFI = 0.925 fell below the ideal threshold.

Reliability was similarly low ( $\alpha = 0.080$ ), with Q13, Q14, and Q15 underperforming and Q12 and Q13 recommended for exclusion. After removal, Cronbach's  $\alpha$  increased to 0.728, reaching an acceptable level.

Table 27 - Quantitative analysis of the Economy subcategory

<b>Economy</b>	Q12-Q15								
4 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
<b>Subcategory</b>	<b>Region</b>	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	<b>Cronbach's <math>\alpha</math></b>	<b>Loadings</b>
Economy	Greater London	0,199	2	0,099	1,000	0,000	1,000	-0,093	Q12, Q13 low; Q13 no sig
Economy	RMPA	1,756	2	0,878	0,996	0,000	1,000	0,061	all low
Economy	RMSG	6,639	2	3,319	0,989	0,132	0,926	0,081	Q13, Q14, Q15 low
<b>Take Q13 off</b>									
Economy	Greater London							0,580	Q12
<b>Take Q12 and Q13 off</b>									
Economy	RMPA							0,758	
<b>Take Q12 and Q13 off</b>									
Economy	RMSG							0,729	

Source: Elaborated by the author (2024)

These findings suggest that while regional cases demonstrated strong statistical model fit, the subcategory's validity requires careful consideration of item-specific challenges. For instance, data revealed that nearly 40% of respondents in RMPA and RMSG found their city's infrastructure inadequate for population needs, and 20% across all contexts reported residing in high-cost-of-living areas. These insights align with qualitative findings, reinforcing the need for targeted adjustments to enhance the subcategory's interpretative precision and regional applicability.

#### *Culture and identity subcategory results*

The analysis of the culture and identity subcategory (Q19–Q24) revealed significant differences across the regions of Greater London, RMPA, and RMSG, highlighting both strengths and challenges in model fit, reliability, and item performance. Greater London demonstrated excellent model fit, with  $\chi^2/df = 0.381$ , GFI = 0.997, RMSEA = 0.000, and CFI = 1.000. High reliability ( $\alpha = 0.863$ ) indicated internal consistency and a clear representation of the construct, with all factor loadings exceeding 0.5.

In contrast, RMPA exhibited weaker performance, with  $\chi^2/df$  at the acceptable limit (3.033), GFI below the ideal threshold (0.941), elevated RMSEA (0.135), and low CFI (0.769). Reliability was marginal ( $\alpha = 0.634$ ), with items such as Q20 (things to see while walking), Q21 (preservation of local culture), and Q24 (cultural options) showing low factor loadings. Similar trends were observed in RMSG, where model fit was acceptable ( $\chi^2/df = 2.627$ , GFI = 0.953, RMSEA = 0.110, and CFI = 0.845), but reliability remained low ( $\alpha = 0.627$ ), and the same problematic items undermined the construct's robustness.

Excluding items like Q21 and Q24 in RMPA and Q20 and Q24 in RMSG significantly improved results. Model fit indices were enhanced ( $\chi^2/df < 0.2$ , GFI > 0.996, and CFI = 1.000), and reliability reached acceptable levels ( $\alpha > 0.7$ ). Further analysis revealed that approximately 40% of respondents in RMPA and RMSG expressed dissatisfaction with the cultural options in their cities (Q24), such as theater, music, art, and cinema. Additionally, more than a third of RMPA participants were unaware of or only partially agreed with the perception that sustainable development initiatives promote and preserve local culture and products (Q21). In RMSG, around 30% of respondents were uncertain or partially agreed with the statement that their city offers interesting sights while walking (Q20).

Table 28 - Quantitative analysis of the Culture and Identity subcategory

Culture and Identity		Q19-Q24							
6 Questions		Reference		<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Culture and Identity	Greater London	3,434	9	0,382	0,997	0,000	1,000	0,863	All higher 0,5
Culture and Identity	RMPA	27,300	9	3,033	0,942	0,135	0,769	0,634	Q20, Q21 and Q24 low
Culture and Identity	RMSG	23,649	9	2,628	0,953	0,111	0,845	0,627	Q20, Q21 and Q24 low
<b>Take Q21 and Q24 off</b>									
Culture and Identity	RMPA							0,706	All higher 0,5
<b>Take Q20 and Q24 off</b>									
Culture and Identity	RMSG							0,682	Q21 low

Source: Elaborated by the author (2024)

In conclusion, the culture and identity subcategory presents a well-established model in Greater London. However, in RMPA and RMSG, respondents' perceptions reveal gaps that call for increased cultural activities aligned with the construct. These findings underscore the need for improvements to enhance the theoretical and practical applicability of the construct, particularly in the context of mobility projects in metropolitan regions.

#### *Innovation subcategory results*

The performance of the innovation subcategory (Q25–Q29) varied significantly across the regions of Greater London, RMPA, and RMSG, highlighting both methodological strengths and challenges related to model fit, reliability, and item validity.

In Greater London, the model demonstrated results, with  $\chi^2/df = 0.863$ , GFI = 0.993, RMSEA = 0.000, and CFI = 1.000. Reliability was satisfactory (Cronbach's  $\alpha = 0.705$ ), with all factor loadings above 0.5, indicating strong item contributions to the construct.

In contrast, RMPA showed weaker performance, with  $\chi^2/df = 3.217$ , GFI = 0.957, RMSEA = 0.140, and CFI = 0.538, reflecting poor model fit and high residuals. Reliability was low ( $\alpha = 0.304$ ), and items such as Q26, Q27, and Q28 had unsatisfactory factor loadings. Removing these items improved reliability to  $\alpha = 0.690$ , emphasizing the need for targeted analysis of these questions. Specific findings revealed that 60% of respondents in RMPA reported feeling unsafe in their city (Q26), one-third did not notice trees providing shade on sidewalks (Q27), and 20% failed to identify pleasant natural features in urban areas. These results underscore the importance of retaining these attributes and further examining their relationship with the subcategory.

In RMSG, the model's performance was marginal, with  $\chi^2/df = 3.110$ , GFI = 0.969, RMSEA = 0.126, and CFI = 0.811, indicating the proposed model did not align with the data structure. Reliability was also low ( $\alpha = 0.521$ ), with weak contributions from items Q25 and Q29. Removing these items increased internal consistency to  $\alpha = 0.609$ , necessitating deeper investigation into the shifts in factor loadings. Despite the marginal technical performance, specific analyses revealed that 85% of RMSG respondents agreed that increasing bike lanes and implementing low-emission zones effectively promote sustainable mobility and urban sustainability (Q25 and Q29). This high level of agreement influenced the results, emphasizing the importance of these attributes for the construct and the respondents' strong environmental awareness.

Table 29 - Quantitative analysis of the Innovation subcategory

Innovation	Q25-Q29								
5 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Innovation	Greater London	4,318	5	0,864	0,993	0,000	1,000	0,706	All higher 0,5
Innovation	RMPA	16,088	5	3,218	0,958	0,141	0,538	0,305	Q26, Q27 and Q28 low
Innovation	RMSG	15,548	5	3,110	0,969	0,126	0,811	0,521	Q25 and Q29 low
	<b>Take Q26, Q27 and Q28 off</b>								
Innovation	RMPA							0,690	
	<b>Take Q25 and Q29 off</b>								
Innovation	RMSG							0,609	Q26 low

Source: Elaborated by the author (2024)

These findings indicate that while Greater London demonstrated a well-adjusted and reliable model, RMPA and RMSG faced structural challenges that require targeted interventions to strengthen the construct. The Innovation subcategory shows potential to represent the construct effectively across metropolitan contexts, with Greater London's model serving as a valuable reference for improving practices in other regions.

#### *Net subcategory results*

The net subcategory (Q30–Q35) revealed significant differences in model performance across Greater London, RMPA, and RMSG, highlighting strong statistical fit but also challenges with reliability and specific item performance.

In Greater London, the model demonstrated satisfactory fit, with  $\chi^2/df = 1.719$ , GFI = 0.977, RMSEA = 0.079, and CFI = 0.917, showing alignment with the data. However, the CFI below the ideal threshold of 0.95 indicates room for improvement in incremental fit, while marginal reliability ( $\alpha = 0.643$ ) and the low factor loading of Q31 underscore limitations.

In RMPA, the model showed solid performance, with  $\chi^2/df = 0.692$ , GFI = 0.991, RMSEA = 0.000, and CFI = 1.000, reflecting strong fit and acceptable reliability ( $\alpha = 0.719$ ). Similar results were observed in RMSG, which also displayed very strong fit ( $\chi^2/df = 0.747$ , GFI = 0.994, RMSEA = 0.000, CFI = 1.000) and reliability near the acceptable threshold ( $\alpha = 0.710$ ).

Item-level analysis revealed specific challenges. Q31, which assesses whether

collaboration between the respondent's city and the Metropolitan Authority leads to more equitable and effective urban mobility solutions, saw about one-fifth of respondents across all regions either disagreeing or unable to answer, suggesting limited perception and understanding of the issue. Additionally, in RMPA and RMSG, 50% of respondents did not perceive intelligent traffic light systems as functioning adequately, reflecting the absence of this policy as a structured local practice.

Table 30 - Quantitative analysis of the Net subcategory

Net		Q30-Q35							
6 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Net	Greater London	15,475	9	1,719	0,977	0,079	0,917	0,643	Q31 low
Net	RMPA	6,228	9	0,692	0,991	0,000	1,000	0,719	Q31 and Q35 low
Net	RMSG	6,720	9	0,747	0,994	0,000	1,000	0,710	Q31 and Q35 low

Source: Elaborated by the author (2024)

In conclusion, the net subcategory demonstrates potential as a reliable and valid measure of the construct, provided that regional-specific challenges are addressed to enhance alignment with metropolitan realities.

#### *Climate change subcategory results*

The climate change subcategory (Q36–Q43) revealed variations in model performance, reliability, and item contributions across Greater London, RMPA, and RMSG, highlighting strengths and limitations. In Greater London, the model demonstrated excellent fit ( $\chi^2/df = 1.381$ , GFI = 0.9828, RMSEA = 0.058, CFI = 0.99) and high reliability (Cronbach's  $\alpha = 0.821$ ). All factor loadings exceeded 0.5, indicating strong item contributions and consolidating the model as well-adjusted and reliable for this region.

In RMPA, the performance was marginal, with  $\chi^2/df = 2.088$ , GFI = 0.9427, and RMSEA = 0.099, suggesting adjustment issues, particularly due to residuals. The CFI (0.899) fell below the ideal threshold (>0.95), and reliability was insufficient (Cronbach's  $\alpha = 0.658$ ). Items Q36, Q37, Q38, and Q39 displayed low factor loadings, compromising their relevance. These results emphasize the need for a contextual revision of these questions in RMPA.

Challenges were more pronounced in RMSG. Although  $\chi^2/df$  (3.869) was within the acceptable range (<5), GFI (0.938), RMSEA (0.147), and CFI (0.848) highlighted significant adjustment problems. Reliability, though moderate (Cronbach's  $\alpha = 0.754$ ), was undermined by the poor performance of Q36 and Q37. After adjustments, including the exclusion of Q36



and Q37, the model improved significantly ( $\chi^2/df = 1.152$ , GFI = 0.990, RMSEA = 0.034, CFI = 0.996, Cronbach's  $\alpha = 0.781$ ). Despite Q38's low factor loading, two-thirds of respondents strongly agreed on the importance of transitioning to electric vehicles (Q36), and three-quarters supported pedestrian and cyclist infrastructure (Q37). These findings highlight high awareness of these themes but limited perception of their execution as public policies.

Table 31 - Quantitative analysis of the Climate Change subcategory

Climate Change	Q36-Q43								
8 Questions	Reference			<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSEA	CFI	Cronbach's $\alpha$	Loadings
Climate Change	Greater London	27,627	20	1,381	0,983	0,058	0,982	0,821	All higher 0,5
Climate Change	RMPA	41,759	20	2,088	0,943	0,099	0,899	0,658	Q36, Q37, Q38 and Q39 low
Climate Change	RMSG	77,390	20	3,869	0,938	0,147	0,848	0,754	Q36 and Q37 low
<b>New analyses separating Q36, Q37, Q38, Q39 from Q40, Q41, Q42 and Q43</b>									
<b>Q36-Q39</b>									
Climate Change	RMPA			0,510	0,996	0,000	1,000	0,658	Q39 low
<b>Q40-Q43</b>									
Climate Change	RMPA			0,061	0,999	0,000	1,000	0,828	All higher 0,5
<b>Take Q36 and Q37 off</b>									
Climate Change	RMSG			1,152	0,990	0,034	0,996	0,781	Q38 low
<b>New analyses separating Q36, Q37, Q38 from Q39, Q40, Q41, Q42 and Q43</b>									
<b>Q36-Q38</b>									
Climate Change	RMSG							0,764	All higher 0,5
<b>Q39-Q43</b>									
Climate Change	RMSG							0,816	Q39 low

Source: Elaborated by the author (2024)

Further analysis in RMPA revealed improvements when separating Q36–Q39 and Q40–Q43. For Q36–Q39, the model fit was excellent ( $\chi^2/df = 0.510$ , GFI = 0.996, RMSEA = 0.000, CFI = 1.000), though Q39 showed marginal contributions. Q40–Q43 performed even better ( $\chi^2/df = 0.061$ , GFI = 0.999, RMSEA = 0.000, CFI = 1.000), with all factor loadings above 0.5 and high reliability (Cronbach's  $\alpha = 0.828$ ). Similar results were observed in RMSG, where

separating Q39–Q43 yielded satisfactory reliability (Cronbach's  $\alpha = 0.816$ ), though Q39 required further investigation.

This separation underscored distinct approaches in RMSG: Q36–Q38 addressed global and conceptual strategies, while Q39–Q43 evaluated practical policy implementation. The former relied on theoretical knowledge, while the latter reflected direct perceptions of concrete actions. This distinction reinforces the complementary nature of these dimensions, highlighting their specific contributions to construct analysis.

In conclusion, the climate change subcategory presents a sturdy and reliable model in Greater London, while RMPA and RMSG require adjustments and more detailed analysis. Grouping items into distinct clusters proved essential for refining analytical precision, demonstrating that regional adaptations are crucial for aligning the model with metropolitan contexts. Greater London serves as a benchmark for the other studies in this thesis, given its superior performance across all evaluated indicators.

#### *Foresights subcategory results*

The foresight/future thinks subcategory (Q44–Q52) demonstrated consistent model fit across Greater London, RMPA, and RMSG, while highlighting challenges with specific item contributions. In Greater London, the model performed exceptionally well, with  $\chi^2/df = 0.513$ , GFI = 0.989, RMSEA = 0.000, and CFI = 1.000, indicating a sturdy structure. Similarly, RMPA exhibited strong fit indices ( $\chi^2/df = 0.682$ , GFI = 0.992, RMSEA = 0.000, and CFI = 1.000) alongside high reliability ( $\alpha = 0.844$ ). However, items like Q51 and Q52 showed weak contributions, with low factor loadings. In RMSG, the model was equally solid ( $\chi^2/df = 1.018$ , GFI = 0.991, RMSEA = 0.000, and CFI = 1.000), and reliability remained high ( $\alpha = 0.8708$ ), but Q51 continued to underperform, while Q49 emerged as the most impactful item, highlighting heterogeneity in item relevance.

Detailed item analysis underscored the need for targeted refinement. Q51 consistently exhibited low loadings across all regions, with approximately 42% of respondents indicating no participation in organized, voluntary activities like associations, NGOs, or community groups that generate positive social impact. This finding aligns with similar results in the Regulation category (Q2), where 47% of respondents reported no involvement in community social activities, suggesting a gap in social integration. Q52, relevant only in RMPA, revealed that 30% of participants agreed to some extent that efforts to improve transportation accessibility in peripheral areas effectively reduce socio-spatial inequalities, emphasizing the importance of this attribute within that regional context.

Table 32 - Quantitative analysis of the Foresight/Future Thinks subcategory

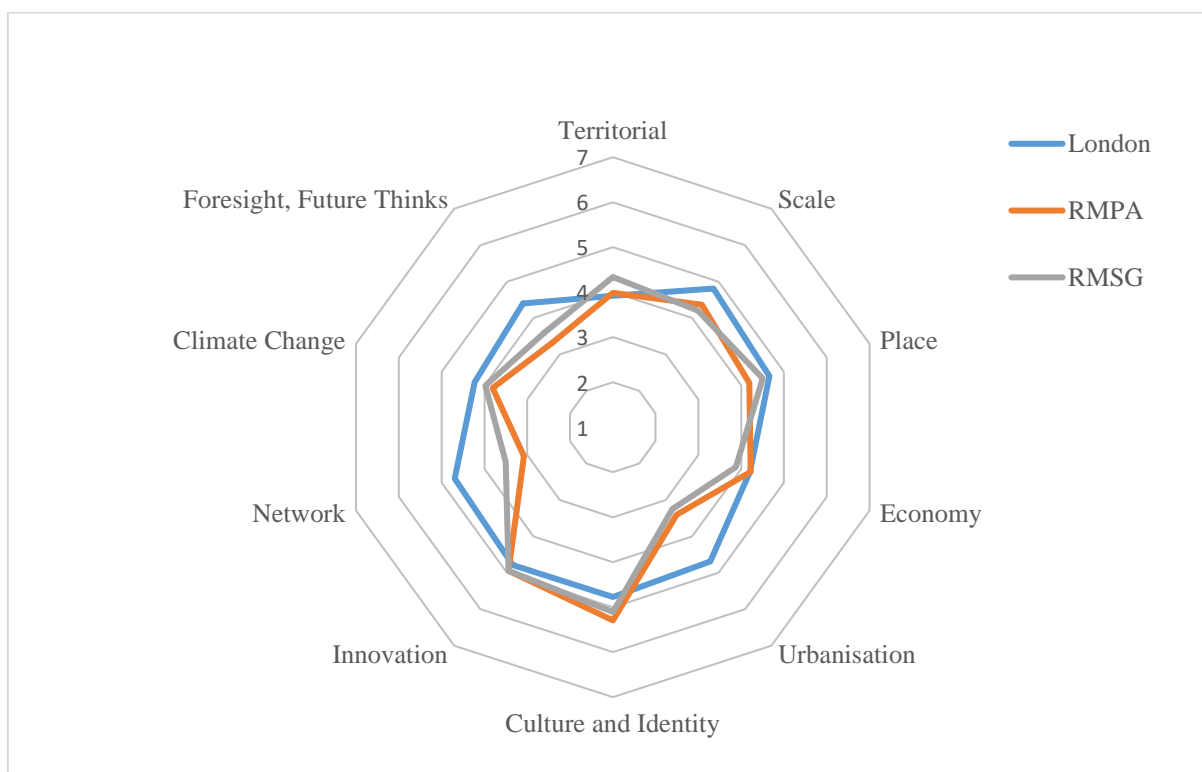
Foresight/ Future Thinks		Q44-Q52							
9 Questions				<3	>0,95	<0,08	>0,95	>0,6/0,7	
Subcategory	Region	$\chi^2$	df	$\chi^2/df$	GFI	RMSE A	CFI	Cronbach's $\alpha$	Loadings
Foresight/ Future Thinks	Greater London	13,850	27	0,513	0,989	0,000	1,000	0,790	Q51 low
Foresight/ Future Thinks	RMPA	18,408	27	0,682	0,992	0,000	1,000	0,844	Q51 and Q52 low
Foresight/ Future Thinks	RMSG	27,473	27	1,018	0,991	0,000	1,000	0,871	Q51 low

Source: Elaborated by the author (2024)

In conclusion, while the Foresight/future thinks subcategory provides a foundation for construct measurement, detailed case-by-case analysis is crucial for enhancing internal consistency, theoretical validity, and regional comparability. Such refinements will strengthen its applicability in both academic research and practical contexts.

The radar chart provides a comprehensive comparative analysis of average scores across various subcategories for the regions of Greater London, RMPA, and RMSG (Figure 20).

Figure 20 - Averages of the subcategories evaluated in the quantitative phase.



Source: Elaborated by author (2024).

Greater London consistently achieves the highest scores, reflecting more positive perceptions, particularly in scale, urbanisation, and Foresight/future thinks. In contrast, RMPA and RMSG exhibit more heterogeneous performances, with RMSG recording the lowest scores in urbanisation and network, highlighting specific challenges in these areas. Notably, RMPA outperforms even Greater London in culture and identity, suggesting a strong local perception of cultural engagement and identity preservation. These disparities underscore not only regional variations but also the need for tailored policies and strategies to address the unique contexts of each metropolitan area. This analysis highlights the importance of detailed contextual evaluations to strengthen sustainable mobility policies and urban development strategies.

#### 4.4 MIXED ANALYSIS

This research identifies parallels between CPT and GPT, aligning with contemporary studies on metropolitan analysis. Key concepts such as territoriality, scale, locality, net, urbanisation, and urban economy are central to understanding regional dynamics, while distinct culture and identity, innovation and climate change, and foresight and future planning are essential for comprehensive metropolitan studies.

The three regions differ significantly in terms of size, population density, governance structures, and the operational status of their metropolitan regions (Table 39) into Appendix e – relationships between the concepts announced and the case studies. The RMSG, with a population density of 186.81 inhabitants per square kilometer, remains unregulated and non-operational, highlighting its nascent stage in metropolitan planning. The RMPA demonstrates moderate progress, featuring a population density of 388.41 inhabitants per square kilometer, partial operational status since 1973, and regulated governance structures. In contrast, Greater London, with a population density of 5,500 inhabitants per square kilometer, exhibits advanced governance, full operational integration, and democratic features such as the election of the Mayor of Greater London, reflecting its maturity as a global metropolitan area.

The conceptual framework of territoriality underscores varying degrees of integration across these regions. RMSG and RMPA operate within a national framework divided into states and municipalities, with RMSG serving as a regional capital and RMPA as a state capital in Brazil's urban hierarchy. Greater London, functioning as both the United Kingdom's capital and a global city, exists within a complex regional system of counties, regions, and unitary authorities. This global integration highlights its dual significance as a national and international hub.

The spatial contexts of RMSG and RMPA are shaped by diverse Brazilian topographies and planning dynamics, whereas Greater London benefits from its centrality, flat terrain, and historical connection to the Thames River. While RMPA shows stronger regional integration compared to RMSG's fragmented planning efforts, Greater London capitalizes on its position as an economic and cultural nucleus, leveraging the Thames as a cornerstone of urban and economic development.

Urbanisation levels further illustrate disparities in metropolitan development. RMPA (96.90% in 2010) and RMSG (91.62% in 2010) demonstrate Brazil's rapid urbanisation trends, yet fall short of Greater London's near-total urbanisation. This disparity highlights the maturity of London's urban systems, which feature dense, interconnected networks, compared to the ongoing challenges of integrating peripheral areas in RMPA and RMSG.

Economic diversification characterizes all three regions but varies in scale and reach. RMSG and RMPA primarily operate at the national level, with some international influence. In contrast, Greater London functions as a global economic powerhouse, driven by its role as a financial hub and its concentration of multinational corporations and leading research institutions.

Cultural and identity reflects regional diversity, with RMSG emphasizing its Italian heritage through gastronomy and tourism, and RMPA showcasing Brazil's gaucho culture alongside German and Portuguese influences. Greater London, shaped by global migration, epitomizes multiculturalism and positions itself as an international cultural capital with a wealth of events, institutions, and venues celebrating its diverse identity.

Innovation levels present stark contrasts. While RMSG and RMPA are home to nationally recognized academic and research institutions, Greater London is a global leader in innovation, hosting world-renowned universities, cutting-edge research facilities, and headquarters for leading financial and technological companies, cementing its status as an epicenter of global advancement.

Transport infrastructure underscores the developmental disparities among the regions. RMPA and RMSG prioritize regional connectivity, relying on federal and state highways, with RMPA benefitting from multimodal integration including railways and waterways. RMSG, however, lacks integrated waterway transport and operates on a smaller airport scale. Greater London surpasses both, featuring a sophisticated and integrated transport network of highways, railways, waterways, six international airports, and a subway system with 272 stations, showcasing unparalleled connectivity.

Climate change planning highlights significant differences in environmental governance. Both RMPA and RMSG lack formal policies addressing climate change, reflecting gaps in long-term planning. In contrast, Greater London leads in this area with established climate policies focused on emissions reduction, green infrastructure, and urban resilience, positioning it as a global model for proactive environmental governance.

Foresight and future planning further distinguish Greater London, which demonstrates advanced capabilities through measurable long-term projects and strategic goals. RMPA and RMSG, in contrast, lack defined future-oriented strategies, underscoring their developmental stage in metropolitan planning. This disparity reinforces Greater London's role as a benchmark for innovative and sustainable urban governance, while RMPA and RMSG highlight opportunities for targeted improvements to align with national and global standards.

#### **4.4.1 Mixed analysis of all cases**

The mixed analysis of the case studies begins with an integrative approach based on the convergence presented in Figure 19. The analyses were conducted by subcategory, drawing on concepts derived from two classical theories and recent studies discussed earlier in this thesis. Using a case study method and a mixed approach, the research integrates results from the qualitative and quantitative phases.

In the qualitative analysis, Greater London identifies 33 attributes, the RMPA recognizes 35, and the RMSG highlights 36. Of these, 27 attributes are shared across all three case studies, indicating significant convergence (Table 33). However, attributes such as Climate Change and Sustainability, Climate Change Mitigation Strategies, and Enhanced Public Transport and Non-motorized Mobility, identified in Greater London, were not recognized in the RMPA or RMSG. Additionally, Greater London's Public Spaces and Accessibility attribute was reinterpreted as Public Transport Efficiency in the other regions.

The RMPA introduces six new attributes compared to Greater London: Study of the Territory, Unified Governance and Integrated Planning, Social and Economic Equity, Flood Management and Urban Planning, Integration and Coordination, and Forward-Looking Mobility Strategies and Policy Influence. Similarly, the RMSG includes these five attributes and adds Need for Strategic Investment in Mobility Solutions.

Table 33 - Non-convergent attributes between the three cases studies

Attributes	Subcategory Align	Greater London	RMPA	RMSG	Observation
Study of the Territory	Territorial	-	New	New	Not identified
Unified Governance and Integrated Planning	Innovation	-	Emerged	Emerged	Not identified in Greater London
Public Spaces and Accessibility	Innovation	Public Spaces and Accessibility	Public Transport Efficiency	Public Transport Efficiency	Understanding Change in RMPA and RMSG
Social and Economic Equity	Innovation	-	Emerged	Emerged	Not identified in Greater London
Need for Strategic Investment in Mobility Solutions	Net	-	-	Emerged	Emerged RMSG only
Flood Management and Urban Planning	Climate Change	-	Emerged	Emerged	Not identified in Greater London
Climate Change and Sustainability	Climate Change	Emerged	-	-	Emerged Greater London only
Climate Change Mitigation Strategies	Climate Change	Emerged	-	-	Emerged Greater London only
Enhanced Public Transport and Non-motorized Mobility	Foresight, Future Thinks	Emerged	-	-	Emerged Greater London only
Integration and Coordination	Foresight, Future Thinks	-	Emerged	Emerged	Not identified in Greater London
Forward-Looking Mobility Strategies and Policy Influence	Foresight, Future Thinks	-	Emerged	Emerged	Not identified in Greater London

Source: Elaborated by the author (2024).

The attribute Study of the Territory (territorial subcategory) emerges exclusively in the RMPA and RMSG, reflecting these regions' focus on the spatial relationship between urbanization, land use, and service provision. This attribute is linked to challenges such as municipal fragmentation and the need for more robust regional planning frameworks. In contrast, its absence in Greater London likely stems from its consolidated governance and advanced spatial integration, where foundational discussions on territorial cohesion are less pertinent due to its high level of administrative and urban maturity.

The emergence of the attribute Unified Governance and Integrated Planning (innovation subcategory) in the RMPA and RMSG highlights the urgency for cohesive regional governance frameworks in Brazil, where fragmented municipal administrations hinder integrated planning and mobility efforts. In contrast, its absence in Greater London reflects the presence of established structures, such as the GLA and TfL, which provide centralized oversight, reducing the need for additional integrated governance frameworks.

In Greater London, Public Spaces and Accessibility (innovation subcategory) are deemed essential for urban sustainability and inclusion, supported by significant investments in

pedestrian and cyclist infrastructure. In contrast, in the RMPA and RMSG, this attribute has been reinterpreted as Public Transport Efficiency (innovation subcategory), reflecting a more fundamental focus on providing reliable and equitable transport services. This difference highlights gaps in non-motorized mobility infrastructure development in these Brazilian regions compared to the advanced maturity of Greater London.

The RMPA and RMSG feature the attribute Social and Economic Equity (innovation subcategory), emphasizing the need to address socio-spatial inequalities and improve transport access for underserved populations. This focus aligns with the challenges of fostering regional inclusion in the context of historical disparities. In contrast, the absence of this attribute in Greater London can be attributed to its advanced socio-economic integration and established urban policies, rendering this issue less prominent.

The attribute Need for Strategic Investment in Mobility Solutions (net subcategory) emerges in the RMSG as a response to specific infrastructure deficits, particularly in underserved areas and intermunicipal connectivity. This attribute underscores the need for substantial investments in basic transport networks to meet regional demand. In the RMPA, its lower prominence can be attributed to higher population density, its status as a state capital, and the availability of public transport systems like TRENURB, which partially address these needs. In Greater London, the absence of this attribute reflects a more advanced and consolidated transport infrastructure, with a focus on integration and enhancement strategies rather than initial investments in basic infrastructure.

Flood Management and Urban Planning (climate change subcategory) is a critical attribute in the RMPA and RMSG, highlighting the urgency of mitigating climate risks such as floods that impact regional mobility and infrastructure. Its emergence is also linked to recent flooding and natural disasters in these regions during 2023 and 2024. In contrast, the absence of this attribute in Greater London can be attributed to the integration of flood management into broader climate strategies, reducing its prominence as an isolated issue.

Greater London demonstrates leadership in Climate Change and Sustainability (climate change subcategory) through advanced policies and carbon-neutral initiatives that underscore its commitment to urban sustainability. In contrast, the absence of this attribute in the RMPA and RMSG suggests these regions remain focused on more basic environmental strategies, lacking comprehensive approaches. A similar analysis applies to the attribute Climate Change Mitigation Strategies (climate change subcategory), reflecting Greater London's proactive efforts to reduce emissions through initiatives such as low-emission zones and public transport electrification. In the RMPA and RMSG, the absence of this attribute indicates a lack of such



public policies and a prioritization of immediate resilience measures over advanced emission reduction strategies.

Greater London prioritizes Enhanced Public Transport and Non-motorized Mobility (Foresight/future thinks subcategory) through investments in sustainable infrastructure such as cycling lanes and pedestrian networks. The absence of this attribute in the RMPA and RMSG reflects a focus on basic transport improvements rather than advanced mobility strategies.

In contrast, the RMPA and RMSG emphasize Integration and Coordination and Forward-Looking Mobility Strategies and Policy Influence (Foresight, future thinks subcategory), highlighting the need to harmonize policies and strengthen intermunicipal collaboration to address governance fragmentation. These attributes also underscore the growing importance of long-term strategies to tackle urbanization and sustainability challenges. In Greater London, these attributes are not explicitly identified, as integration is inherently managed through centralized governance structures such as the GLA and TfL. These institutions, supported by well-established planning frameworks, ensure that long-term strategies are seamlessly embedded in regular governance and urban planning practices.

Building on these findings and the relationships among attributes identified in the case studies, the thesis proceeds with integrated qualitative and quantitative analyses. These analyses, organized by subcategory, align with the research structure, enabling a coherent and systematic approach to exploring the convergences and divergences between the cases. This methodology deepens data interpretation and strengthens the connection between identified attributes and the regional contexts under study.

### *Territorial*

The RMPA and RMSG introduce a unique attribute, Study of the Territory, which receives less emphasis in Greater London. In the RMPA, stakeholders highlight the intricate relationship between land use and service provision, with mobility projects and land parceling playing key roles in shaping territorial landscapes. Similarly, the RMSG focuses on structured territorial governance through regulatory frameworks (e.g., Law 14.293) and coordinated infrastructure management. This structured approach underscores the strategic use of land to support sustainable occupation and efficient service delivery, illustrating a nuanced understanding of territorial planning in Brazilian metropolitan regions.

The Principle of Socio-Spatial Structuring reveals significant regional distinctions. This attribute emphasizes the link between land use and regional governance, underscoring the need for regulatory frameworks and coordinated planning to address fragmentation and urban sprawl. In Greater London, the principle manifests through active engagement with urban

landscapes, showcasing flexibility in accommodating diverse personal and professional projects. In the RMPA, it operates via structured coordination of land use and transportation, leveraging regulatory frameworks to manage urban sprawl and promote metropolitan cohesion. In the RMSG, socio-spatial structuring addresses challenges of fragmented governance, emphasizing regional cooperation and boundary delineation for integrated planning. Quantitative analysis revealed conceptual misalignment for this attribute, and its removal improved reliability indices, highlighting limitations in understanding socio-spatial issues. Nevertheless, qualitative findings underscored the importance of integrated governance and participatory frameworks for effective socio-spatial structuring, linking this attribute to the Scale subcategory.

In Construction of Internal/External Partitions, divisions in Greater London are shaped by emotional and professional ties, influencing stakeholders differently based on their focus on central or peripheral areas. This reflects the complexity of balancing diverse interests in a global metropolis. In the RMPA and RMSG, emphasis lies on governance models promoting integrated structures. The RMPA prioritizes transport connectivity, exemplified by aerial tram systems, while the RMSG seeks to overcome historical divisions to strengthen regional cohesion. Quantitative analysis supports these observations, with 57.18% of respondents agreeing on the importance of integration to overcome internal and external barriers. These findings highlight the need for strategies that combine functional connectivity with governance alignment, addressing local and regional dynamics effectively.

Fields of Operation illustrate dynamic responses to boundaries, limits, and socio-economic pressures. Greater London continuously adjusts its boundaries to address socio-economic changes, fostering fluid interactions between residents and urban spaces. The RMPA integrates transport and urban planning to address historical land-use challenges and pursue sustainability goals. Meanwhile, the RMSG focuses on overcoming historical fragmentation through strategic alliances and political frameworks that promote a unified regional identity. Quantitative data reinforces this perspective, with 61.87% of respondents agreeing on the relevance of this attribute. This dynamic approach examines how regions respond to socio-economic changes and external pressures by adjusting boundaries and strategies to enhance regional cohesion and ensure long-term sustainability.

### *Scale*

In Greater London, Governance Dynamics and Organization highlight the importance of inter-borough collaboration under entities such as the GLA and TfL. Projects like the Elizabeth Line exemplify unified infrastructure efforts aimed at reducing disparities while

preserving borough independence. In contrast, the RMPA and RMSG emphasize the need for a unified metropolitan planning authority to integrate fragmented systems. However, there is no consensus on its structure or existence, reflecting divergent opinions. In both Brazilian cases, the need for integrated regional governance is evident, supported by 45.34% of quantitative respondents, though approximately 20% remain neutral or uninformed about metropolitan governance or authority.

The Principle of Socio-Spatial Structuring reveals both shared goals and interpretative differences across the regions studied. This attribute examines how layered socio-spatial structures promote regional connectivity, addressing inequalities between well-connected and underserved areas, and the impact of centralization versus local autonomy in socio-spatial policies. In Greater London, consensus exists on the value of layered structures for connectivity, but opinions vary on their effectiveness in addressing disparities between wealthier and less-connected boroughs. In the RMPA, interviewees acknowledge the importance of socio-spatial structuring for governance and mobility but differ on prioritizing centralized policies versus municipal flexibility. In the RMSG, there is agreement on the role of socio-spatial integration in strengthening regional identity and cohesion, but opinions diverge on the balance between regionalization and local autonomy.

Infrastructure concerns also emerge in the quantitative data, with 66% of respondents expressing agreement on the need for improved integration. The thesis identifies this limited progress as directly linked to the lack of infrastructure and coordination between municipalities, a recurring issue highlighted by interviewees. This attribute aligns closely with others within the Territorial subcategory, reinforcing the need for integrated solutions to address socio-spatial and governance challenges.

### *Place*

The attribute Market, Traffic, and Administrative Separation examines the interplay between markets, traffic flow, administrative divisions, and the influence of governance and resource distribution on mobility and access to public services. In Greater London, the city functions as a multicultural, market-oriented hub supported by an extensive public transport network, such as the Elizabeth Line. However, opinions diverge on administrative separation: some interviewees advocate for greater inter-borough collaboration to ensure equitable resource distribution, while others highlight persistent disparities in access to public services. In the RMPA, stakeholders agree on the need for institutional integration to optimize transport and reduce inefficiencies, whether through metropolitan oversight or a hybrid model respecting municipal autonomy. Similarly, in the RMSG, coordinated governance is emphasized to

address infrastructure challenges like highway congestion and insufficient resources to meet regional demands. Both Brazilian cases reveal difficulties in identifying a comprehensive regional service network, with approximately half of respondents recognizing this necessity.

The Principle of Socio-Spatial Structuring illustrates the impact of spatial organization on connectivity and regional equity. In Greater London, convergence occurs through an interconnected urban fabric, where public transport enhances accessibility and proximity between boroughs. However, debates arise over whether centralization is necessary to address socio-economic disparities or if borough autonomy should be preserved. In the RMPA, socio-spatial structuring is recognized as vital for reducing inequalities and transportation costs, though stakeholders are divided between centralized or locally tailored approaches to integration. In the RMSG, socio-spatial structuring is viewed as a tool for balanced development, with central cities like Caxias do Sul acting as growth hubs. Disagreements persist over whether smaller cities should assume broader roles or if larger hubs should remain dominant. This attribute also addresses perceptions of territorial risk, with quantitative data revealing that 83% of respondents are unaware if they live in risk-prone areas. This highlights the need to revise question Q7 and incorporate risk awareness into territorial planning strategies.

The attribute Place-Centrism reveals convergence across the three regions in valuing identity and inclusive development. In Greater London, interviewees emphasize the city's global identity, cultural diversity, and urban innovation, but diverge on balancing rapid development with historic preservation. In the RMPA, there is consensus on sustainable growth focused on public transport and equity, although stakeholders debate prioritizing unified regional plans versus local initiatives. In the RMSG, regional cooperation is highlighted, particularly in mobility and social services. Quantitative analysis reinforces this attribute, showing alignment on street conditions, safety, and ease of access to essential services, with 46.61% agreement on questions Q9 and Q10 and 61.60% on Q11. These findings underscore the importance of Place-Centrism in integrated urban planning, demonstrating its role in fostering more inclusive and efficient development.

### *Urbanisation*

In the attribute of Urbanisation and Urban Planning, the effective use of infrastructure in Greater London, including the extensive public transport system and the green belt policy, demonstrates a convergence in managing urban density and preserving green spaces. However, there are divergences regarding the impact of the green belt: while some stakeholders consider it essential for controlling urban sprawl, others criticize it for limiting affordable housing supply and exacerbating migratory pressures. In the RMPA, there is consensus on the necessity of

cohesive urban planning to balance urban and rural dynamics, although opinions diverge on the ideal governance model—whether centralized or decentralized—for effective land use. In the RMSG, stakeholders agree on the importance of zoning regulations to control urban expansion and protect agricultural land but differ on whether these regulations should remain stringent to preserve rural livelihoods or be more flexible to accommodate growth. Quantitative analysis indicates that 61.60% of respondents do not perceive specific regional policies linking urban, peri-urban, and rural areas, underscoring the need for integrated strategies.

For Mobility and Urban Planning, there is consensus in Greater London on the importance of public transport for enhancing accessibility and sustainability. Adaptive strategies have emerged in response to post-pandemic commuting patterns, with debates among stakeholders: some advocate for sustainable alternatives such as cycling, while others emphasize the need for car accessibility in peripheral boroughs. In the RMPA, stakeholders converge on improving public transport to connect urban and rural areas and reduce commuting costs. However, opinions diverge on whether to prioritize broad metropolitan strategies or localized interventions, such as rural subsidies. In the RMSG, the focus is on improving road infrastructure to connect rural and urban areas, but there is disagreement over whether to prioritize road expansion or public transport to reduce dependence on private vehicles. Half of the respondents reported that roads are inadequate for all rural residents, and they disagreed that alternative modes of transport to cars are used for commuting to work. These findings highlight the need to advance this attribute to foster greater public engagement and awareness.

The RMPA and the RMSG emphasize Innovative Solutions for Urban Mobility with a territorial focus absent in Greater London's discussions. In the RMPA, initiatives such as "Zero Fare" reflect a commitment to rural-urban connectivity, offering free transport solutions to underserved populations and promoting mobility equity. This approach demonstrates a nuanced understanding of the socio-spatial interdependencies characteristic of the region. Similarly, the RMSG prioritizes the integration of digital and physical infrastructures to enhance mobility between rural and urban areas, fostering economic and social cohesion among municipalities. These initiatives reveal a deep engagement with local socio-economic and territorial realities, offering tailored solutions not explicitly addressed in Greater London's metropolitan mobility strategies.

### *Economy*

In Investment and Infrastructure for Mobility, all analysed regions agree on the critical need for robust transport infrastructure to sustain economic activity and enhance connectivity. In Greater London, attention is focused on large-scale projects such as the Elizabeth Line and

HS2, which strengthen inter-regional links and consolidate its role as a global hub. However, disagreements emerge regarding investment priorities, with some stakeholders advocating for national redistribution and others emphasizing local demands. In the RMPA, there is alignment on the necessity of connecting urban centers with peripheral and rural areas through public transport, although opinions diverge on whether centralized or decentralized governance should lead these efforts. Similarly, the RMSG highlights the importance of improving road and transport networks to economically integrate the region, but debates persist over whether private partnerships or regional collaborations should drive investments. Quantitative analysis shows a low level of perceived alignment on this attribute, requiring further interpretative precision. Specifically, Q12, which evaluates the adequacy of infrastructure to meet population needs, revealed agreement levels of 66% in Greater London, 37.16% in the RMPA, and 42.53% in the RMSG, exposing a clear perception gap among the case studies.

In Economic Concentration and Spatial Inequality, Greater London's role as a national economic powerhouse fosters growth but exacerbates spatial inequalities within the city and compared to other regions. Stakeholders are divided between urban densification strategies to improve accessibility and expanding transport links to redistribute opportunities. In the RMPA, there is consensus on promoting economic activities among municipalities to counterbalance Porto Alegre's dominance, though opinions differ on whether to create decentralized sub-centers or enhance regional connectivity. In the RMSG, the focus is on economic diversification to stabilize the regional economy, with tensions between centralized planning and municipal autonomy in addressing inequalities. As with the previous attribute, quantitative data required careful evaluation. For Q13, which pertains to cost of living, agreement levels were 23.47% in Greater London, 18.58% in the RMPA, and 20.14% in the RMSG, underscoring the need for more balanced strategies to address regional disparities.

In Sustainability and the Sharing Economy, all regions emphasize the importance of reducing environmental impacts and improving resource efficiency. Greater London leads in integrating technological solutions, such as car and bike-sharing initiatives, although stakeholders disagree on how to ensure equitable access to these services. In the RMPA, there is convergence on integrating sustainable practices into urban planning, but opinions differ on prioritizing technological solutions. In the RMSG, attention is directed toward shared infrastructure and sustainable tourism as strategies to balance growth and environmental responsibility, with divisions between regional cooperation and municipality-led initiatives. Joint analysis of Q14 and Q15 indicates higher perceptions in the RMPA, with 70.79% agreement, while Greater London recorded 52.17% and the RMSG 47.01%.

### *Culture and Identity*

In the attribute Governance and Metropolitan Cosmopolitan Character emerges as a central theme across the three regions, underpinning efforts to foster inclusion and manage cultural exchanges. Quantitative data indicates that 70.99% of respondents agree, to some extent, that equitable and inclusive urban planning supports cultural diversity in metropolitan areas. In Greater London, governance mechanisms promote inclusion and modernization of public spaces, reflecting its global and multicultural character. However, stakeholders are divided on whether to prioritize historical preservation or adapt infrastructure for inclusion, revealing tensions between tradition and modernization. In the RMPA, cohesive governance is deemed essential to managing cultural diversity and infrastructure, though debates persist regarding centralization in Porto Alegre versus decentralization to preserve municipal identities. Similarly, in the RMSG, stakeholders agree on the need for regional collaboration to balance economic growth and cultural preservation but differ on whether centralized oversight or municipal autonomy better addresses the region's specificities.

Enrichment Through Diversity is widely acknowledged as essential to enhancing cultural, social, and economic landscapes. Quantitative analyses of Q20, Q21, and Q22 reveal that 48.34% of respondents agree, to some extent, on the relevance of this attribute, while Q22 alone reached 83.14%, emphasizing the importance of regions open to diversity. In Greater London, diversity is intrinsic to its cosmopolitan identity and innovation, but opinions differ on its integration: some view distinct cultural communities as barriers to social cohesion, while others highlight the city's success in blending cultures into a unified urban identity. In the RMPA, diversity is valued as a driver of enrichment, though stakeholders disagree on the visibility and reach of cultural policies, with some advocating for the expansion of cultural events. In the RMSG, diversity is deeply connected to Italian and German heritage, with consensus on its importance but differing views on how to integrate new residents without compromising historical traditions. These findings suggest that the attribute may be better understood when analysing individual questions rather than relying on a consolidated view.

Cultural Integration and Identity is critical for fostering cohesive identities in metropolitan areas, though approaches vary. In Greater London, cultural integration is celebrated as a cornerstone of an inclusive identity, but stakeholders disagree on its long-term effects: some argue it strengthens cultural identity through fusion, while others warn of the dilution of distinct traditions. In the RMPA, there is consensus on balancing integration with preserving municipal identities, with cultural events reinforcing community ties. However, stakeholders differ on the degree of integration necessary, reflecting divergent views on a

unified metropolitan identity. In the RMSG, stakeholders emphasize collaboration to preserve the Serra Gaúcha's heritage while integrating new influences, debating whether to prioritize traditional celebrations or accommodate demographic changes. Quantitative analyses, such as Q23 (83.14% agreement), highlight the potential of cultural integration to strengthen community cohesion. In contrast, Q24 (48.89% satisfaction with cultural options) exposes significant gaps in cultural offerings, which may explain the low exploratory factor scores in both Brazilian case studies. These results underscore the need to enhance cultural policies that meet regional demands and elevate the perceived value of cultural contributions within metropolitan communities.

### *Innovation*

Infrastructure and Mobility Innovations emerge as a critical attribute across the three regions, emphasizing the importance of transportation infrastructure to enhance connectivity and drive economic activity. Confirmatory quantitative analysis reveals that 81.49% of respondents agree, to some extent, with the link between innovation, sustainable mobility, and active transportation. In the RMSG, this issue required joint analysis with Q29, related to Behavioral Change and Environmental Sustainability. In Greater London, convergence is evident through projects such as the Elizabeth Line, cycling lanes, and the Ultra Low Emission Zone (ULEZ), which underline its commitment to reducing car dependency and promoting sustainable mobility. However, stakeholders diverge on investment priorities: some advocate for expanding cycling and pedestrian infrastructure, while others emphasize public transport electrification and expanding low-emission zones. Despite these differences, the actions are complementary and interconnected. In the RMPA, there is consensus on the need for substantial investments, especially through public-private partnerships, to modernize systems such as TRENURB and adopt smart mobility solutions. Divergences emerge regarding the balance between traditional improvements and innovative technologies, such as micromobility and real-time tracking applications. In the RMSG, stakeholders agree on the importance of coordinated investments in transportation, including road expansion, airport upgrades, and logistics connectivity. However, there is no clear regional priority or focus on urban infrastructure to address congestion.

Behavioural Change and Environmental Sustainability reveals consensus on promoting sustainable behaviours to achieve environmental goals. Concepts such as incentivizing cycling and walking, along with implementing low-CO<sub>2</sub> emission zones, are widely acknowledged, with 75.96% of respondents in agreement. Specific analysis of Q29 shows Greater London with a lower percentage of agreement (69.56%) compared to the RMPA (79.64%) and RMSG



(78.35%). This suggests that, in London, these initiatives are perceived as part of an established culture rather than innovative measures. In Greater London, initiatives like ULEZ, electrified buses, and pedestrian-friendly projects align with emission reduction and environmental awareness. Divergences emerge in the promotion methods: some advocate strict vehicle-use restrictions, while others prefer gradual approaches to ensure public adaptability. In the RMPA, there is alignment on sustainable practices in transport planning, focusing on reducing car dependency and increasing public transport use. Debates revolve around the implementation pace, balancing immediate actions with gradual adaptations. Similarly, in the RMSG, there is agreement on sustainability in regional planning, particularly in transport and waste management. Divergences include the preferred level of intervention, from regional awareness campaigns to stricter regulations.

In Greater London, the attribute Public Spaces and Accessibility reflects a strong commitment to urban space restructuring through the creation of pedestrian zones, cycling routes, and low-traffic neighbourhoods. These initiatives aim to enhance safety, reduce car dependency, and improve urban quality of life. However, stakeholders' priorities diverge, with some advocating for the rapid expansion of active transportation infrastructure, while others emphasize the need for a more systemic perspective on potential negative impacts on traffic and existing transportation systems. Confirmatory analysis comparing case studies coincidentally suggested the exclusion of questions Q26, Q27, and Q28 in the RMPA to enhance factor loadings and model reliability indices. This technical recommendation aligns with qualitative insights from respondents, which highlighted variations in perceptions and concepts related to the same theme. These findings underscore the necessity of tailoring question formulation to contextual specificities and accounting for the diverse interpretations of respondents.

The attribute Public Transport Efficiency, emerging exclusively from the interpretations of respondents in the RMPA and RMSG, emphasizes the integration of public spaces into an accessible and cohesive transport network. There is consensus on the importance of expanding public transport to reduce congestion and ensure equitable mobility across municipalities. However, stakeholders differ on priority strategies: while some advocate for unifying transport lines and enhancing integration, others point to the necessity of broader investments in infrastructure such as sidewalks, cycling paths, and pedestrian-friendly areas.

In the RMSG, Public Transport Efficiency underscores the need for accessible transport infrastructure to promote regional connectivity and social inclusion. Stakeholders agree on integrating public spaces with transport systems to foster economic and social cohesion in a

region characterized by both urban and rural populations. Nonetheless, divergences emerge in project focus: some prioritize investments in active transport infrastructure, such as bike lanes and sidewalks, while others emphasize improving public transport networks to address the needs of less urbanized areas.

Notable differences and significant similarities exist between the Brazilian metropolitan regions studied. These distinctions reflect the urban and rural complexities of both the RMPA and the RMSG, necessitating a strategic allocation of resources to simultaneously address densely populated urban centers and less connected peripheral regions. The analysis of these differences suggests that they should not be seen as mutually exclusive but as complementary perspectives which, if implemented in an integrated manner, could lead to substantial advancements in metropolitan planning and management. This contrast highlights the challenge of balancing innovative public space design solutions with the strengthening of essential transport infrastructure to inclusively and effectively meet regional needs.

The comparative analysis reveals a shared commitment among Greater London, RMPA, and RMSG to advance Public Spaces and Accessibility and Public Transport Efficiency as fundamental pillars for equitable mobility and urban inclusion. All regions recognize the transformative potential of cohesive infrastructure to enhance quality of life and strengthen social and economic connectivity. However, their strategies diverge in response to specific regional challenges. Greater London prioritizes rapid transformations in public spaces to foster active transport, navigating tensions between modernization and system stability. In contrast, the RMPA and RMSG focus on bridging the divides between urban and rural areas: the RMPA aims to harmonize transport integration and mitigate disparities, while the RMSG seeks to balance investments in active transport and basic public transport infrastructure. These approaches underscore the need to tailor mobility solutions to the socio-economic, geographical, and cultural contexts of each region, offering critical insights for developing inclusive and adaptable urban strategies on a global scale.

In the RMPA, there is broad agreement on the necessity of Unified Governance and Integrated Planning to optimize transport and implement the 2009 metropolitan plan. Stakeholders emphasize the importance of a cohesive authority to ensure consistent policies and efficient resource allocation, balancing national guidelines with local collaboration to preserve regional autonomy and address specific needs.

In the RMSG, there is convergence on the need for collaborative governance to tackle regional mobility and infrastructure challenges. Stakeholders agree on the creation of a governance council to unify the region's 14 municipalities, addressing priority issues such as

transportation and housing. However, opinions diverge regarding the strategy and urgency of implementation. Some advocate for the immediate establishment of a centralized council to expedite regional initiatives, while others prefer a gradual legislative approach that allows for greater adaptation and consensus among the municipalities involved.

On the issue of Social and Economic Equity in both the RMPA and RMSG, there is convergence on the importance of ensuring equitable access to transportation and infrastructure as a means to reduce socioeconomic disparities and promote inclusive development. In the RMPA, stakeholders identify public-private partnerships as indispensable tools for achieving these objectives. However, concerns arise regarding the involvement of the private sector, particularly about maintaining accessibility and equity, with fears that privatization could undermine the reach of services to lower-income populations.

Similarly, in the RMSG, there is a shared understanding of the importance of public-private partnerships. However, the discussion is shaped by the need to address economic and social disparities between urban and rural areas. Divergence emerges in the strategic approach: some stakeholders advocate prioritizing improvements in less-developed areas to correct historical imbalances, while others propose implementing a centralized framework to ensure that equity policies are applied uniformly across the region.

#### *Net*

All three regions emphasize the importance of Integrated Transport Networks for efficient mobility. Confirmatory analysis revealed that 43.01% of respondents believe city streets are well-maintained (paved and free from major defects), while 53.09% disagree. This negative perception is even more pronounced in the Brazilian cases, reaching 63.56%, highlighting consensus between the qualitative and quantitative phases regarding infrastructure conditions. In Greater London, the transportation system is highly developed, with initiatives such as Legible London and cohesive networks enhancing connectivity between boroughs. In contrast, the RMPA and RMSG face significant challenges. In the RMPA, fragmented fare systems and the absence of unified ticketing compromise accessibility. Meanwhile, in the RMSG, infrastructure deficiencies hinder connectivity, particularly in rural and underserved areas. These disparities reflect different stages of development, with Greater London serving as a model of advanced integration, while the RMPA and RMSG still grapple with basic structural gaps.

The attribute of Governance and Collaboration Across Municipalities (Boroughs or Cities) highlights the need for cooperation among municipalities to optimize transportation strategies. In Greater London, centralized governance under Transport for London (TfL)

ensures cohesive planning, aligning mobility policies and objectives. This centralization was emphasized by 60% of respondents, contrasting with the Brazilian cases, where this figure is below 50%. In the RMPA, fragmented governance leads to political misalignments, while in the RMSG, stakeholders advocate for the establishment of a regional body to coordinate intermunicipal planning. This comparison underscores the efficiency of Greater London's advanced governance model versus the decentralized and fragmented approaches in the RMPA and RMSG.

All three regions acknowledge the importance of Forward-Looking Mobility Strategies and Policy Influence to meet growing transportation demands. Greater London excels with innovative policies spearheaded by TfL, integrating digital platforms and prioritizing sustainable solutions such as low-emission zones. In contrast, the RMPA and RMSG recognize the potential of such strategies but emphasize the need to establish institutional and policy foundations before adopting similar innovations. This distinction reflects Greater London's advanced stage in implementing progressive strategies, while the RMPA and RMSG are still developing foundational structural and policy frameworks.

The attribute Accessibility and Inclusivity is a key focus in Greater London, with targeted investments in inclusive design and infrastructure adapted for people with disabilities. Analysis of questions Q32 and Q33 revealed that 64.34% of respondents recognize the city's strong accessibility infrastructure. In contrast, this perception drops significantly to 21.23% in the RMPA and 20.14% in the RMSG. The absence of this attribute in the qualitative phases of the Brazilian regions highlights the lack of comprehensive inclusion initiatives. The primary focus in these cases lies in expanding transport networks to underserved peripheral areas, underscoring a significant gap in accessibility measures.

The Need for Strategic Investment in Mobility Solutions is particularly pronounced in the RMSG, where stakeholders emphasize the urgency of long-term investments to address poor mobility conditions and foster sustainable growth. Strategic priorities include developing railway systems and recent investments in airports and ports to bolster economic resilience. However, a lack of effective leadership is identified as a major barrier to the implementation of critical projects. In Greater London, respondents emphasize the necessity of ongoing investments to sustain growth and meet sustainability goals, focusing on maintaining a robust and innovative system. Meanwhile, in the RMPA, investments aim to expand and refine the transport network, with a strong emphasis on sustainability and future capacity-building.

### *Climate Change*

Greater London exemplifies a comprehensive approach to Climate Change and Sustainability, with standout initiatives in decarbonization and electrification, including substantial investments in electric vehicle infrastructure and the phased elimination of fossil fuels. These measures, aligned with the global imperatives of the IPCC (2021), position the city as a leader in urban sustainability. While the qualitative phase highlighted this attribute extensively, only 44.34% of respondents in the quantitative analysis (Q36 and Q37) expressed agreement. By contrast, in the RMPA and RMSG, though the topic did not emerge spontaneously, 69.02% and 62.68% of respondents, respectively, acknowledged its relevance when prompted. This contrast suggests that in Brazilian contexts, awareness of the attribute depends on external introduction, whereas in London, advanced initiatives like ULEZ and integrated planning, although significant, may require better communication of their benefits to the public.

Similarly, Greater London's Climate Change Mitigation Strategies include the Ultra Low Emission Zone (ULEZ), congestion charges, and extensive cycling networks, showcasing a sophisticated integration of technology and policy to reduce urban emissions. Quantitative analysis (Q39–Q42) revealed that 32.17% of respondents in London recognize this attribute, compared to only 11.50% and 19.40% in the RMPA and RMSG, respectively. This discrepancy highlights London's advanced stage in implementing climate responses, while the Brazilian regions remain in initial stages, focused on more immediate and less structured measures. This dynamic, coupled with the qualitative findings, underscores why the attribute did not emerge spontaneously in the Brazilian cases. The results emphasize the need for increased awareness campaigns to communicate the benefits of these strategies in RMPA and RMSG.

All three regions emphasize the importance of Integrated Planning Beyond Administrative Boundaries. In Greater London, the centralized structure of Transport for London (TfL) facilitates borough-level integration, aligning localized initiatives with broader climate goals. Quantitative analysis (Q38) showed that 72.65% of respondents agreed on the necessity of integration. In contrast, the RMPA and RMSG struggle with governmental fragmentation, with municipalities acting in isolation. In the RMPA, the absence of a central transportation authority hampers the implementation of unified strategies, while in the RMSG, the lack of metropolitan coordination limits efforts to address climate risks and mobility challenges. These findings underscore the critical need to address fragmented governance structures to enhance both perception and execution of climate strategies in the Brazilian regions.

All regions prioritize Adaptation to Climate Change Impacts to address risks such as floods and extreme weather events, though their strategies differ significantly. Greater London adopts proactive measures, including urban cooling strategies, tree planting, and stormwater management, integrating urban mobility with resilience planning. In the quantitative phase, 47.82% of respondents acknowledged the effectiveness of these strategies in protecting infrastructure and essential services, compared to only 15.92% and 15.67% in the RMPA and RMSG, respectively. Brazilian regions focus on foundational solutions, such as retention basins and green corridors, yet fragmented governance hampers their implementation and limits their effectiveness. These quantitative results highlight the pressing need for integrated governance to improve both the implementation and public perception of adaptation strategies.

The RMPA and RMSG converge on the urgent need for Flood Management and Urban Planning. Respondents emphasized that severe weather events frequently disrupt mobility and damage infrastructure, underscoring the importance of stormwater retention systems and enhanced drainage capacity. In the RMPA, coordinated flood prevention policies are deemed essential for mitigating transport interruptions, while in the RMSG, urban permeabilization initiatives take precedence. Although not explicitly discussed, Greater London serves as an example of advanced integration of flood management within sustainable urban planning, employing strategies like increasing tree cover and urban cooling measures. By contrast, the RMPA and RMSG remain focused on basic solutions to address immediate vulnerabilities.

Respondents from the RMPA and RMSG stress the necessity of establishing unified planning bodies to implement cohesive climate adaptation policies. These Brazilian cases seek to replicate Greater London's model of integrated governance, which combines efficient coordination with advanced climate strategies. The comparative analysis reveals stark disparities in resilience strategies across different stages of development, underscoring the pivotal role of integrated governance in advancing urban sustainability.

Among all the subcategories analysed, climate change demanded the most in-depth analytical exploration, revealing commonalities across the three case studies, albeit at different stages of application. Structural quantitative analyses provided a distinctive perspective on the attributes within this subcategory, highlighting structural and communicational challenges in the Brazilian metropolitan regions. Directed recognition demonstrates that, in the RMPA and RMSG, attributes such as sustainability and integrated planning, despite their significance, do not emerge spontaneously but achieve high levels of agreement when explicitly addressed. This finding underscores a significant gap in public communication or education, indicating that awareness of strategic issues remains confined to specific contexts.

Furthermore, the fragmentation of governance, reflected in the low levels of agreement on attributes related to integration and governance, reveals institutional barriers that hinder both the perception of the effectiveness of climate and mobility strategies and their coordinated implementation. This fragmentation undermines not only the execution of cohesive actions but also the public engagement necessary to sustain them. Therefore, the urgency of strengthening integrated governance structures and promoting effective communication strategies becomes evident. Such measures are essential to enhance public awareness and foster social adherence to climate and sustainable mobility policies.

#### Foresight/Future Thinks

All three regions highlight the Innovative Urban Mobility Solutions attribute, recognizing the transformative role of technology in urban mobility. Greater London stands out for integrating electric and autonomous vehicles with advanced ICT systems, promoting active mobility and optimizing public transport. Quantitative analysis shows that 60% of respondents in London agree with the application of this attribute, compared to lower agreement levels in RMPA (38.93%) and RMSG (36.56%). These differences reflect London's advanced stage of technological adoption, contrasting with the Brazilian regions, which remain focused on fundamental infrastructure improvements, such as electronic ticketing in RMPA and the development of rail systems in RMSG.

The Adapting to Climate Change attribute is a priority across the three regions, although strategies vary in scope and sophistication. Greater London leads with initiatives such as low-emission zones, expanding green areas, and urban cooling to combat heat islands. In the quantitative analysis, 56.35% of respondents recognize efforts related to expanding green spaces (Q45), while 77.62% show limited awareness of frequent updates to disaster management plans (Q46). Conversely, RMPA and RMSG focus on immediate vulnerabilities, such as reforestation and flood prevention. This contrast illustrates London's focus on comprehensive, long-term strategies, while the Brazilian regions address urgent resilience needs.

The Stakeholder Involvement and Collaborative Planning attribute is pivotal across all regions but reveals significant disparities in governance maturity. In Greater London, consolidated structures like Transport for London (TfL) enable an integrated and cohesive approach to transport and climate planning. In contrast, RMPA and RMSG face challenges related to intermunicipal coordination. In RMPA, there is a pressing need for a metropolitan authority to unify mobility planning, whereas RMSG emphasizes the establishment of a central governance body to address regional challenges. These differences highlight Greater London's

advantage in collaborative planning, underscoring the Brazilian regions' need for foundational governance mechanisms.

The detailed analysis of issues related to this attribute grouped questions Q49 and Q50, which explore stakeholder involvement in collaborative planning to improve public transportation, non-motorized mobility, and public-private partnerships in urban infrastructure projects. These were analysed separately from Q51, which focuses on respondents' direct participation in organized, unpaid collaborative processes, such as associations, NGOs, communities, or groups generating positive social impact. This distinction provided deeper insights into the levels of engagement and practical outcomes of stakeholder collaboration in each region.

The results reveal a significant gap between the perception of collective participation and the individual involvement of respondents in these processes. While 26.79% of respondents recognize the involvement of stakeholders (Q49 and Q50), 48.89% report their own active participation as agents in these processes (Q51). This contrast suggests that, although there is an acknowledgment of the importance of collaborative planning, the respondents perceive a disconnect between collective planning initiatives and their personal involvement in these processes. These findings reinforce the need for strategies that not only promote collaborative planning but also directly engage individuals, expanding their participation as transformative agents within the metropolitan context.

There is a consensus regarding the importance of reducing inequalities through mobility, with 59.39% of respondents believing that efforts to improve transportation in peripheral areas have a positive impact. Greater London focuses on creating decentralized and accessible neighbourhoods, reducing car dependence. In contrast, the priorities in RMPA and RMSG center on expanding access to public transportation in peripheral areas, addressing regional inequalities. While London refines an already established network, the Brazilian regions are still working on building foundational systems to ensure equitable connectivity.

The attribute of Enhanced Public Transport and Non-Motorized Mobility highlights divergent strategies for sustainable mobility, as this attribute emerged in Greater London but not in the Brazilian cases. In London, the optimization of extensive transportation systems, such as integrated tram and bus networks, is coupled with investments in cycling and pedestrian infrastructure, aligning with sustainability and public health goals. In the quantitative analysis, agreement levels are high in London, with 64.34% (Q47) and 66.95% (Q48), whereas in RMPA (32.74% and 26.23%) and RMSG (28.33% and 32.08%), the figures are significantly lower, which explains why this attribute did not emerge in the Brazilian regions studied. These



discrepancies reflect London's maturity in active mobility, in contrast to the Brazilian regions, which still face basic challenges, such as ticketing integration and pedestrian safety.

Interviewees from both RMPA and RMSG emphasize the importance of the Integration and Coordination Attribute to address regional mobility challenges. Effective coordination between municipalities is considered essential to optimize resource management, streamline service delivery, and meet intermunicipal mobility needs. However, both regions face significant barriers due to governmental fragmentation. The absence of a centralized authority to oversee transportation initiatives, unify ticketing systems, and harmonize schedules hinders the creation of efficient and integrated networks. Stakeholders from both regions advocate for the establishment of metropolitan councils or a transportation authority as a critical step to overcoming these challenges, drawing inspiration from integration models implemented in more developed metropolises. In contrast, this attribute was not emphasized by interviewees from Greater London, where mature governance structures, such as TfL, already ensure centralized and effective coordination.

Both RMPA and RMSG also recognize the importance of the Forward-Looking Mobility Strategies and Policy Influence Attribute to accommodate urban growth, address environmental challenges, and leverage technological advancements. Respondents emphasize the need for long-term planning to transition to sustainable and inclusive transportation systems. However, these efforts are still in their early stages, constrained by limited financial resources, fragmented governance, and a lack of consistent political support. Current initiatives focus on fundamental improvements, such as expanding public transportation infrastructure and building resilient networks, aimed at laying the groundwork for future innovations. In contrast, Greater London exemplifies this attribute with a focus on Innovative Urban Mobility Solutions, including advanced initiatives such as autonomous vehicles, low-emission zones, and integrated ICT systems. This distinction reflects London's ability to prioritize sophisticated, sustainability-oriented solutions, while RMPA and RMSG still need to address basic infrastructure needs.

This analysis highlights a shared commitment to achieving integrated and sustainable mobility across the three regions, but it also underscores the development gap between them. Greater London showcases the advanced implementation of cohesive, visionary strategies supported by centralized governance, serving as a model for RMPA and RMSG. The Brazilian regions face fundamental governance and infrastructure challenges that must be overcome in order to enable the adoption of more advanced mobility solutions. These findings reinforce the

importance of robust governance structures and incremental development to transition from basic improvements to innovative transportation systems.

#### 4.4.2 **Composition of aligned attributes and proposed framework**

The previous text examined the convergence of qualitative and quantitative analyses of identified attributes. Some attributes, initially linked to specific categories or subcategories, exhibit conceptual similarities with attributes from other categories. To address this, the following analysis identifies these overlaps and establishes clearer connections between attributes and their respective categories. Removing subcategories simplifies associations, enhancing the clarity of definitions and strengthening both theoretical implications and practical applicability.

The unification of attributes resulted in a framework guided by conceptual coherence, functional interdependencies, and thematic alignment. Attributes were grouped based on shared objectives and their contributions to comprehensive strategies (Figure 21). Clear boundaries were defined to preserve distinct roles for the newly consolidated attributes, ensuring their integration into the broader analytical framework. This process streamlined the organization of attributes, optimizing their application to address metropolitan challenges effectively.

Integrated Metropolitan Governance unifies the core principles of territorial planning and metropolitan governance into a cohesive framework. By integrating elements such as the Study of Territory, Principle of Socio-Spatial Structuring, Construction of Internal/External Partitions, and Governance Dynamics and its Operation, this attribute addresses the interconnectedness of land use, governance, and infrastructure. It prioritizes overcoming fragmentation through functional interconnectivity and the development of coordinated policies that support cohesive territorial development. Additionally, it encompasses attributes like Governance and Collaboration Across Boroughs/Municipalities, Unified Governance and Integrated Planning, and Integrated Planning Beyond Administrative Boundaries to establish a regulatory framework that transcends administrative divisions. This integrated approach aligns resources, fosters intermunicipal collaboration, and facilitates the implementation of unified strategies that strengthen metropolitan resilience and operational capacity.

Sustainable and Inclusive Mobility integrates the core aspects of Behavioural Change and Environmental Sustainability, Accessibility and Inclusivity, Public Spaces and Accessibility, and Enhanced Public Transport and Non-Motorized Mobility. This attribute is central to advancing transportation systems that balance efficiency and inclusivity. By

addressing behavioural changes, sustainability, and accessibility, it promotes public and non-motorized mobility solutions that are equitable and environmentally sound.

Climate Resilience and Risk Management incorporates the foundational attributes of Flood Management and Urban Planning, Adaptation to Climate Change Impacts, and Climate Change Mitigation Strategies. It reflects an integrated approach to urban vulnerability, focusing on proactive climate adaptation and risk mitigation strategies. By combining these elements, this attribute strengthens urban systems' capacity to respond to climate-induced challenges, ensuring sustainable and secure environments.

Innovative and Resilient Infrastructure unites the elements of Infrastructure and Mobility Innovations, Investment and Infrastructure for Mobility, and Need for Strategic Investment in Mobility Solutions. This attribute underscores the transformative potential of infrastructure that integrates technological advancements with strategic investment planning. It aims to develop systems that not only meet current needs but also anticipate future demands for connectivity and efficiency.

Integrated Transport Networks brings together Integrated Transport Networks, Fields of Operation, and Public Transport Efficiency to form a comprehensive approach to multimodal connectivity. This attribute is key to optimizing transport systems that bridge urban, rural, and peri-urban areas. It highlights the importance of efficiency and accessibility in reducing inequalities while ensuring seamless integration across diverse transport modes.

Socio-Spatial Structuring consolidates the Principle of Socio-Spatial Structuring, Market, Traffic, and Administrative Separation, and Addressing Socio-Spatial Inequalities. This attribute reflects the need for coordinated planning that balances economic flows, administrative frameworks, and social equity. It provides a foundation for addressing disparities and fostering cohesion through targeted mobility and spatial strategies.

Participation and Collaborative Planning is defined by the integration of Stakeholder Involvement and Collaborative Planning and Forward-Looking Mobility Strategies and Policy Influence. This attribute emphasizes inclusive and forward-thinking decision-making processes. It bridges collaborative engagement with strategic foresight, ensuring that planning efforts align with long-term metropolitan goals.

Regional Economy and Equity integrates Economic Concentration and Spatial Inequality, Social and Economic Equity, and Sustainability and the Sharing Economy. This attribute addresses the economic dimensions of metropolitan planning, focusing on reducing disparities and promoting equitable access to resources. It aligns sustainable practices with economic inclusivity to enhance regional development and opportunity distribution.

Rural-Urban Connectivity incorporates Urbanisation and Urban Planning, Mobility and Urban Planning, and Place-Centrism. This attribute reflects the integration of urban, rural, and peri-urban dynamics, emphasizing policies that balance development with connectivity. It promotes mobility strategies that align with spatial planning, ensuring the preservation of local identities and sustainable growth.

Sustainability and Innovation unifies Innovative Urban Mobility Solutions and Climate Change and Sustainability to create a forward-looking approach to urban challenges. This attribute underscores the synergy between innovative practices and sustainable planning. It aims to align technological advancements with environmental goals, ensuring resilience and adaptability in metropolitan systems.

Cultural Inclusion and Identity integrates Cultural Integration and Identity and Enrichment Through Diversity to highlight the cultural dimensions of metropolitan planning. This attribute recognizes diversity as a key driver of social cohesion and development. By preserving local identities and fostering cultural integration, it supports balanced urban growth and inclusivity.

Future-Oriented Strategies and Visionary Planning brings together Adapting to Climate Change and Foresight and Future Thinking to emphasize proactive and strategic approaches to metropolitan planning. This attribute reflects the importance of anticipating future challenges and opportunities. By integrating climate adaptation and visionary thinking, it provides a foundation for sustainable and innovative urban development.

The composition of attributes within the analytical categories reflects a structured approach to addressing metropolitan challenges, ensuring alignment with the conceptual framework. The regulation category incorporates attributes that focus on governance, territorial planning, and socio-spatial structuring. Attributes such as Integrated Territorial Planning and Unified Metropolitan Governance emphasize policy coordination, intermunicipal integration, and regulatory practices that transcend administrative boundaries. Socio-Spatial Structuring balances urban planning and mobility to address economic flows, administrative divisions, and social inequalities, while Regional Economy and Equity highlights sustainable and inclusive practices to reduce regional disparities.

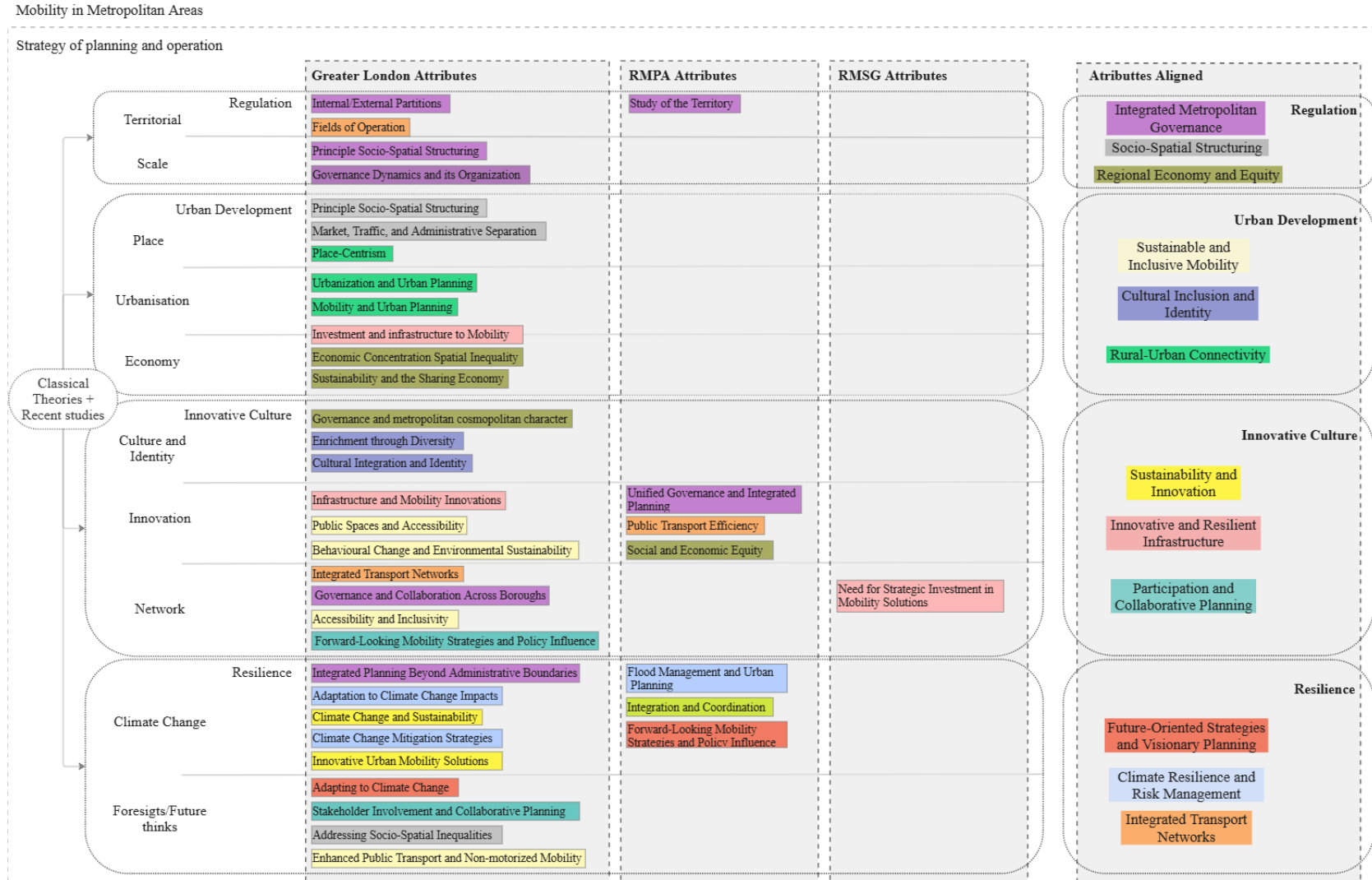
The urban development category encompasses attributes tied to urban growth, culture, identity, and economic integration. Sustainable and Inclusive Mobility focuses on efficient public transport and accessible infrastructure, promoting urban accessibility and ecological balance. Cultural Inclusion and Identity emphasizes diversity and local identity as fundamental

to balanced development, while Rural-Urban Connectivity ensures the integration of urban, rural, and peri-urban areas through adapted mobility and spatial planning.

In the innovative culture category, attributes focus on leveraging technology and innovative practices in urban planning and mobility. Sustainability and Innovation combines sustainable solutions with technological advancements, addressing future urban challenges. Innovative and Resilient Infrastructure highlights the importance of strategic investments in forward-thinking infrastructure, while Participation and Collaborative Planning aligns stakeholder engagement with visionary strategies to ensure effective implementation.

Finally, the resilience category addresses climate adaptation, strategic foresight, and mobility integration. Climate Resilience and Risk Management focuses on mitigating climate risks through integrated policies, while Future-Oriented Strategies and Visionary Planning emphasizes anticipating future demands with innovative and sustainable approaches. Integrated Transport Networks ensures resilience in mobility by optimizing public transport systems and reducing regional inequalities.

Figure 21 - Attributes aligned from cases of studies

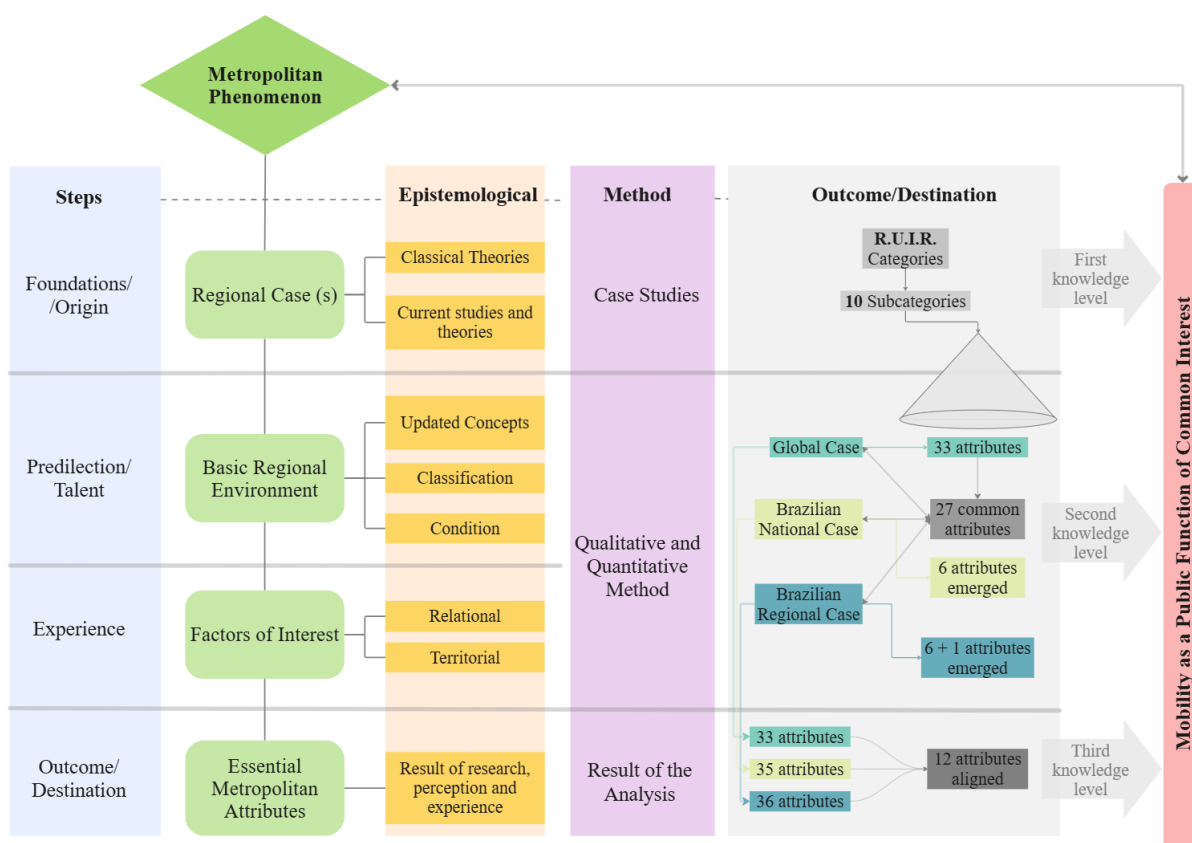


Source: Elaborated by author (2024).

The framework presented organizes key dimensions of metropolitan mobility, linking theoretical insights with practical applications. By structuring attributes under the categories of regulation, urban development, innovative culture, and resilience, the analysis integrates elements such as governance, socio-spatial structuring, sustainable mobility, and future-oriented strategies. This approach highlights the interconnections of attributes across different metropolitan contexts - Greater London, RMPA, and RMSG - and demonstrates how aligned categories can strengthen theoretical understanding and operational strategies. The framework establishes a model for analysing metropolitan systems, focusing on clarity, adaptability, and innovation in addressing urban mobility challenges. It provides a basis for advancing research and policy design across varying metropolitan contexts.

The methodological framework (updated from Figure 11) illustrates a structured progression from foundational regional cases to the consolidation of essential metropolitan attributes through qualitative and quantitative analysis (Figure 22).

Figure 22 - Framework after research



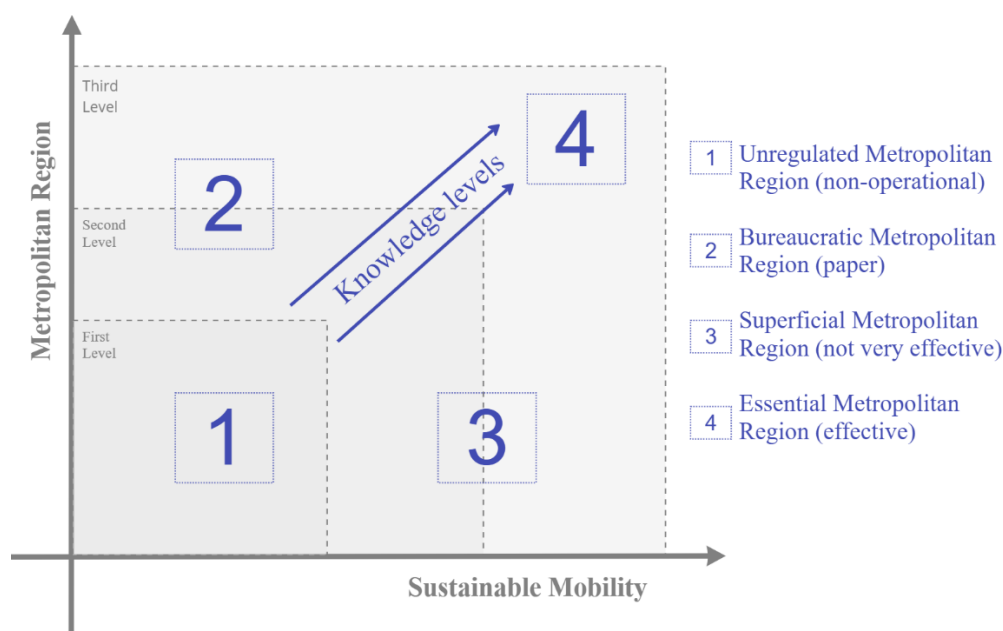
Source: Elaborated by author (2024).

Starting with epistemological insights grounded in classical and updated theories, the framework incorporates regional factors of interest and relational and territorial classifications. Case studies of global, national, and regional contexts revealed 39 attributes (sum of all and not

by case study), which were refined into 12 aligned attributes across four categories - regulation, urban development, innovative culture, and resilience. This framework links theory and practice, providing a comprehensive basis for understanding metropolitan mobility as a public function of common interest.

Similarly, following the analysis in this thesis, the Graph 2 has been updated from its previous demonstration of the relationship between territorial factors and relational factors (Graph 1). It now illustrates the connection between metropolitan regions and sustainable mobility. This revised graph is presented to reflect these updated relations.

Graph 2 - The relationship between the metropolitan region and sustainable mobility in its levels of knowledge



Source: Elaborated by author (2024).

The graph presents a four-level model connecting metropolitan phenomena and sustainable mobility. The characteristics progress from the Unregulated Metropolitan Region (non-operational) at the base, through the Bureaucratic Metropolitan Region (formal but limited to documentation), and the Superficial Metropolitan Region (operational but ineffective), to the Essential Metropolitan Region (both operational and effective). This progression illustrates the stages of metropolitan development, structured across three knowledge levels, which are interconnected with the levels of knowledge outlined in Figure 22. The framework emphasizes the transition from conceptual understanding to practical and effective implementation. The ultimate objective of a metropolitan region is to achieve the status of an Effective Metropolitan Region, focusing on sustainable and functional integration.



#### 4.4.3 Thesis framework, dimensions, categories and attributes

Once the analysis was completed, the main findings of the research were organized into a final framework. This framework is inspired by the *Crassula pyramidalis* “Buddha's Temple,” a plant renowned for its so - called divine geometry - forms considered perfect or spectacular to the human eye (Figure 23 and Figure 24). This plant was selected for its alignment with three key characteristics. First, its growth structure is based on four inseparable sides, forming a harmonious and regular geometry. Second, the relationship between cultivation and flowering illustrates that while specific conditions are required for growth, flowering can occur at any time. Finally, its horizontal growth cycle emphasizes that its leaves (or shoots) emerge, develop, and complete their life cycle at the center of the plant, symbolizing a continuous process of internal renewal.

Figure 23 - *Crassula pyramidalis* “Buddha's Temple”



Source: monstera website (2024)<sup>31</sup>

This analogy is integrated into the final framework of this research, where the plant’s four regular columns represent the four categories developed throughout the study: regulation, urban development, innovative culture, and resilience. The leaves or shoots of each column represent the set of actions aligned with the 12 convergent attributes preliminarily defined in Figure 21 and Table 40 (Appendix f – Preliminary version of the definitions of the attributes). These attributes include Integrated Metropolitan Governance, Socio-Spatial Structuring, Regional Economy and Equity, Sustainable and Inclusive Mobility, Cultural Inclusion and Identity, Rural-Urban Connectivity, Sustainability and Innovation, Innovative and Resilient

<sup>31</sup> MONSTERA. *Crassula Buddha’s Temple*. Available at: <https://www.monstera-app.com/en/plants/varieties/crassula-buddha-s-temple-01H8YGH8PEYJTGEAM18JYXNTG3>. Accessed on: Nov. 29, 2024.

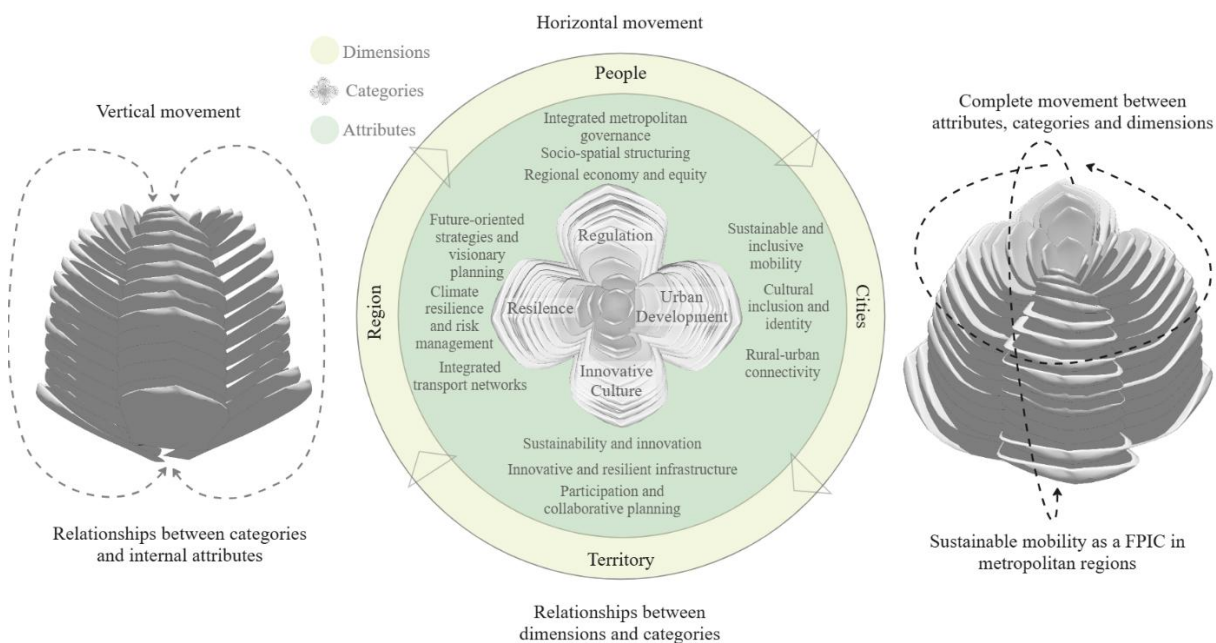
Infrastructure, Participation and Collaborative Planning, Future-Oriented Strategies and Visionary Planning, Climate Resilience and Risk Management, and Integrated Transport Networks. Together, they form a foundational framework for evaluating and effectively integrating mobility systems into broader metropolitan governance structures.

The research emphasizes the critical integration of categories and attributes within four interrelated dimensions: people, territory, city, and region. These dimensions constitute the fundamental elements for planning, managing, and promoting sustainable mobility and integrated metropolitan development.

An interesting analogy compares the relationship between cultivation and flowering in a plant to the connection between dimensions and categories. Just as cultivation requires specific conditions, dimensions demand harmonious alignment. Flowering, which can occur at any moment, symbolizes the categories and their attributes, representing the outcome of proper cultivation and adherence to the necessary conditions for full development.

Furthermore, a continuous horizontal movement is observed, both in the interaction between dimensions and their attributes and in the relationships between categories and dimensions. This dynamic creates 16 complementary interpretative possibilities, enhancing the harmony and effectiveness of the attribute set.

Figure 24 - Framework of the attributes of a Sustainable Metropolitan Region



Source: Elaborated by author (2024).

Table 34 provides a systemic analysis of horizontal interactions, examining both clockwise and counterclockwise dynamics across four key categories—regulation, urban

development, innovative culture, and resilience—and their relationships with the dimensions of people, territory, city, and region. This approach underscores the interdependence of human, spatial, and administrative factors in achieving sustainable metropolitan development. Each intersection demonstrates how these categories operate at varying scales, highlighting essential interactions that support integrated planning and promote sustainable mobility.

Table 34 - Direct relationships between dimensions and categories

<b>Dimensions/ Categories</b>	<b>People</b>	<b>Territory</b>	<b>City</b>	<b>Region</b>
<b>Regulation</b>	The connection between people and the category of regulation reflects the importance of understanding how governance policies, territorial planning and socio-spatial structuring directly impact individual needs and perceptions.	Territory as a regulatory base requires governance and planning that transcend administrative boundaries..	Cities are key units in the fulfilment of metropolitan regulations, translating policies into practical actions.	Regions depend on regulations that transcend municipal jurisdictions.
<b>Urban Development</b>	People are fundamental in urban development, as they mould and are moulded by infrastructure and cultural spaces.	In urban development, the territory is shaped by sustainable mobility and connectivity between urban and rural areas.	Urban development in cities depends on sustainable mobility and cultural inclusion.	Regional development integrates urban, peri-urban and rural areas.
<b>Innovative Culture</b>	Innovation must respond to people's needs, integrating technologies that improve mobility and accessibility.	Innovation applied to the territory must seek sustainability and the efficient use of resources.	Cities as innovation centres must leverage technologies to improve mobility and infrastructure.	Innovation on a regional scale allows for the creation of shared solutions to common challenges.
<b>Resilience</b>	People are at the centre of resilience, as they directly face the impacts of climate change and urban crises.	The territory must be prepared to resist climate crises and adapt to new environmental conditions.	The resilience of cities is central to their survival in the face of climate crises.	Regional resilience requires integrated transport networks and climate risk management.

Source: Elaborated by author (2024).

The framework offers a multidimensional perspective on metropolitan governance, addressing the trade-offs between localized needs and broader regional objectives. Regulatory frameworks, for instance, must simultaneously cater to individual needs (people) and transcend municipal boundaries (region), creating challenges in balancing inclusivity with enforceability. Urban development emphasizes sustainable mobility and connectivity but requires careful coordination to mitigate socio-spatial inequalities between urban and rural areas. Innovative culture drives efficiency and sustainability; however, its success relies on equitable access to technology, which is often constrained by regional disparities. Resilience is crucial for

addressing climate crises but requires alignment across all categories to reconcile localized adaptation efforts with broader regional strategies.

This comprehensive framework reveals the complexity and complementarity of relationships within the metropolitan context. By integrating the dimensions of people, territory, city, and region, it highlights the importance of coordinated actions across scales to enhance governance, foster innovation, strengthen resilience, and achieve sustainable urban development. The insights generated provide a foundation for designing policies and practices that align the diverse needs of actors and spaces within metropolitan regions, promoting cohesive and adaptive governance.

## 5. CONCLUDING REMARKS

This thesis aimed to analyse the dimensions of mobility as a Public Function of Common Interest (FPIC) and to define the attributes essential for developing sustainable metropolitan regions. Grounded in the central research question: How can the appropriation of mobility as a Public Function of Common Interest (FPIC) contribute to defining the attributes of a Sustainable Metropolitan Region? The study examined whether metropolitan regions have clear legal criteria for their establishment, management, and expansion. It also explored the fundamental elements required to assess these regions as social phenomena. Furthermore, the research evaluated the consistency of these elements at national and international levels, their relationship with mobility, and their contributions to sustainable development.

This thesis demonstrates how the identified attributes collectively define a sustainable metropolitan region by offering a multidimensional framework that ensures balanced development, governance, and connectivity. These attributes address critical aspects such as socio-spatial structuring, integrated transport networks, and climate resilience, promoting equitable resource distribution and innovative solutions. By aligning governance structures with infrastructure development and enhancing territory connectivity, they enable metropolitan regions to adapt to environmental, social, and economic challenges, fostering inclusivity, efficiency, and long-term viability.

Building on this foundation, the thesis refines the understanding of sustainable mobility in metropolitan regions, as a progressive, collective policy framework that prioritizes efficient, low-impact, and accessible transportation modes across interconnected urban and rural areas. It fosters a cohesive transit system that emphasizes walking, cycling, and public transit, while advancing democratic public spaces and prioritizing people over vehicles. This approach not only educates and engages citizens in sustainable practices but also promotes coordinated governance across municipal boundaries, supporting environmental resilience, social inclusivity, and enhanced quality of life throughout the metropolitan region.

After finding, sustainable mobility in metropolitan regions is a progressive and collective framework that integrates governance, infrastructure, and socio-spatial planning to establish an efficient, inclusive, and low-impact transportation system. Rooted in the interplay of four dimensions - people, territory, city, and region - it prioritizes walking, cycling, and public transit while fostering democratic public spaces and connectivity between urban and rural areas. By aligning critical attributes, the framework underscores the importance of

continuous interaction and balance across dimensions and categories, ensuring adaptability and harmony in metropolitan development.

This thesis employed a mixed-methods approach, integrating qualitative and quantitative phases. The qualitative phase involved a panel of 24 experts from academia, public institutions, NGOs, and private organizations across the three metropolitan regions analysed: Greater London, the RMPA, and the RMSG. Using ten semi-structured questions, this phase drew on classical theories, such as CPT and GPT, alongside contemporary themes like innovation, sustainability, and climate change. The data collected were synthesized into a structured analytical framework, identifying macro-categories, categories, and subcategories essential for metropolitan mobility, including regulation, urban development, innovative culture, and resilience. Each category was further divided into subcategories such as Territory, Scale, and Place, aligning the analysis with the broader objectives of the study.

The quantitative phase complemented the qualitative findings by systematically assessing public perceptions of sustainable mobility attributes identified in the qualitative interviews conducted in Greater London. These interviews established 33 key attributes, which informed the development of 52 Likert-scale questions grouped into four core dimensions: regulation, urban development, innovative culture, and resilience. Each question was carefully coded by category, subcategory, and sequence to ensure a structured data analysis approach. Tailored questionnaires for each region were developed in English and Portuguese to reflect the unique contexts of the United Kingdom and Brazil, and they were distributed via Google Forms.

This methodological framework enabled a comparative analysis of the three metropolitan regions - Greater London, RMPA, and RMSG - highlighting both regional convergences and disparities. While Greater London demonstrated advanced integration and governance structures, RMPA and RMSG faced significant challenges stemming from fragmented governance and inadequate infrastructure. CFA validated the reliability of the identified attributes, revealing strengths and gaps in regional perceptions and providing robust insights to inform sustainable mobility strategies.

The study identified 33 attributes for metropolitan mobility in Greater London, while 35 and 36 attributes were identified in the RMPA and RMSG, respectively. Of these, 27 attributes were shared across all three regions, highlighting convergent themes such as integration, stakeholder engagement, and sustainable mobility strategies. However, six additional attributes emerged exclusively in the Brazilian cases, reflecting regional priorities such as equitable access to transportation and collaborative governance. These findings

underscore the need to tailor mobility strategies to the unique socio-economic and institutional contexts of each region.

The research highlighted the relevance of classical theories when integrated with contemporary perspectives to address modern challenges in metropolitan planning. It proposed a comprehensive framework that organizes the identified attributes into a structured hierarchy, facilitating the analysis of mobility systems in metropolitan regions. This framework enables policymakers to identify critical gaps, adapt advanced models from contexts like Greater London, and develop tailored solutions for RMPA and RMSG. Furthermore, the thesis demonstrated the potential of integrated governance, infrastructure planning, and innovative mobility solutions to enhance sustainability and resilience in metropolitan areas.

This thesis presents advancements in theoretical understanding by positioning mobility as a central dimension for evaluating metropolitan regions. It highlights the need to assess fundamental attributes that aid in interpreting and analysing metropolitan systems. The study introduces a novel perspective by integrating stakeholder and citizen perceptions from three metropolitan regions of varying scales, demonstrating the potential for developing globally adaptable frameworks for understanding metropolitan dynamics. By framing mobility as a core necessity, the research establishes a foundation for expanding discussions on its role in shaping metropolitan governance and systems.

This thesis advances the discourse on sustainable mobility in metropolitan regions by introducing an integrated framework centered on four key dimensions: regulation, urban development, innovative culture, and resilience. It incorporates twelve critical attributes and sixteen horizontal pathways to enhance urban-rural connections, foster socio-spatial cohesion, and support adaptive metropolitan governance. The framework includes essential attributes such as Integrated Metropolitan Governance, Regional Economy and Equity, Sustainable and Inclusive Mobility, Cultural Identity, Rural-Urban Connectivity, Innovation, Resilient Infrastructure, Collaborative Planning, and Climate Resilience. These elements provide a structured approach for evaluating and integrating mobility systems within metropolitan governance. By interlinking people, territory, city, and region, the research highlights essential dimensions for planning and managing sustainable mobility. Incorporating stakeholder and citizen perspectives across diverse metropolitan contexts ensures adaptability, making the framework applicable to various regional scenarios.

Building on the proposed framework of sustainable mobility attributes in metropolises, its applicability extends beyond metropolitan regions to the local scale, emphasizing operational rather than strategic implementation. Local governments and organizations can

adapt this framework to tackle immediate, context-specific mobility challenges, such as optimizing transport infrastructure, enhancing public transit efficiency, and promoting active and inclusive mobility. By aligning the framework's principles with operational needs, stakeholders can implement targeted interventions that improve urban mobility while fostering collaboration between public and private entities. This localized application enhances flexibility and responsiveness, positioning the framework as a dynamic tool for advancing sustainable mobility goals within diverse socio-economic and institutional contexts.

The potential applications of this study are evident at both national and global levels, as metropolitan regions worldwide could benefit from its insights. In the Brazilian context, and potentially in other nations yet unidentified, the findings may hold even greater relevance due to legislative gaps that this research highlights. These gaps suggest the need for updates to Brazilian legislation, particularly in areas related to metropolitan governance and mobility (Appendix G – Furthermore, this thesis has the potential to contribute by proposing frameworks that enhance understanding and facilitate public leadership in incorporating metropolitan mobility and governance into their daily policy agendas. By addressing these gaps, the study provides tools for advancing public strategies and fostering more integrated metropolitan development.

The specificity of each case study and the difficulty in accessing respondents were the primary limitations of this research. Challenges included securing participation from respondents in the case studies, the complexity of the questionnaire, and the level of understanding required on the topic. Each metropolitan case study demands its own distinct analysis, shaped by unique historical, cultural, and public policy contexts. This necessitates a tailored and nuanced approach to analysis, requiring careful consideration to avoid inappropriate replication across different contexts. While the metropolitan phenomenon presents inherent limitations for research due to its complexity and variability, it also offers significant opportunities for deeper exploration and understanding, paving the way for further studies to address its multifaceted nature.

While the proposed framework offers a comprehensive model for integrating mobility as a Public Function of Common Interest (FPIC) within metropolitan governance, its practical implementation in regional contexts presents significant challenges. Mobility systems in regional areas often face fragmented governance structures, varying socio-economic conditions, and disparities in resource distribution, which complicate the alignment of attributes, categories, and dimensions outlined in the framework. The interconnected nature of rural-urban connectivity, inclusive mobility, and socio-spatial structuring requires coordinated



efforts across multiple jurisdictions, yet such coordination is often hindered by competing local priorities and limited institutional capacity. Furthermore, the need for innovative and resilient infrastructure, coupled with sustainable transport networks, demands substantial financial investment and technological adaptation, which are not uniformly available in all regions. These difficulties highlight the critical need for adaptive governance mechanisms and collaborative planning to bridge the gap between conceptual design and operational execution of the framework in diverse regional contexts.

For future studies, advancing the concepts and definitions of the attributes is a key step in refining this study. It is known that the construction of attributes was initially defined through insights gathered from qualitative interviews conducted in London. These insights were subsequently expanded with data from the Metropolitan Region of Porto Alegre and the Serra Gaúcha Metropolitan Region. The analysis of the results revealed that from the 33 previously defined attributes, it was possible to consolidate them into 12. However, this thesis did not delve deeply into providing detailed technical and academic definitions for each attribute. Instead, it lays the groundwork for future studies focused on updating and refining these definitions. To advance this endeavour, the thesis proposes not only updated definitions for each attribute but also the creation of facilitating questions tailored to each attribute. These questions aim to support the pursuit of specific knowledge relevant to each region. For instance, for the attribute Integrated Territorial Planning, the proposed definition is: A strategic framework that integrates land use, regional governance, and infrastructure to address fragmentation, ensuring functional interconnectivity between areas and fostering cohesive territorial policies. The accompanying facilitating question is: How can the coordination of land use, infrastructure, and governance improve the integration of metropolitan areas? These tools are intended to provide a starting point for a more focused exploration of each attribute, addressing its core aspects and supporting the practical application of the concepts in metropolitan contexts. To facilitate this process, the thesis proposes the inclusion of an appendix (Appendix G) that organizes these updated definitions and questions systematically, serving as a reference for future studies and deeper investigations into metropolitan mobility and planning challenges. This approach ensures that the framework remains adaptable and provides pathways for advancing knowledge specific to different regional contexts.

Advancing studies and analyses of the quantitative data from the three case studies is essential for exploring new dimensions of metropolitan planning and mobility. Future research should aim to conduct correlation analyses between the profiles of the respondents and the interrelationships among the identified attributes. Such an approach could uncover patterns and

connections that provide deeper insights into the dynamics of metropolitan systems. Moreover, this investigation could evaluate the potential for constructing a scale based on these data, offering a structured framework for measuring and comparing metropolitan attributes across diverse contexts. This process would not only enhance the theoretical understanding of the attributes but also open opportunities for practical applications, bridging gaps between empirical findings and actionable strategies.

In the context of ongoing research, it could further develop this study by applying both qualitative and quantitative methodologies to the 12 aligned attributes. This approach would allow for a deeper exploration of these attributes, testing their relevance and applicability across different metropolitan contexts. By combining qualitative insights with quantitative validation, the research could uncover new findings and refine the theoretical and practical implications of the attributes. This dual-method approach would also enable a comprehensive analysis of how these attributes function collectively, offering a more holistic understanding of their interdependencies and their potential to inform metropolitan planning and mobility strategies.

Building on the findings of this thesis, a proposal for a legislative project could be developed to evaluate its accuracy and alignment with the results of the study. This proposal would utilize the 12 aligned attributes as guiding principles or defining directives, framing mobility as a FPIC. Such an approach would ensure that the principles derived from the research inform the structuring of metropolitan mobility policies. Additionally, the proposal could explore the establishment of a metropolitan authority initiated by municipalities through a consortium-based model. This model would foster intermunicipal collaboration and shared governance, ensuring the effective coordination and implementation of metropolitan mobility strategies in line with the principles identified in this study. Future research could further examine the feasibility and impact of such a framework, assessing its potential to enhance metropolitan governance and mobility integration.

As a potential avenue for further investigation, advancing metropolitan relations requires a focused exploration of common aspects that connect rural and urban zones, as one of the reinforced attributes highlights the critical importance of this relationship. Bridging rural and urban dynamics involves addressing shared challenges and opportunities in mobility, governance, and spatial planning. This relationship needs further development to ensure that rural areas are not only integrated into metropolitan strategies but also that their unique characteristics and needs are adequately addressed. By strengthening this connection, future studies and policies can promote a more cohesive and balanced development framework, fostering equitable access to services, resources, and infrastructure across metropolitan regions.

To expand upon the findings of this study, there is an opportunity to delve deeper into an exploratory question included in the quantitative questionnaire, which was posed exclusively to the two Brazilian case studies – RMPA and RMSG - previously justified in this thesis. The questions were as follows: Q53 - If your residence were affected by climate disasters, would you consider moving to another city? and Q54 - If you answered yes to the previous question, please indicate which city you would consider moving to. Of the 247 respondents, 122 answered "no" to Q53, while the remaining 125 suggested various locations where they would seek new opportunities for life. These data warrant further analysis, as they provide clear indications that internal migration driven by climate change will need to be incorporated into the agendas of local public policies. Additionally, this phenomenon is intrinsically linked to urbanisation, which may acquire new meanings and require updated conceptual frameworks. Understanding the implications of climate-induced migration on urban and metropolitan dynamics could offer critical insights for designing adaptive and inclusive policies that address emerging challenges in both rural and urban settings.

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## APPENDIX A – COMPOSITION OF THE THESIS SCALE ACCORDING TO THE QUALITATIVE PHASE

Table 35 - Composition of thesis scale according Greater London case

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code
Strategy of planning and operation	Regulation	Territorial	Principle of Socio-Spatial Structuring	ISO 37122	City Living Lab (Corede) Q.45	(21) Urban planning. (21.1) Annual number of citizens engaged in the planning process per 100 000 population	The city's citizens participate in its planning process.	1	R.T.01
			Construction of Internal/External Partitions	Capital System (Relational)	City Living Lab (Corede) Q.8	-	I take part in social activities in my community or neighbourhood.	2	R.T.02
			Fields of Operation. Past, Present, and Emerging Borders	ISO 37122	21.1*	(21) Urban planning. (21.1) Annual number of citizens engaged in the planning process per 100 000 population	From your period of involvement, you can say that you already have a history of contributing to the territorial organization of the city you are living in.	3	R.T.03
		Scale	Governance Dynamics and its Organization	UN Habitat 2020; National Law	MedroHub	Governance Integration: Collegiate Governing Body, Legal Framework and Regulations, Metropolitan Facts and Management Entity.	There is a metropolitan entity responsible for Governance Dynamics and its organization, including at least a Collegiate Governing Body, Legal Framework and Regulation, Metropolitan Projects, and a Management Entity.	4	R.S.01
			Principle of Socio-Spatial Structuring	SMob	ARO34	-	There are various choices of routes to get in or out of the neighbourhoods in the city you live in.	5	R.S.02
	Urban Development	Place	Market, Traffic, and Administrative Separation	Christaller (1966)	-	Three established principles: the Market principle, the Administrative principle and the Traffic principle.	In the city where I live, there is a regional offer of various services and a local and regional governance structure that I recognize.	6	UD.P.01
				Principle of Socio-Spatial Structuring	ISO 37123	12.6	(12) Housing (12.6) Percentage of residential properties located in high-risk areas	According to my knowledge, I live in a residential property in a high-risk area.	7
			Place-Centrism	SMob	ARO35	-	The city center can be easily reached from the neighborhoods.	8	UD.P.03
				SMob	AEQ26	-	I am satisfied with the conditions of the streets where I live.	9	UD.P.04
				SMob	SAF17	-	I feel safe in the city where I live	10	UD.P.05
			SMob	ARO33	-	The neighborhoods have easy commutes to important parts of the city where I live, such as schools and hospitals.	11	UD.P.06	
		Economy	Investment and infrastructure to Mobility	SDG 9	City Living Lab (Corede) Q.41	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	The infrastructure of the city where I live is adequate for the population's needs	12	UD.E.01
			Economic Concentration Spatial Inequality	SDG 10	City Living Lab (Corede) Q.49	(10.1) By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	The city where I live has a very high cost of living.	13	UD.E.02
			Sustainability and the Sharing Economy	ISO 37122	City Living Lab (Corede) Q.24	9.1 Annual amount of revenues collected from the sharing economy as a percentage of own-source revenue	Many people have sharing economy activities as a source of income (Uber, 99, Garupa, ifood, Airbnb).	14	UD.E.03
				ISO 37122	City Living Lab (Corede) Q.38	19.2 Number of users of sharing economy transportation per 100,000 population	Many people in the city where I live use sharing economy transport (Uber, 99 and the like).	15	UD.E.04
		Urbanisation	Urbanisation and Urban Planning (dynamic land use planning and its infrastructure)	SDG 11	11.a	(11.a) Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning. (11.a.1) Number of countries (cities) that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space **	Having the infrastructure and specific regional policies between urban, peri-urban and rural areas	16	UD.U.01



Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	N°	Code
			Mobility and Urban Planning	SDG 9	9.1.1	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. (9.1.1) Proportion of the rural population who live within 2 km of an all-season road	In the city where I live, all-season roads are adequately accessible to all rural residents, enhancing our community's economic development.	17	UD.U.02
				ISO 37120	18.5	18) Transport (18.5) Percentage of passengers travelling to work as an alternative to the private car	Indicate how strong you agree with the following statement: "I use alternative modes of transport to work instead of taking the car."	18	UD.U.03
	Innovative culture	Culture and Identity	Governance and metropolitan cosmopolitan character.	Sennett (2018); Barbera and De Rossi (2021)	-	Functionally interconnected cities, regardless of their administrative boundaries	You agree that fair and inclusive city planning helps to promote cultural diversity in metropolitan areas.	19	IC.CI.01
				SMob	AEQ21	-	There are many interesting things to look at as I walk through the city where I live in	20	IC.CI.02
			Enrichment through Diversity.	SDG 12	12.b	(12.b) Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	To what extent do you agree that sustainable development initiatives in your community successfully promote and preserve local culture and products	21	IC.CI.03
				Sennett (2018); Barbera and De Rossi (2021)	-	Open City Concept	You strongly agree that London's cultural diversity enhances its identity by fostering an 'open city' environment.	22	IC.CI.04
			Cultural Integration and Identity	SDG 11	11.4.0	(11.4) Strengthen efforts to protect and safeguard the world's cultural and natural heritage. (11.4.1) Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)	You strongly agree that London's approach to cultural integration enhances its community cohesion and urban and metropolitan identity.	23	IC.CI.05
				SDG 10	City Living Lab (Corede) Q.63	(10.2) By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	I'm satisfied with the cultural options on offer in my city where I live in (theatre, music, art, dance, free fairs and cinema).	24	IC.CI.06
		Innovation	Infrastructure (cycling and walking) and Mobility Innovations	ISO 37120	18.7	Quilómetros de ciclovías e ciclofaixas por 100.000 habitantes (indicador de apoyo)	You agree that the increase in kilometers of bike lanes and cycle tracks effectively promotes sustainable mobility in the metropolitan area.	25	IC.I.01
				SMob	SAF17	I feel safe in the city where I live	I feel safe in the city where I live in.	26	IC.I.02
			Public Spaces and Accessibility.	SMob	AEQ19	The trees make shade on the sidewalks of the city	The trees make shade on the sidewalks of the city where I live in.	27	IC.I.03
				SMob	AEQ20	There are pleasant natural characteristics in this city	There are pleasant natural characteristics in this city where I live in.	28	IC.I.04
			Behavioural Change and Environmental Sustainability	London (2018) & Insights interviewees	-	-	Encouraging cycling and walking, along with implementing zones like ULEZ, are effective measures for reducing urban emissions and enhancing environmental sustainability. ***	29	IC.I.05
		Network	Integrated Transport Networks	SMob	AEQ25	The city streets are well maintained (paved, regular, and without many defects).	The streets in the city where I live are well-maintained (paved, regular, and without many defects).	30	IC.N.01
			Governance and Collaboration Across Boroughs	Christaller (1966)	-	Three established principles: the Market principle, the Administrative principle and the Traffic principle.	Enhanced collaboration between London boroughs and the Greater London Authority (GLA) leads to more equitable and effective urban mobility solutions.***	31	IC.N.02
	Accessibility and Inclusivity.		SMob	WLK02	The city sidewalks are well cared (paved, regular, and without any defects).	The sidewalks in the city where I live are well-maintained (paved, regular, and without any defects).	32	IC.N.03	

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code	
			Forward-Looking Mobility Strategies and Policy Influence	SMob	WLK05	There are adequate structures for people with reduced mobility (ramps, tactile signs) on the city sidewalks	There are adequate structures for people with reduced mobility (ramps, tactile signs) on the city sidewalks where I live.	33	IC.N.04	
				SMob	TSF12	Most drivers respect the speed limit while driving in the city	Most drivers respect the speed limit while driving in the city where I live	34	IC.N.05	
				SMob	ITD28	The smart traffic lights system works well	The smart traffic lights system works well	35	IC.N.06	
	Resilience	Climate Change	Climate Change and Sustainability	London (2018), IPCC (2021) & Insights interviewees	-	Decarbonization and electrification	According to your knowledge, you strongly agree that the shift towards electric vehicles (EVs) and the expansion of EV charging infrastructure are effective strategies for reducing urban greenhouse gas emissions.	36	R.CC.01.1	
					-	Prioritization of pedestrian and cycling infrastructure	According to your knowledge, you strongly agree that investing in pedestrian and cycling infrastructure significantly contributes to reducing car dependency and improving urban sustainability.	37	R.CC.01.2	
			Integrated Planning Beyond Administrative Boundaries	Christaller (1966)	-	Three established principles: the Market principle, the administrative principle and the Traffic principle.	According to your knowledge, integrated planning across administrative boundaries is crucial for effectively combating climate change in metropolitan areas.	38	R.CC.02	
			Climate Change Mitigation Strategies.	ISO 37123	10.4	(10) Governança. (10.4) Porcentagem de reuniões públicas destinadas à resiliência na cidade	In my city where I live, the frequency of public meetings focused on urban resilience effectively contributes to climate change mitigation strategies.	39	R.CC.03	
				SDG	11.5.1	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.1) Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	According to your knowledge, current strategies are effective in reducing the number of deaths, missing persons, and those directly affected by disasters as a percentage of Gross domestic product (GDP).	40	R.CC.04	
				SDG	11.5.2	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.2) Direct economic loss attributed to disasters in relation to global domestic product (GDP)	According to your knowledge, current climate change mitigation strategies are effective in reducing economic losses caused by disasters.	41	R.CC.05	
				SDG	11.5.3	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.3) (a) Damage to critical infrastructure and (b) number of disruptions to basic services, attributed to disasters	According to your knowledge, current strategies are effective in protecting infrastructure and basic services from disaster damage.	42	R.CC.06	
				Adaptation to Climate Change Impacts	SDG	11.b.2	(11.b) By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels. (11.b.2) Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies Framework for Disaster Risk Reduction 2015-2030	According to my knowledge, local governments in the city where I live effectively implement climate change adaptation plans to protect against heatwaves and surface water flooding.	43	R.ACC.07
			Foresight, Future Thinks	Innovative Urban Mobility Solutions	SDG	11.2.1	(11.2) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of	In the city where I live, innovative urban mobility solutions like autonomous vehicles and expanded public transport	44	FFT.I.01

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	N°	Code
						those in vulnerable situations, women, children, persons with disabilities and older persons. (11.2.1) Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	effectively enhance accessibility and sustainability.		
			Adapting to Climate Change	SDG	11.b.2	(11.b) By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels. (11.b.2) Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies Framework for Disaster Risk Reduction 2015-2030	In the city where I live, efforts to increase green spaces and implement low-emission zones effectively prepare it for climate change impacts.	45	FFT.ACC.01
				ISO 37123	10.1	(10) Governance (10.1) Frequency of updating disaster management plans	In the city where I live, disaster management plans are updated frequently enough to effectively address climate change impacts.	46	FFT.ACC.02
			Enhanced Public Transport and Non-motorized Mobility	SDG	11.2.1	(11.2) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. (11.2.1) Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	In the city where I live, efforts to improve public transport and non-motorized mobility (like walking and cycling) effectively reduce reliance on private vehicles.	47	FFT.EPTNM.01
				SDG	9.1.2	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. (9.1.2) Passenger and freight volumes, by mode of transport	In the city where I live, the quality and reliability of public transport and non-motorized mobility infrastructure support economic development and well-being.	48	FFT.EPTNM.02
			Stakeholder Involvement and Collaborative Planning	SDG	11.3.2	(11.3) By 2030, enhance inclusive and sustainable Urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. (11.3.2) Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically	In the city where I live, stakeholder involvement and collaborative planning effectively enhance public transport and non-motorized mobility.	49	FFT.SICP.01
				SDG	17.17.1	(17.17) Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships. (17.17.1) Amount in United States dollars committed to public-private partnerships for infrastructure	In the city where I live, effective stakeholder involvement and collaborative planning enhance public-private partnerships in urban infrastructure projects.	50	FFT.SICP.02
				Capital System (Collective Human Capital)	City Living Lab (Corede) Q.20	-	I participate freely, in an organised and unpaid way, in associations, NGOs, communities or groups that generate a positive social impact.	51	FFT.SICP.03
			Addressing Socio-Spatial Inequalities	SDG	11.3.1	(11.3) By 2030, enhance inclusive and sustainable Urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. (11.3.1) Ratio of land consumption rate to population growth rate	Efforts to improve transport accessibility in peripheral areas effectively reduce socio-spatial inequalities in my city where I live in.	52	FFT.ASSI.01

## Notes:

\*Adapted scale and question

\*\*Adapted form SDG

\*\*\*Specific question to London. For other cases it will adapted

Source: Elaborated by the author (2024)

Table 36 - Composition of thesis scale according to RMPA and RMSG case

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code	
Strategy of planning and operation	Regulation	Territorial	Principle of Socio-Spatial Structuring	ISO 37122	City Living Lab (Corede) Q.45	(21) Urban planning. (21.1) Annual number of citizens engaged in the planning process per 100 000 population	Os cidadãos da cidade participam do seu processo de planeamento.	1	R.T.01	
			Construction of Internal/External Partitions	Capital System (Relational)	City Living Lab (Corede) Q.8	-	Eu participo de atividades sociais na minha comunidade ou bairro.	2	R.T.02	
			Fields of Operation. Past, Present, and Emerging Borders	ISO 37122	21.1*	(21) Urban planning. (21.1) Annual number of citizens engaged in the planning process per 100 000 population	Pelo seu período de envolvimento, você pode dizer que já tem um histórico de contribuição com a cidade	3	R.T.03	
		Scale	Governance Dynamics and its Organization	UN Habitat 2020; National Law	MedroHub	Governance Integration: Collegiate Governing Body, Legal Framework and Regulations, Metropolitan Facts and Management Entity.	Existe uma entidade metropolitana responsável pela Dinâmica de Governança e sua organização, incluindo pelo menos um Órgão Governante Metropolitanos, com estrutura legal de colegiado e de projetos.	4	R.S.01	
			Principle of Socio-Spatial Structuring	SMob	ARO34	-	Existem várias opções de rotas para entrar ou sair dos bairros na cidade onde eu moro	5	R.S.02	
	Urban Development	Place	Market, Traffic, and Administrative Separation	Christaller (1966)	-	Three established principles: the Market principle, the Administrative principle and the Traffic principle.	Na cidade onde moro, há uma oferta regional de vários serviços e uma estrutura de governança local e regional que eu reconheço.	6	UD.P.01	
				Principle of Socio-Spatial Structuring	ISO 37123	12.6	(12) Habitação. (12.6) Porcentagem de propriedades residenciais situadas em áreas de alto risco	De acordo com meu conhecimento, moro em uma propriedade residencial em uma área de alto risco.	7	UD.P.02
					SMob	ARO35	-	O centro da cidade pode ser facilmente alcançado a partir dos bairros.	8	UD.P.03
			Place-Centrism	SMob	AEQ26	-	Estou satisfeito com as condições das ruas onde moro.	9	UD.P.04	
				SMob	SAF17	-	Eu me sinto seguro na cidade onde moro.	10	UD.P.05	
				SMob	ARO33	-	Os bairros têm trajetos fáceis para partes importantes da cidade onde moro, como escolas e hospitais.	11	UD.P.06	
		Economy	Investment and infrastructure to Mobility	SDG 9	City Living Lab (Corede) Q.41	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	A infraestrutura da cidade onde moro é adequada para as necessidades da população.	12	UD.E.01	
			Economic Concentration Spatial Inequality	SDG 10	City Living Lab (Corede) Q.49	(10.1) By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	A cidade onde moro tem um custo de vida muito alto.	13	UD.E.02	
			Sustainability and the Sharing Economy	ISO 37122	City Living Lab (Corede) Q.24	9.1 Annual amount of revenues collected from the sharing economy as a percentage of own-source revenue	Muitas pessoas têm atividades da economia de compartilhamento como fonte de renda (Uber, 99, Garupa, IFood, Airbnb).	14	UD.E.03	
		ISO 37122		City Living Lab (Corede) Q.38	19.2 Number of users of sharing economy transportation per 100,000 population	Muitas pessoas na cidade onde moro usam transporte da economia de compartilhamento (Uber, 99 e similares).	15	UD.E.04		
		Urbanisation	Urbanisation and Urban Planning (dynamic land use planning and its infrastructure)	SDG 11	11.a	(11.a) Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning. (11.a.1) Number of countries (cities) that have national urban policies or regional development plans that (a) respond to population dynamics; (b) ensure balanced territorial development; and (c) increase local fiscal space **	Existe infraestrutura e políticas regionais específicas entre áreas urbanas, periurbanas e rurais.	16	UD.U.01	
			Mobility and Urban Planning	SDG 9	9.1.1	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and	Na cidade onde moro, as estradas para todas as estações são adequadamente acessíveis a todos	17	UD.U.02	

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code
						transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. (9.1.1) Proportion of the rural population who live within 2 km of an all-season road	os moradores rurais, melhorando o desenvolvimento econômico da nossa comunidade.		
				ISO 37120	18.5	18) Transport (18.5) Percentage of passengers travelling to work as an alternative to the private car	Por favor, indique o quanto você concorda com a seguinte afirmação: "Eu uso modos de transporte alternativos para ir ao trabalho em vez de usar o carro."	18	UD.U.03
	<b>Innovative culture</b>	<b>Culture and Identity</b>	Governance and metropolitan cosmopolitan character.	Sennett (2018); Barbera and De Rossi (2021)	-	Functionally interconnected cities, regardless of their administrative boundaries	Você concorda que um planejamento urbano justo e inclusivo ajuda a promover a diversidade cultural em áreas metropolitanas.	19	IC.CI.01
				SMob	AEQ21	-	Há muitas coisas interessantes para ver enquanto eu caminho pela cidade onde moro.	20	IC.CI.02
			Enrichment through Diversity.	SDG 12	12.b	(12.b) Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	Até que ponto você concorda que as iniciativas de desenvolvimento sustentável em sua comunidade promovem e preservam com sucesso a cultura e os produtos locais.	21	IC.CI.03
				Sennett (2018); Barbera and De Rossi (2021)	-	Open City Concept	Você concorda fortemente que a diversidade cultural de Londres melhora sua identidade ao promover um ambiente de 'cidade aberta'.	22	IC.CI.04
			Cultural Integration and Identity	SDG 11	11.4.0	(11.4) Strengthen efforts to protect and safeguard the world's cultural and natural heritage. (11.4.1) Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)	Você concorda fortemente que a abordagem de uma cidade para promover a integração cultural pode melhorar a coesão da comunidade e a identidade urbana e metropolitana.	23	IC.CI.05
				SDG 10	City Living Lab (Corede) Q.63	(10.2) By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	Estou satisfeito com as opções culturais disponíveis na minha cidade onde moro (teatro, música, arte, dança, feiras gratuitas e cinema).	24	IC.CI.06
		<b>Innovation</b>	Infrastructure (cycling and walking) and Mobility Innovations	ISO 37120	18.7	Kilometres of cycle paths and lanes per 100,000 inhabitants (support indicator)	Você concorda que o aumento em quilômetros de ciclovias e pistas cicláveis promove efetivamente a mobilidade sustentável na área metropolitana.	25	IC.I.01
				SMob	SAF17	I feel safe in the city where I live	Eu me sinto seguro na cidade onde moro.	26	IC.I.02
			Public Spaces and Accessibility.	SMob	AEQ19	The trees make shade on the sidewalks of the city	As árvores fazem sombra nas calçadas da cidade onde moro.	27	IC.I.03
				SMob	AEQ20	There are pleasant natural characteristics in this city	Há características naturais agradáveis nesta cidade onde moro.	28	IC.I.04
			Behavioural Change and Environmental Sustainability	London (2018) & Insights interviewees	-	-	Incentivar o ciclismo e a caminhada, juntamente com a implementação de áreas de baixa emissão de CO2, como restringir a circulação de carros a combustão e tributá-los, são medidas eficazes para reduzir as emissões urbanas e melhorar a sustentabilidade ambiental.	29	IC.I.05
		<b>Network</b>	Integrated Transport Networks	SMob	AEQ25	The city streets are well maintained (paved, regular, and without many defects).	As ruas da cidade onde moro são bem mantidas (pavimentadas, regulares e sem muitos defeitos).	30	IC.N.01
			Governance and Collaboration Across Boroughs (cities)	Christaller (1966)	-	Three established principles: the Market principle, the Administrative principle and the Traffic principle.	A colaboração aprimorada entre a cidade onde moro e a Autoridade Metropolitana leva a soluções de mobilidade urbana mais equitativas e eficazes.	31	IC.N.02

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code		
			Accessibility and Inclusivity.	SMob	WLK02	The city sidewalks are well cared (paved, regular, and without any defects).	As calçadas da cidade onde moro são bem mantidas (pavimentadas, regulares e sem defeitos).	32	IC.N.03		
				SMob	WLK05	There are adequate structures for people with reduced mobility (ramps, tactile signs) on the city sidewalks	As calçadas da cidade onde moro têm estruturas adequadas para pessoas com mobilidade reduzida, como rampas e sinais táteis.	33	IC.N.04		
			Forward-Looking Mobility Strategies and Policy Influence	SMob	TSF12	Most drivers respect the speed limit while driving in the city	A maioria dos motoristas respeita o limite de velocidade ao dirigir na cidade onde moro.	34	IC.N.05		
				SMob	ITD28	The smart traffic lights system works well	O sistema de semáforos inteligentes funciona bem.	35	IC.N.06		
			Resilience	Climate Change	Climate Change and Sustainability	London (2018), IPCC (2021) & Insights interviewees	-	Decarbonization and electrification	De acordo com o seu conhecimento, você concorda fortemente que a transição para veículos elétricos (EVs) e a expansão da infraestrutura de carregamento de EVs são estratégias eficazes para reduzir as emissões urbanas de gases de efeito estufa.	36	R.CC.01.1
							-	Prioritization of pedestrian and cycling infrastructure	De acordo com o seu conhecimento, você concorda fortemente que investir em infraestrutura para pedestres e ciclistas contribui significativamente para reduzir a dependência de carros e melhorar a sustentabilidade urbana.	37	R.CC.01.2
	Integrated Planning Beyond Administrative Boundaries	Christaller (1966)			-	Three established principles: the Market principle, the Administrative principle and the Traffic principle.	De acordo com o seu conhecimento, o planejamento integrado através de fronteiras administrativas é crucial para combater efetivamente as mudanças climáticas em áreas metropolitanas.	38	R.CC.02		
		ISO 37123			10.4	(10) Governança. (10.4) Porcentagem de reuniões públicas destinadas à resiliência na cidade	Na cidade onde moro, a frequência de reuniões públicas focadas na resiliência urbana contribui efetivamente para as estratégias de mitigação das mudanças climáticas.	39	R.CC.03		
		SDG			11.5.1	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.1) Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	De acordo com o seu conhecimento, as estratégias atuais são eficazes na redução do número de mortes, pessoas desaparecidas e aqueles diretamente afetados por desastres como uma porcentagem do Produto Interno Bruto (PIB).	40	R.CC.04		
		SDG			11.5.2	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.2) Direct economic loss attributed to disasters in relation to global domestic product (GDP)	De acordo com o seu conhecimento, as estratégias atuais de mitigação das mudanças climáticas são eficazes na redução das perdas econômicas causadas por desastres.	41	R.CC.05		
		SDG	11.5.3	(11.5) By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. (11.5.3) (a) Damage to critical infrastructure and (b) number of	De acordo com seu conhecimento, as estratégias atuais são eficazes na proteção da infraestrutura e dos serviços básicos contra danos causados por desastres.	42	R.CC.06				

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code
						disruptions to basic services, attributed to disasters			
			Adaptation to Climate Change Impacts	SDG	11.b.2	(11.b) By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels. (11.b.2) Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies Framework for Disaster Risk Reduction 2015–2030	De acordo com o meu conhecimento, os governos locais na cidade onde moro implementam efetivamente planos de adaptação às mudanças climáticas para proteger contra ondas de calor e inundações superficiais.	43	R.ACC.07
		Foresight, Future Thinks	Innovative Urban Mobility Solutions	SDG	11.2.1	(11.2) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. (11.2.1) Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	Na cidade onde moro, soluções inovadoras de mobilidade urbana, como veículos autônomos e transporte público expandido, melhoram efetivamente a acessibilidade e a sustentabilidade.	44	FFT.I.01
			Adapting to Climate Change	SDG	11.b.2	(11.b) By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels. (11.b.2) Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies Framework for Disaster Risk Reduction 2015–2030	Na cidade onde moro, os esforços para aumentar os espaços verdes e implementar zonas de baixa emissão preparam efetivamente a cidade para os impactos das mudanças climáticas.	45	FFT.ACC.01
				ISO 37123	10.1	(10) Governance (10.1) Frequency of updating disaster management plans	Na cidade onde moro, os planos de gerenciamento de desastres são atualizados com frequência suficiente para abordar efetivamente os impactos das mudanças climáticas.	46	FFT.ACC.02
			Enhanced Public Transport and Non-motorized Mobility	SDG	11.2.1	(11.2) By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. (11.2.1) Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities	Na cidade onde moro, os esforços para melhorar o transporte público e a mobilidade não motorizada (como caminhar e andar de bicicleta) reduzem efetivamente a dependência de veículos particulares.	47	FFT.EPTNM.01
				SDG	9.1.2	(9.1) Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic	Na cidade onde moro, a qualidade e a confiabilidade do transporte público e da infraestrutura de mobilidade não motorizada	48	FFT.EPTNM.02

Macrocategory	Category	Subcategory	Attributes	Standard or Reference	Scale/Indicator	Description	Questions for quantitative phase - Likert questionnaire	Nº	Code
						development and human well-being, with a focus on affordable and equitable access for all. (9.1.2) Passenger and freight volumes, by mode of transport	apoiam o desenvolvimento econômico e o bem-estar.		
			Stakeholder Involvement and Collaborative Planning	SDG	11.3.2	(11.3) By 2030, enhance inclusive and sustainable Urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. (11.3.2) Proportion of cities with a direct participation structure of civil society in urban planning and management that operate regularly and democratically	Na cidade onde moro, o envolvimento das partes interessadas e o planejamento colaborativo melhoram efetivamente o transporte público e a mobilidade não motorizada.	49	FFT.SICP.01
				SDG	17.17.1	(17.17) Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships. (17.17.1) Amount in United States dollars committed to public-private partnerships for infrastructure	Na cidade onde moro, o envolvimento eficaz das partes interessadas e o planejamento colaborativo melhoram as parcerias público-privadas em projetos de infraestrutura urbana.	50	FFT.SICP.02
				Capital System (Collective Human Capital)	City Living Lab (Corede) Q.20	-	Participo livremente, de forma organizada e não remunerada, em associações, ONGs, comunidades ou grupos que geram um impacto social positivo.	51	FFT.SICP.03
			Addressing Socio-Spatial Inequalities	SDG	11.3.1	(11.3) By 2030, enhance inclusive and sustainable Urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. (11.3.1) Ratio of land consumption rate to population growth rate	Os esforços para melhorar a acessibilidade de transporte nas áreas periféricas reduzem efetivamente as desigualdades socioespaciais na cidade onde moro.	52	FFT.ASSI.01

## Notes:

\*Adapted scale and question

\*\*Adapted from SDG

Source: Elaborated by the author (2024)



## APPENDIX B – COMPARES LEGISLATIVE FRAMEWORKS FOR METROPOLITAN GOVERNANCE

Table 37 - Suggested administrative structures, past and present, common services, and plan requirements

Instrument	Year	Council/Instance	Constitution	Common Service Interests	Plans
Complementary Law No. 14	1973	Deliberative Council	5 members	I - Integrated planning of economic and social development; II - basic sanitation, notably water supply and sewage and public cleaning services; III - metropolitan land use; IV - transportation and road system; V - production and distribution of piped combustible gas; VI - use of water resources and environmental pollution control, as provided by federal law.	Promote the preparation of the Integrated Development Plan for the metropolitan region
		Advisory Council	1 representative from each municipality		
State Law No. 6656 and Decree No. 23.070	1973 and 1974	Deliberative Council	5 members	Integrated planning of economic and social development, water supply and sewage collection will be through concession to a state company, land use, transportation and road system, water resources, and environmental pollution control.	Promote the preparation of the Integrated Development Plan for the metropolitan region
		Advisory Council	1 representative from each municipality		
State Complementary Law No. 13,854 and Decree No. 48,946	2011	Deliberative Council	47 with voting rights and 8 without	Does not address FPIC. Only the CDM competencies: I - establish development guidelines; II - plan strategic development; III - propose and approve the region's Master Plan; IV - propose and approve the Multi-Year Plan guidelines for the region; V - identify priority metropolitan actions, proposing their incorporation into the state and municipal LDO and LOA for the RMPA.	Propose and approve the Master Plan for the region
		Executive Board	13 representatives		
		RMPA Governance Office	Office integrated with METROPLAN		
Federal Law No. 13,089	2015	Executive Instance	-	I - guidelines for FPIC, including strategic projects and priority investment actions; II - urban territorial unit macro-zoning; III - guidelines for inter-municipal articulation in land subdivision, use, and occupation; IV - intersectoral public policy coordination in urban territorial units; V - delimitation of areas with Urbanisation restrictions for environmental or cultural protection, or special control for natural disaster risks; VI - monitoring and control system for its provisions.	Integrated urban development plan (PDUI) as a guiding instrument, recognizing broad civil society participation and oversight by the Public Ministry. It should recognize the legislation and plans of the cities that comprise it.
		Deliberative collegiate body	-		
		Public organisation with technical advisory functions	-		
Federal Law No. 13,146	2015	-	-	Guidance linked to the Union to incorporate housing, basic sanitation, transport, and urban mobility.	-
Federal Law No. 14,001	2021	-	-	Links the Urban Mobility Plan to integrated urban development plans.	-

Source: BRAZIL (1973, 2015, 2021), RIO GRANDE DO SUL (1973).

## APPENDIX C - QUALITATIVE ANALYSIS

### GREATER LONDON

The study analysed interviewees' responses, extracting key statements and organizing them by question. The aim was to connect these responses using predefined subcategories. Researchers highlighted and connected the main statements of each interviewee, noting similarities and common points to analyse mobility dimensions and define attributes for a sustainable metropolitan region. Subsequently, the findings were explored through predefined subcategories. The researchers identified common points essential for regional sustainability and linked them to classical theories and recent studies. This approach ensured a comprehensive understanding of the necessary attributes for creating a sustainable metropolitan region, contributing significantly to the research objectives.

#### Territorial

The narratives from our interviewees vividly demonstrate profound connections to Greater London, intertwining their professional and personal lives with the city and underscoring strong emotional bonds. Their reflections on London's development, its role in their everyday experiences, and their engagement with its multifaceted urban environment reveal a city of extraordinary vibrancy and dynamism. These accounts collectively emphasize London's remarkable adaptability and the myriad ways its residents interact with its spaces, governance, and transport systems.

Interviewee 1, who has spent their entire life in the heart of the city, articulates this bond: "I've been living actually in the center of London, in the city of London, for my whole life, and my relationship with it is not only as a resident but as someone who is very emotionally invested." This sentiment echoes in the perspective of Interviewee 3, who was "positively surprised" by London and seamlessly embraced it as home.

For Interviewee 7, London became central to their personal and professional journey after arriving in 2000 for doctoral studies. They describe the city's enduring significance, stating, "I'm very emotionally connected to it, especially as my kids attend school here and are true Londoners," highlighting how London forms the core of their family life and career. Similarly, Interviewee 8 reflects on their extensive journey through education, residence, and efforts to improve the city's quality of life. They note, "London is where I live and where I studied at university. I've lived in London for a very long time and have had the benefit of

working to help improve the city. And yes, I really like the city. It's a big, big, big, big, big place, but somewhere I've grown to really like."

#### Scale

The narratives from our interviewees illuminate the intricate governance, mobility, and sustainability challenges of Greater London. Interviewee 1 highlights the City of London's unique governance and its collaboration with Transport for London, emphasizing cross-borough cooperation and financial partnerships, especially in projects like the Elizabeth Line. Interviewees 2 and 3 discuss the semi-autonomous nature of the Greater London Authority and its boroughs, stressing the need for coherent regional governance and bridging socioeconomic disparities. Interviewee 4 and others address the diverse identities and collaboration levels among boroughs, noting variances in transport networks and potential gaps in inter-borough relationships. Key insights include Interviewee 1's focus on the City of London's distinctive governance and synergies with Transport for London, emphasizing inter-borough cooperation. Interviewee 2 discusses the Greater London Authority and boroughs' semi-independent relationship, highlighting localized governance. Interviewee 3 raises concerns about governance inconsistencies and the need for a unified regional approach to mitigate socioeconomic divides. Interviewee 4 highlights the distinct identities and collaboration efforts among boroughs, noting disparities in transportation access.

#### Place

The discourse surrounding London's urban landscape, shared by various stakeholders, encapsulates its dynamic nature, rooted in diversity, mobility, accessibility, and a respect for its historical and modern elements. Central to these discussions is London's diversity, heralded as a cornerstone of the city's vibrancy and innovation. There's a strong emphasis on sustainable mobility, advocating for a comprehensive public transport system and promoting walking, cycling, and low-traffic neighbourhoods. Balancing urban regeneration with preserving London's rich historical and cultural legacies highlights a collective vision for a city that honours its past while progressively charting its future.

The distinct identities and variations across London's boroughs, shaped by unique histories, geographies, and communities, reinforce its global reputation as a diverse and continually transforming metropolis. Interviewees underscore London's global allure and foundational principles. "London's cultural and ethnic diversity, with over 225 mother tongues, stands as a testament to our unwavering commitment to inclusivity and multiculturalism," notes Interviewee 1. I4 highlights diversity in each borough's people and identity. I6 appreciates the creative atmosphere fuelled by diversity. I7 acknowledges London's global influence and

historical significance, while I8 emphasizes London's diversity in ethnicity, age, and communities, painting Greater London as a dynamic, inclusive, and culturally rich metropolis.

#### Urbanisation

The interviews illuminate critical themes in Greater London's mobility and sustainability, emphasizing its comprehensive public transport network, including the Elizabeth Line and metro systems, which navigate the densely populated city. A recurring theme is the importance of integrating equality, diversity, and inclusion into urban regeneration efforts. Challenges in mobility management include balancing urban and rural needs and ensuring equitable transport accessibility. The strategic use of the green belt to control urban sprawl is pivotal. Migration patterns highlight London's attraction to a diverse populace, impacting housing and urban development. Living costs and property prices spotlight public transport's role in maintaining affordability. COVID-19's impact on work patterns necessitates reevaluation of urban planning. These insights underscore the need for innovative, inclusive strategies to navigate Greater London's complex mobility and sustainability landscape.

The discourse on Urbanisation and infrastructure development within Greater London reveals the symbiotic relationship between the city's history of Urbanisation and its infrastructure framework. Interviewee 1 notes, "Urbanisation has always been the history of London... it's been urbanized for about 250 years and it's also had the infrastructure." Interviewee 2 highlights the city's mobility advantages, "We have a fairly good public transport provision." These statements underscore the integral role of infrastructure in supporting London's urban fabric, highlighting how the city's longstanding Urbanisation process is linked with a comprehensive public transport system, embodying the city's commitment to sustainability.

The vital role of London's comprehensive public transport system, with its diverse trains, buses, underground, DLR, docklands railways, cycling, and walking options, is crucial for urban mobility. Interviewees 2 and 6 highlight this system's support for the city's dynamic nature, enabling "people [to] easily take train, take bus, take underground...cycling, walking," ensuring "it's a very fluid kind of place in terms of mobility. Public transit...works generally very well." COVID-19 has introduced shifts in working patterns and urban planning needs, as noted by Interviewee 1, "The impact of COVID means that working patterns have changed significantly and the need to come into the centre has diminished." Interviewee 7 emphasizes "alternatives to the car for those local journeys and those more orbital journeys within the zones," reflecting the city's adaptive response to ongoing changes.

The cost of living and property prices in London highlight the critical role of the public transport system in mitigating these concerns. The ability to reside in more affordable outskirts while maintaining employment in the city center is facilitated by public transport, noted by multiple interviewees. Interviewee 1 adds, "A very rural life within one hour of London," offering diverse living conditions. Addressing disparities in transport accessibility and leveraging innovative transport solutions are essential for enhancing mobility management and ensuring living in London remains viable for a broader demographic.

Diversity and inclusivity stand at the core of London's urban planning ethos, with a deliberate focus on cultivating a multicultural environment. Interviewee 2 highlights the influx of migrants enriching London's socio-economic tapestry, creating a "mix of like exchange of knowledge and of different paths of life in every corner," according to Interviewee 3. The green belt around London serves as a pivotal planning tool to curb urban sprawl while impacting property prices and guiding development towards sustainability. Interviewee 1 acknowledges London's green belt as a "crucial planning designation," and Interviewee 8 notes the importance of "a strong land use planning framework." These policies preserve green spaces essential for ecological balance and public well-being while enabling sustainable urban growth.

### Economy

The interviews highlight Greater London's integration of mobility, sustainability, and economic development. A holistic strategy is necessary to balance Urbanisation, infrastructure enhancement, and equitable economic growth. Key themes include the importance of an efficient public transport system, economic sustainability, and addressing disparities for inclusive growth. This approach aligns Greater London's economic dynamics with sustainable mobility and urban planning to foster a resilient, inclusive future.

Discussions on Urbanisation and economic issues emphasize the intersections of density, investment, and long-term planning. I3 states, "The low density of the city doesn't help at all for improving," and "we need to increase the density in the center of the city." I4 and I7 stress prudent resource allocation and sustained transport infrastructure investment to bridge community divides. The dialogue around projects like HS2 illustrates complex infrastructure spending debates. I3, I6, and I8 advocate leveraging London's economic strengths and historical infrastructure towards green mobility and public spaces.

London's public transport system, discussed by I1 and I3, is critical for city-wide mobility and urban development. It addresses urban residents' and commuters' needs and shapes the city's socio-economic landscape. I3 reflects on the infrastructure level, finding it superior to other places, highlighting London's commitment to green mobility. The HS2 project,

mentioned by I1, exemplifies strategic infrastructure investments extending benefits beyond the metropolitan area. These perspectives suggest that London's public transport system is a critical element in guiding future development, sustaining dynamic growth, and addressing mobility challenges.

The economic landscape of London, articulated by I1, I2, I7, and I8, presents a city at the nexus of growth and spatial inequality. London's economic dynamism contributes to global stature and internal disparities. I1 observes the unique economic concentration, contrasted with peripheral migration patterns, underscoring spatial inequality. I2 and I7 highlight London's role in driving UK economic growth and attracting international talent. However, as I8 points out, economic power concentration introduces challenges, including disparities and political tensions. These observations underline the relationship between economic prosperity and socio-spatial structure, necessitating a balanced urban planning strategy. Sustainable mobility solutions and efforts to alleviate disparities are imperative for further growth.

Urban development, mobility, and socio-economic disparities in London are highlighted through development projects impacting access and movement. The influx of commuters reveals how London's economic hub status contributes to mobility patterns that may deepen inequalities. Insights from I2 and I5 into spatial inequality and the juxtaposition of affluent and impoverished areas further complicate the narrative. These disparities manifest in varied access to resources, underscoring the need for equitable urban development. Addressing these challenges requires a holistic strategy fostering mobility, connectivity, and socio-economic equity for cohesive development and residents' well-being.

#### Culture and Identity

Each interviewee recognizes London's diversity as its greatest strength, enriching its cultural, economic, and social landscape. This diversity drives innovation, promotes inclusivity, and is crucial for sustainable metropolitan development. The discussions highlight London's diversity shaping its metropolitan essence and impacting infrastructure and urban planning. There is a consensus on the necessity of a mobility infrastructure that supports diversity, modernizes heritage sites, and advances green mobility solutions. Emphasizing cultural and social inclusion in urban planning and mobility strategies is essential for London's sustainability. These strategies address spatial inequalities and sustain its dynamic nature. Improving public transport and expanding green spaces are vital for supporting a diverse, growing population. The collective insights stress integrating diversity into urban planning and mobility strategies to ensure London's continued vibrancy, inclusivity, and sustainability as a global city.

London's governance framework and cosmopolitan essence have nurtured a tradition of diversity and openness, foundational elements deeply woven into the metropolis's fabric. Historical records and narratives affirm this, with I6 noting, "London has been a diverse city for centuries." I2 underscores its global standing as "one of the most diverse metropolitan regions globally." These aspects present challenges but also offer vast opportunities for cultural enrichment and social cohesion. The city's inclusive ethos promotes learning about and appreciating diverse cultures, fostering unity within its multifaceted society. This sentiment is captured by I4, who says, "You get educated about other cultures. It helps to create a sense of we are one diverse sort of thing." I8 adds that London's openness empowers its communities to flourish, preserving their unique cultural identities while enriching the city's dynamic mosaic.

Diversity stands as the cornerstone of London's cultural and social landscape, elevating the city's global stature. Participants uniformly acknowledge diversity's enriching influence, with I5 stating, "It undoubtedly contributes to the enrichment of cultures and identities." I2 adds, "The diversity of cultures and voices in London makes it unique." The collective viewpoint champions the positive impacts of diversity, with I6 asserting, "Without doubt, it enriches it." Such reflections underscore the pivotal contribution of London's myriad communities to forging a vibrant and dynamically diverse urban identity.

London's gravitational pull for individuals worldwide has left a lasting legacy on its architecture, culinary arts, and cultural tapestry, reinforcing its identity as a global metropolis. The city's diversity entices those interested in varied literary works, gastronomies, and cultural practices. I6 captures this allure, stating, "If you want to find out about different literatures, because of that diversity, it has so much attraction." While the blending of cultures may spark debates over the erosion of distinct identities, the prevailing discourse leans towards an affirmative appreciation of cultural synthesis. I5 notes, "It does enrich cultures and identities." This enrichment fosters an ethos of coexistence and reciprocal respect among diverse groups, illustrating London's educational and social dynamism.

### Innovation

Interviews from Greater London highlight innovation in merging mobility, sustainability, and urban development. The focus on improving public transportation, adopting micro-mobility, prioritizing environmental health, and ensuring inclusivity showcases mobility as a key to urban innovation. This approach integrates social equity, environmental sustainability, and economic vitality into metropolitan mobility strategies, underscoring the need for innovative frameworks to support sustainable urban ecosystems and promote equitable, environmentally friendly growth.

Innovative transportation has a transformative effect on urban life. Projects like the Elizabeth Line reduce car reliance, while expanding cycling and pedestrian paths, micro-mobility initiatives, and the Ultra-Low Emission Zone (ULEZ) demonstrate a commitment to sustainable transport and environmental health. Efforts to improve safety and accessibility for all depict a comprehensive strategy for inclusive urban mobility. Ongoing infrastructure investment, innovative policy, community involvement, and cross-sector collaboration highlight the importance of creating a vibrant, sustainable, and inclusive city.

Interviewees emphasize infrastructure projects like the Elizabeth Line, cycle lanes, and low emission zones. I1 calls the Elizabeth Line "very significant infrastructure." I3 and I6 highlight HS2 and Crossrail as "the most important ones." I7 notes the creation of "a network of 350 kilometers of cycle routes." These initiatives illustrate London's commitment to improving accessibility and sustainability. Transit-oriented development (TOD) enhances accessibility to public transportation, fostering mobility around transit stations. I2 notes projects like the Elizabeth Line in this context, saying, "So we also call it TOD transit-oriented development."

Adopting micro-mobility solutions, such as e-scooters and e-bikes, addresses the first and last mile gap in transportation infrastructure. I2 underscores the significance of e-micromobility, "To roll out like the I would say that where I point to e-micromobility, for example, e-scooters." I7 emphasizes infrastructure innovations to support micro-mobility, highlighting safe pathways for pedestrians and cyclists, especially for children going to school.

Environmental concerns are prominent among interviewees, who emphasize initiatives to reduce emissions and enhance air quality. I7 states the importance of "reducing any air pollution in the city." I6 highlights bus network electrification, while I8 emphasizes improvements to enhance air quality, reflecting a commitment to sustainability and public health.

Community-level initiatives to enhance mobility and safety are also noted. I5 says, "I think that's really great movement, I think, in terms of moving around London." I6 references school streets implemented since 2016, prioritizing pedestrian safety. I8 highlights community-driven initiatives like the ULEZ, emphasizing, "Everyone usually thinks of innovation as things like electric bikes or e-scooters, but this is a community level, global importance type of initiative." These remarks underscore the pivotal role of community-led efforts in promoting sustainable mobility and safety

Net



The interviews highlight the importance of an integrated transportation network in Greater London's sustainability. Emphasizing efficient public transport, accessible mapping for pedestrians and cyclists, and inter-borough collaboration to overcome infrastructure disparities, interviewees identify challenges such as improving accessibility for all, including those with disabilities, and enhancing connections in areas lacking rapid transit. Insights call for enhanced integration, collaborative governance, and inclusive, environmentally sustainable mobility solutions. This comprehensive perspective advocates for a holistic approach to ensuring Greater London's sustainable development.

The interviewees stress the need for an integrated transport network, recognizing its role in enhancing urban mobility and connectivity. I1 praises London's efforts, describing it as having the "most integrated transport network in the UK." I5 acknowledges Transport for London's (TFL) proactive stance, affirming that "TFL has always been quite at the forefront of mobility." I6 agrees, emphasizing London's highly integrated existing mobility network. Their collective remarks highlight initiatives like "Legible London" and seamless interconnectivity between various transportation modes, essential for optimizing urban mobility.

Effective governance and cooperation between government entities, including boroughs and central government, are crucial for shaping comprehensive mobility strategies. I2 underscores the importance of "cooperation between different boroughs and Greater London." I8 emphasizes governance in formulating overarching strategies, noting, "basically set the strategy for the city up through the transport strategy that I wrote." I6 highlights the need for effective policy implementation and strong leadership to address challenges like air pollution, congestion, and mobility efficiency.

Accessibility and inclusivity are paramount, with a focus on ensuring equal access for all, including those with disabilities, and extending service coverage to isolated areas. I4 raises concerns about transportation network accessibility for individuals with disabilities, asking, "people who are in a wheelchair, for example, can they go on every platform?" I7 highlights addressing air pollution, congestion, and health, recognizing improved accessibility's role in tackling these issues.

The discourse on Management and Policy Implementation reveals a nuanced understanding of the challenges and strategies necessary for sustainable urban growth. I3 notes a gap between the mobility network enhancements and the city's rapid population growth, calling for accelerated policy implementation. I6 points out that necessary policies often face public resistance, highlighting the complexity of balancing long-term sustainability goals with

immediate public sentiment. I7 emphasizes the strategic focus on addressing urban challenges like air pollution, congestion, and public health, essential for future success.

The interplay between urban mobility strategy, policy implementation, and public sentiment in Greater London reflects a complex governance and urban management landscape. I3 highlights the challenge of scaling urban mobility solutions with rapid urban expansion, while I6 acknowledges the necessity of certain urban policies despite their unpopularity. I7 emphasizes the long-term benefits of addressing air pollution, congestion, and health. I8 compares London favorably to other UK and European cities in creating an integrated transport network, while I6 encapsulates the diverse and interconnected nature of London's transport system, highlighting the importance of accommodating various transportation modes.

### Climate Change

The synthesis of interviews highlights the critical role of an integrated transportation network in Greater London's sustainability. It emphasizes the expansion of public transport, accessible mapping for pedestrians and cyclists, and inter-borough collaboration to overcome infrastructure disparities. Key challenges include improving accessibility for all, including those with disabilities, and enhancing connections in areas lacking rapid transit. Insights call for enhanced integration, collaborative governance, and inclusive, environmentally sustainable mobility solutions. This comprehensive perspective advocates a holistic approach to ensuring Greater London's sustainable development.

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#### Foresight, future thinks

The interviews highlight diverse perspectives on the future of mobility and sustainability in Greater London, emphasizing urban development, technological innovation, environmental concerns, and social equity. These discussions underscore the link between mobility and sustainability and the essential attributes for a sustainable metropolitan region. There's a shared emphasis on improving public transport networks, including trams, autonomous buses, and interconnected systems to reduce private vehicle reliance. Highlighting non-motorized transport, such as walking and cycling, is crucial for lowering emissions and enhancing public health. New technologies, including electric and autonomous vehicles and ICT for remote work, indicate a shift towards digitalization and the future of mobility. Advocacy for decentralized living aims to reduce commute times while emphasizing climate resilience and social equity to ensure access for all. This comprehensive perspective underlines the need for an integrated, multimodal transport network that is climate-resilient, human-centered, promotes local living, guarantees equity, and involves community engagement in policymaking, fostering a livable, resilient, and equitable urban environment.

The collective insights of the interviewees focus on sustainable and future-proof mobility through technological innovations, addressing climate change, enhancing public transport and non-motorized mobility options, stakeholder involvement, and collaborative

planning. I4 articulates the need to "cater more for all areas, so everyone can move more freely," emphasizing equitable mobility solutions across the urban landscape. I5 envisions public transport, cycling, and walking as the future cornerstones of London's mobility, shifting away from car-centric design. I6 suggests a pivot towards more sustainable, less capital-intensive mobility solutions, indicating that the future may not hold "new big infrastructure investments" like another Crossrail. I7 reinforces this view, stating that changes "to infrastructure" and the adoption of "new technologies" will reduce private car use, aligning with broader sustainability goals. I8's perspective on policy-making for a "cleaner, safer, greener area" speaks to broader objectives of creating accessible and welcoming urban environments.

Technological innovations in urban mobility highlight a strategic pivot towards sustainable and efficient systems, driven by ICT and emerging vehicular technologies. I2 notes, "we can walk from home," emphasizing digital tools' role in facilitating remote work and reducing physical travel. This aligns with I5's observation that London integrates technology into its mobility strategy. I6 adds, "Technology will with the introduction of new technology, the generation of data," highlighting data analytics' potential in improving transportation planning and management. I7 envisions a significant transformation by 2050, with "64% mode shift of walking, cycling, public transport," attributing this shift to technological innovations. I7 also sees technology as crucial for safety improvements, stating, "I see London in the future using technology to reduce the number of people being killed and seriously injured on our roads." The discussions about autonomous vehicles and electric cars underscore the anticipated impact of these technologies on urban mobility. I5's goal of "moving away from private car movement" and I3's aim of "making every area more accessible" indicate a drive towards a more integrated, technology-enabled urban transport network prioritizing accessibility, sustainability, and safety.

Climate change and environmental concerns in urban mobility strategies underscore an urgent recognition of the challenges posed by global warming. I2 projects a forward-looking goal of significantly reducing carbon dioxide emissions by 2050. I3 emphasizes the climatic emergency's priority, suggesting that addressing climate change should be a top concern. I6 highlights the broader implications of these challenges, suggesting that climate change will pressure health care services due to extreme weather events. I8 acknowledges climate change's difficulties and underscores the collective goal of achieving carbon neutrality. I7 identifies practical approaches, advocating for a shift from private car use to reduce emissions.

Focusing on public transport and non-motorized mobility, there is a consensus on enhancing urban spaces to support healthier lifestyles and environmental sustainability. I1 and

I4 emphasize creating urban environments conducive to walking and cycling, stressing the importance of safe spaces and improved air quality. I4 highlights "interconnectivity" between different transport modes to facilitate easier and more efficient city movement. I8 adds that making urban areas accessible to public transport, walking, and cycling is key to encouraging sustainable transport options.

Stakeholder involvement and collaborative planning are crucial for addressing urban mobility and sustainability challenges. I1 asserts that creating safe spaces is essential for public health, suggesting that stakeholder engagement is vital for conducive environments. I4 reflects on the need for collaborative efforts to address climate change and improve health. I5 argues for urban mobility strategies that consider environmental, health, and financial impacts. Such an approach requires diverse stakeholder involvement to ensure sustainable, health-promoting, and economically feasible mobility solutions.

## METROPOLITAN REGION OF PORTO ALEGRE

### Territorial

The analysis of interviews reveals several common themes among experts in urban mobility and sustainability within the *Porto Alegre* Metropolitan Region. Notably, long-term professional involvement in transportation and urban planning is evident and emotional with I9, I10, I13, I14, I15 e I16. The necessity for intergovernmental and multisectoral collaboration is underscored by I9 e I10, while I12 highlights collective efforts among regional mayors. A strong focus on sustainable urban mobility solutions is emphasized by I13, I14 e I15, integrating international best practices into local initiatives.

Reflections on mobility as a function of common interest within the *Porto Alegre* Metropolitan Region highlight several critical dimensions. Effective governance and policy integration are paramount, requiring seamless coordination across municipal, state, and federal levels to establish robust collaborative governance structures. Sustainable transportation systems, such as the *aeromóvel*, integrated public transport networks, and non-motorized transport options, are essential for long-term sustainability and environmental health. Equally important is community engagement and accessibility, ensuring transportation planning incorporates community input and focuses on providing equitable mobility for all demographics. Technological innovation and adaptation play a crucial role in enhancing the efficiency and sustainability of transportation systems, leveraging advancements to address emerging challenges and improve service delivery. Together, these dimensions underscore the

multifaceted approach needed to achieve effective and sustainable mobility in the metropolitan region.

#### Scale

The analysis of interviews with key stakeholders in the *Porto Alegre* Metropolitan Region reveals the necessity for a unified metropolitan planning authority as a central theme. I9 emphasizes integrated institutional planning, supported by I10's call for a singular governing body to improve coordination. I13 underscores METROPLAN 's role in unifying systems, I14 highlights inefficiencies due to fragmentation. The importance of municipal cooperation and representation is stressed by several interviewees, advocating for a collaborative framework. Furthermore, there is a strong focus on sustainable and rationalized transportation solutions, emphasizing the need for integrated, environmentally friendly systems to enhance metropolitan efficiency and sustainability.

**Need for a Unified Metropolitan Planning Authority.** The necessity for a unified metropolitan planning authority emerges as a central theme among the interviewees. I9 emphasizes, "What is needed in these metropolitan regions is the question of institutional integration, where continuous and integrated planning between these spheres, between the state and the municipality, allows for better... let's say, offer better services and reduce overlaps". Similarly, I10 supports the idea of a singular governing body to facilitate metropolitan coordination, noting, " It would be interesting to have a single body that discusses the metropolitan region that is closer to the municipalities". I13 also underscores the importance of METROPLAN as a unifying force, stating, "Porto Alegre should be METROPLAN, this great body, let's say, a promoter that would bring all the systems together and make something totally integrated ". This sentiment is echoed by I14, who highlights the inefficiency stemming from the current fragmented structure, asserting, " There is a whole irrationality due to the absence of a metropolitan structure". The call for a consolidated entity to oversee metropolitan planning is further reinforced by I15 and I16, who stress the importance of coherent governance structures to manage intermunicipal functions effectively.

**Challenges of Overlapping and Fragmented Transportation Systems.** The issues arising from overlapping and fragmented transportation systems are prominently discussed. I9 points out, " The lack of institutional integration means that today we have an overlapping urban and metropolitan urban system, so 60 per cent in the metropolitan region". I13 identifies the severe lack of metropolitan integration, lamenting, "Porto Alegre unfortunately doesn't have this metropolitan interconnection, it's a very serious problem". I14 elaborates on the potential benefits of rationalizing transportation systems, mentioning, "Thinking about the possibility of

rationalising, we used the BRT issue a lot, with overtaking on the axles, and this would increase the overflow". I15 distinguishes between the regulatory ideal and the real-world inefficiencies, stating, " The regulatory, the legal, and what is imagined as perhaps the most efficient, most coherent, and the real world, where these things don't work exactly as designed". These observations underscore the need for improved systemic integration to enhance the functionality and efficiency of metropolitan transportation networks.

**Importance of Municipal Cooperation and Representation.** The critical role of municipal cooperation and representation in metropolitan governance is highlighted by several interviewees. I10 asserts the value of municipal involvement, saying, "Issues of common interest to the municipalities of the metropolitan region would certainly be decided in a way that... a better way for everyone " I11 echoes this sentiment, emphasizing, " The municipalities that are now part of the metropolitan region (...) discuss common policies of interest to the municipalities in a more centralised way". I12 stresses the necessity of broad-based solutions, stating, "I think it should be an objective to find solutions that will cover as many municipalities as possible ". I16 highlights the importance of preserving unique municipal identities within the metropolitan context, observing, "These relationships must be preserved in their absolute form and characteristics without losing identity in relation to the main central urban centre". Collectively, these perspectives advocate for a collaborative framework that ensures equitable representation and fosters cooperative problem-solving among municipalities.

**Focus on Sustainable and Rationalized Transportation Solutions.** Sustainable and rationalized transportation solutions are emphasized as essential for metropolitan development. I9 calls for a unified planning approach, noting, "So it's essential to unite a consortium planning body". I14 discusses the environmental and health benefits of electric vehicles, stating, " If we imagine (...) electric vehicles, (...) we would also have a significant reduction in emissions and this would have an impact on health (...) also on noise". I13 advocates for a cohesive metropolitan transport system, asserting, "It should be a system, in terms of transport, right, it should be a metropolitan system, we shouldn't have". I15 points out the need for proper governance structures to support effective metropolitan transportation, explaining, "Today we have a metropolitan transport company, Trensurb, which is a federal company, so it no longer conforms to this logic of governance". These insights collectively underline the necessity of sustainable, integrated transportation systems to enhance metropolitan efficiency and environmental sustainability.

## Place

The analysis of interviews with key stakeholders in the *Porto Alegre* Metropolitan Region reveals a convergence of ideas around three pivotal themes: integration and efficiency of public transport, addressing social inequities, and the need for a long-term vision for sustainable development. These themes are crucial for understanding the complex dynamics of urban mobility and sustainability in the region. Stakeholders emphasize the importance of institutional integration and modernizing transport systems to enhance connectivity and efficiency. Additionally, there is a strong focus on tackling social inequities, particularly in housing and access to services, underscoring the need for inclusive planning. Finally, the call for a long-term vision highlights the necessity of sustainable and innovative approaches to urban development, ensuring that future growth is both equitable and environmentally sound. These interconnected themes provide a comprehensive framework for addressing the multifaceted challenges facing the *Porto Alegre* Metropolitan Region.

The integration and efficiency of public transport within the *Porto Alegre* Metropolitan Region emerged as a central concern among interviewees. Interviewee 9 (I9) emphasizes the need for institutional integration to streamline the system, stating, "There is a lack of institutional integration to optimize the system, reduce overlap, and address the lack of transport services in neighborhoods, particularly". He also stresses the importance of flexible transport schedules, contrasting traditional fixed schedules with the modern flexibility provided by transport apps. Interviewee 10 (I10) highlights the gap in connectivity between rural areas and urban centers, noting, "Today, the metropolitan region, especially when looking at areas like Vale do Cai, has extensive rural zones. Currently, there is no transportation from rural areas to the urban centers of the city".

I11 identifies public transport as the primary challenge for municipalities and advocates for an integrated approach that involves municipal, state, and federal governments. Interviewee 12 points out the financial burden on municipalities to maintain public transport services, a strain intensified by competition from services like Uber. Interviewee 13 emphasizes METROPLAN's critical role in developing an integrated transport system, while Interviewee 14 suggests that metropolitan networks could improve accessibility and streamline the transport system. I16 underscores the importance of sustainable, long-term solutions, arguing that "The transport or mobility system is a major driver of opportunities and regional transformation".

The need for a long-term vision and sustainable development is a consistent theme among the interviewees. I9 underscores the importance of innovation in the transport system to compete with individual transport, indicating that the system must adapt to modern needs. I14



discusses the significant benefits that rationalization could bring to users, emphasizing improved efficiency and cost savings. I16 calls for the construction of an inclusive and long-term development project, advocating for a comprehensive social pact to guide future growth and sustainability. These insights collectively underscore the critical importance of adopting a forward-looking approach to urban planning, focusing on sustainability, efficiency, and inclusivity to meet the challenges of the Porto Alegre Metropolitan Region.

#### Urbanisation

The analysis of Urbanisation in the Porto Alegre Metropolitan Region reveals key insights into the region's mobility and sustainability challenges. By examining territorial complexities, policy integration needs, rural-urban mobility, infrastructure development, economic diversification, and the preservation of rural areas, the study highlights the critical need for cohesive planning and innovative solutions. The interviews underscore the importance of addressing social inequities, enhancing transportation efficiency, and fostering long-term sustainable development. These findings underscore the necessity of a unified metropolitan planning approach to harmonize urban expansion and rural preservation, ensuring balanced and equitable growth across the region.

The region's vast expanse poses significant challenges, especially for transportation and infrastructure. Interviewee 9 noted, "We have average travel solutions of around 30 km, which is much larger than any single municipality", highlighting the long travel distances required. Additionally, inadequate infrastructure, particularly in rural and peripheral areas, worsens these issues: "There isn't sufficient infrastructure to meet demand; for example, many routes are still dirt roads". These insights underscore the need for robust transportation infrastructure to support the region's extensive and diverse territories.

Cohesive policies and integrated planning across governmental levels are essential. I9 emphasized, "There is a lack of a national public policy that filters down to the state and municipal levels ", pointing to the gap in national policy support. Effective integration between institutional, political, and economic spheres is vital to addressing these challenges comprehensively: "It requires institutional, political, and economic integration among related areas". This situation underscores the call for a unified metropolitan planning authority to facilitate integration and consistent service provision across the region.

Integrating rural and urban mobility is crucial for maintaining a balanced workforce and regional economic vitality. I10 highlighted a local initiative: "(...) we have a program called Tarifa Zero (...) a bus that goes to rural areas twice a day to bring people into urban centers", illustrating efforts to connect rural populations to city areas. However, challenges remain, as

rural zones often lack sufficient transportation services, making it difficult for residents to access urban job markets: "Uber drivers today don't want to go into rural areas because it's too costly". Strengthening rural-urban mobility is essential for the region's economic development and workforce distribution.

Infrastructure improvements are necessary to support economic activity and enhance residents' quality of life. I11 emphasized, "We need to pave rural roads, especially the primary vicinal roads that transport our agricultural production", underscoring the importance of infrastructure that facilitates agricultural production and connects it with urban markets. Improved infrastructure supports economic activity and enhances the quality of life for rural populations by ensuring access to essential services and markets.

Economic diversification is a strategy for regional resilience, as the region's diverse economy—including agriculture, industry, and services—requires robust infrastructure to support these sectors. I12 noted, "The economy in Glorinha is diversified, as we have horticulture and soy farming, for instance ". underlining the need for reliable infrastructure to support diverse economic activities. Ensuring that infrastructure development keeps pace with economic diversification is vital for the region's sustainable growth.

Preserving rural areas is essential for ecological balance and quality of life. I13 highlighted, "Porto Alegre has a very interesting rural area, a very large one,". pointing to the significance of these rural spaces for regional sustainability. However, these areas often lack sufficient transportation services, and urban residents are generally unaware of them: "People know very little, even though there are rural tours here in Porto Alegre". Fostering greater interaction between urban and rural areas can help preserve these spaces and leverage their benefits for the broader region.

A unified approach to urban-rural planning is necessary for cohesive development. I14 observed, "There is a lot of land use discontinuity, which is common here in Brazil" , pointing out the fragmented nature of current land use planning. Integrating urban and rural areas into a unified planning framework can mitigate the negative impacts of urban sprawl and promote sustainable development: "Metropolitan spaces must be seen as a single, cohesive entity".

Effective mobility solutions tailored to population density are vital for regional development. I15 emphasized, "The central discussion, the truly important topic, is the mobility solutions for this denser core", highlighting the need for adaptive transportation solutions. Implementing scalable and flexible mobility solutions can significantly improve connectivity and reduce congestion in densely populated areas.

Urban expansion often results in the loss of valuable rural spaces, presenting a significant challenge. I16 observed, "I don't see much beyond a process of continuous elimination of rural spaces", describing the ongoing encroachment of urban development into rural areas. Balancing urban expansion with rural area preservation is critical for maintaining ecological balance and ensuring sustainable regional development.

#### Economy

Economic diversification within the *Porto Alegre* Metropolitan Region emerges as a central theme among the interviewees. I9 points out the notable differences in transportation costs and demands, highlighting areas like Gravataí and Cachoeirinha with significant industrial activities: "In areas like Gravataí, where there's a GM plant and an industrial hub like Cachoeirinha, executive transport stands out, costing up to 40% more than regular transit, with significantly higher demand as well". He emphasizes the need for institutional integration to offer quality services tailored to different user profiles. Similarly, I10 observes the interconnected nature of the diversified economy, noting, "Today we see (...) it's a fully diversified economy (...) because one supply chain depends on another". This interconnectedness positively impacts the region by reducing economic dependence on a single industry or locality.

I11 highlights the economic concentration in major metropolitan cities and its influence on the labor market: "The economic concentration in the main metropolitan cities impacts the labor market (...) the only concern I see relates to employment opportunities". He argues that although there is economic concentration, it doesn't necessarily have a negative impact if public transportation is well managed. I12 concurs, emphasizing the value of having multiple economic options: "Yes, certainly. The more options we have for economic development across various economic sectors, the better".

I13 and I14 draw attention to the uneven distribution of economic activities and the development potential in less developed areas. I13 notes the existence of both well-developed economic hubs and areas with considerable development potential, supported by institutions like TecnoPUC and Unirritter: "The distribution is uneven, and the economy isn't shared. We have hubs that are well developed and others with huge potential for growth". I14 advocates for the creation of vibrant subcenters to balance the concentrated economic model: "One solution could be the development of several strong subcenters across the region instead of a single large center".

I15 emphasizes the importance of diversification and specialization within the metropolitan economy: "Diversification and qualification are more important than simply

diversifying the industry or economy within the metropolitan region". He highlights the region's capacity to produce a range of specialized components and services, showcasing its robust and diverse economy. However, I16 cautions against the adverse effects of economic concentration, stating, "Economic concentration in large centers, from my perspective, is detrimental". He warns that urban-centered development can disconnect people from primary production and rural areas, potentially creating further socio-economic issues.

#### Culture and Identity

The interviewees underscore the complex interplay between integration, infrastructure, cultural exchange, economic diversification, and centralization within Porto Alegre's metropolitan context. Their insights highlight the pressing need for cohesive metropolitan governance to address infrastructural challenges, support economic activities, and preserve cultural identities. As metropolitan regions grow, balancing these diverse elements becomes crucial to sustainable and inclusive development, ensuring that both urban and rural areas thrive while retaining unique characteristics that contribute to regional prosperity.

The challenges related to integration and infrastructure in metropolitan areas are multifaceted. I9 highlights the significant issues caused by the lack of institutional integration and metropolitan governance, noting, "There are significant problems caused by metropolitan transportation in a capital lacking institutional integration and metropolitan governance". This lack of coordination results in congestion and infrastructural strain in large urban centers with populations over one and a half million. I9 also points to the cultural and economic exchanges facilitated by transportation, despite increasing difficulties: "This exchange takes people to downtown Porto Alegre, or vice versa, to provide services or sell their products". I10 emphasizes the cultural diversification that industrialization has brought to areas like Vale do Caí, which transitioned from a predominantly German region to a multicultural hub due to workforce demands: "Industrialization during the leather boom brought in workforce demands". I11 underscores the importance of cultural events, such as the *Festa da Bergamota*, in fostering community integration and preserving local cultural identities, even within the metropolitan context: "Even within the metropolitan region, each municipality can still preserve its cultural peculiarities"

Economic diversification and the potential for tourism in smaller municipalities are vital to regional development. I12 highlights the significant potential for rural tourism in his municipality, pointing to the economic benefits of developing such attractions: "Our municipality has great potential for tourism". He also emphasizes a diversified economy and an influx of investors drawn to these prospects. I13 notes the positive impact of cultural

centralization in Porto Alegre, which serves as a cultural hub for the entire metropolitan region: “The metropolitan region benefits from all the cultural resources developed in Porto Alegre”. This centralization allows the metropolitan population to share cultural resources concentrated in the city, fostering a regional identity. I14 reflects on Porto Alegre’s role in attracting people from across Rio Grande do Sul, allowing it to maintain a distinct regional character: “Porto Alegre has this effect of attracting people from other areas”.

The centralization of economic and cultural activities in Porto Alegre presents both opportunities and challenges. I15 highlights the benefits of centralization, particularly in healthcare, where the metropolitan region benefits from concentrated medical expertise: “Porto Alegre’s centralization in healthcare is beneficial, as it brings significant medical expertise to the metropolitan area”. Conversely, I16 discusses the cultural homogenization that occurs in large metropolitan areas, where dominant urban cultures overshadow the unique identities of smaller communities: “I think there’s a loss of unique cultures, regions, and territories”. He argues that while metropolitan growth brings economic advantages, it often leads to a loss of cultural diversity in smaller communities as they integrate into larger urban frameworks. This trend, he notes, is not unique to Porto Alegre but is a common occurrence in major metropolitan regions worldwide, leading to increasingly homogenized cultural landscapes.

#### Innovation

Innovation in metropolitan mobility is multifaceted, involving integrated planning, infrastructure improvements, and establishing a cohesive metropolitan authority. I9 underscores the critical need for political will to implement an integrated transportation plan, noting that despite completing such a plan in 2009, it remains unimplemented due to political inertia. He emphasizes the necessity for a metropolitan authority to unify efforts and streamline initiatives. Similarly, I10 highlights the importance of interconnected infrastructure and collective transport, acknowledging the challenges in achieving sustainable mobility, which still heavily relies on traditional vehicles like buses and trains. I11 discusses innovative approaches, such as unifying transport lines based on diagnostic studies, while pointing out the lack of effective communication and visibility for these initiatives.

I12 focuses on the need for infrastructure improvements and the role of public-private partnerships in funding and implementing these enhancements, emphasizing the necessity of collaborating with private entities for substantial investments. I13 stresses the importance of metropolitan transport planning and the expansion of Trensurb as a significant initiative, but notes the absence of comprehensive metropolitan transport studies. I14 identifies the potential for mobility innovation in *Porto Alegre*, highlighting the need for expansion and technological

advancements. He emphasizes the significance of existing initiatives like Trensurb and Aeromóvel, as well as technological hubs such as Instituto Caldeira and events like South Summit.

I15 highlights the role of technological and economic transformation through the establishment of technological parks, which have spurred regional innovation, while criticizing the conservative nature of mobility planning, which has seen few transformative changes. I16 discusses the importance of building an innovation ecosystem through collaborative efforts among major universities and other stakeholders, aimed at fostering a world-class innovation environment. He warns of the potential collapse of the public transport system if it fails to adapt and compete with unregulated ride-sharing services. These insights collectively underscore the multifaceted challenges and opportunities in innovating metropolitan mobility, emphasizing the need for integrated planning, infrastructural improvements, and robust governance frameworks.

Net

In the metropolitan context, achieving effective mobility requires addressing institutional and policy-related challenges that hinder integration across various transport systems. Collectively, these insights underscore the urgent need for a comprehensive and integrated approach to metropolitan mobility. This involves coordinated governance, innovative infrastructure investments, and strategic planning to enhance the efficiency and inclusivity of the transport network. I9 emphasizes the lack of integrated fare and electronic ticketing systems, noting the presence of more than five separate ticketing systems that do not communicate with each other, resulting in users not receiving fare discounts between metropolitan and urban systems. I10 echoes this sentiment, highlighting the partial success of bus and train integration but insisting it does not fully meet regional demand. He suggests exploring alternative fuels, such as electric buses, to reduce costs and improve efficiency.

I11 underscores the disparity in transport integration across different metropolitan areas, particularly outside the main axes served by Trensurb. He calls for a coordinated public policy approach at federal, state, and municipal levels to achieve effective integration. I12 points out the lack of coordination between municipal and regional management, which disrupts schedules and negatively impacts those who rely on timely transport.

I13 criticizes the outdated transport system in *Porto Alegre*, suggesting that new tenders should be used to rationalize and modernize the system, which has not been updated in decades. I14 supports the feasibility of system interoperability, provided there is a decisive commitment to implementation. He emphasizes that interoperability is possible if there is a willingness to standardize and integrate systems.

I15 critiques the poorly structured and technologically obsolete public transport system, emphasizing the need for integration across different modes of transport, especially for last-mile connectivity. He points out that the integration of various transport modes is undermined by the lack of a structured transport system. I16 highlights the absence of a strategic approach in public transport planning, stressing the importance of dialogue and collaboration with experts to develop a cohesive mobility strategy. He notes that the current system significantly inhibits mobility, particularly in distant and peripheral regions.

#### Climate Change

In the metropolitan context, addressing climate change in mobility requires a multifaceted approach, focusing on integration and coordination of services, the impacts of climate change on mobility, and sustainable practices and innovations. I9 emphasizes the lack of integration among different transportation services, highlighting the need for a unified policy: "We have more than 5 or 6 ticketing systems in the regions, none of which communicate with each other". This sentiment is echoed by I10, who discusses the importance of expanding and integrating transport lines to meet regional demands. He also notes the broader environmental impact, stating, "the entire Rio Grande do Sul region, not just the metropolitan area, has been affected ". I11 underscores the necessity of unified public policy at various government levels to address these issues effectively: "There must be a public policy at the federal, state, and municipal levels seeking integration". I12 points out the lack of integration between municipal and regional transport management, which disrupts schedules and affects those relying on timely transport. I14 highlights the need for interoperable ticketing systems and a structured public transport system, while I15 emphasizes the technological obsolescence and the need for a structured public transport system. I16 highlights the absence of strategic planning for transportation and climate adaptation, pointing out, "There is a lack of strategy... I do not see the public authorities proposing this discussion and moving towards a constructive debate".

The impact of climate change on mobility is profound, affecting both urban infrastructure and daily commuting. I9 discusses how floods significantly impact urban mobility, noting that "more than 100,000 people are affected when these floods occur, impacting urban mobility where road networks become submerged. I10 suggests strategic planning to mitigate the impact of water flow from higher regions, proposing retention basins as a solution. I11 stresses the need for preventive measures and coordinated efforts to handle climate-related challenges, questioning, "What preventive work has been initiated or planned for such magnitude of problems?". I12 highlights Glorinha's commitment to environmental

preservation, which aids in climate resilience. I13 emphasizes the implementation of green corridors and micro-forests to combat urban heat islands, creating "islands of freshness" instead. I14 focuses on the importance of adapting urban infrastructure to climate change, while I15 points out the necessity of electrification and sustainable city infrastructure, stating that "the primary challenge in climate issues is electrification". I16 underscores the lack of comprehensive strategies for climate adaptation, noting the absence of structured efforts despite some specific movements trying to address the issue.

Sustainable practices and innovations are crucial for addressing climate change in metropolitan mobility. I9 and I10 highlight the importance of alternative fuels and the role of a comprehensive prevention system in aiding urban mobility. I13 advocates for the use of solar energy in urban infrastructure, suggesting improvements at bus stops to enhance mobility and utilize renewable energy simultaneously. I14 and I15 stress the need for electric cities and sustainable energy solutions, with I14 focusing on city adaptation to climate changes and I15 acknowledging the maturation of existing measures while noting their insufficiency. I16 discusses the absence of comprehensive strategies for climate adaptation and sustainability, emphasizing the need for better planning and maintenance regarding urban green spaces.

Integrating sustainable practices into urban mobility requires forward-looking strategies and policy influence, driven by stakeholder collaboration. I16 advocates for a comprehensive social pact to address challenges faced by peripheral regions, emphasizing the need for strategic planning and expert dialogue to foster positive perspectives on mobility networks. He notes, "There is a lack of strategy... I do not see the public authorities proposing this discussion and moving towards a constructive debate". Collaborating among government, the private sector, academia, and civil society is essential for fostering innovation and ensuring transport solutions meet the diverse needs of metropolitan populations. This collaboration can drive behavioral change and promote the adoption of sustainable mobility practices, ensuring that innovations are effectively implemented and contribute to the overall well-being and resilience of metropolitan areas.

#### Foresight, future thinks

Future-oriented mobility planning in metropolitan contexts requires a comprehensive approach that integrates foresight, sustainability, and technological innovation. I9 envisions a 2050 landscape with unified resources, centralized electronic ticketing systems, and strong metropolitan governance: "In 2050, things will be different with unique resources, projects, a single electronic ticketing system, unified control, and user information". This vision emphasizes the need for a strong metropolitan entity to oversee integration and coordination.



Similarly, I10 highlights the macro-level needs, such as the expansion of Salgado Filho airport, stressing comprehensive infrastructure planning for future demands: "Mobility is macro and requires expanding infrastructure like Salgado Filho airport". I11 underscores the importance of a seamlessly integrated public transport system for efficient urban mobility: "I envision a perfectly integrated public transport system". These perspectives collectively highlight the necessity of innovative planning and regulatory frameworks to drive future mobility solutions.

Sustainable mobility solutions are essential for addressing environmental concerns and enhancing urban quality of life. I9 advocates for a sustainability fund to improve public transport infrastructure and promote sustainable energy sources: "Establishing a sustainability fund for public transport infrastructure and sustainable energy sources is crucial" I10 foresees a decline in combustion engine vehicles, indicating a shift towards cleaner transportation options: "The use of combustion engine vehicles will decrease". I13 emphasizes the need for a greater focus on active mobility and green infrastructure to address urban mobility challenges: "We must pay more attention to active mobility and green infrastructure". The integration of multimodal transport systems, as noted by I15, is vital for creating a resilient and sustainable urban mobility network: "Mobility is and always will be multimodal". These insights underscore the need for comprehensive strategies that prioritize sustainability and multimodality in urban transport planning.

Technological innovation and infrastructure development are crucial for future mobility solutions. I9 emphasizes the need for advanced infrastructure, technology, and operational improvements to enhance service offerings: "Infrastructure, technology, innovation, and operational improvements are necessary". I14 envisions metropolitan expansion and the creation of macro-metropolitan areas to accommodate growth: "We need to expand metropolitan areas into macro-metropolitan areas." I15 highlights the importance of investing in key transport corridors, managed or regulated by public entities: "Investment in key transport corridors is essential and should be publicly managed or regulated". I16 advocates for participatory planning to develop a long-term vision for urban mobility: "We need a participatory approach to develop a long-term vision for the city. These perspectives highlight the critical role of infrastructure investment and technological advancements in shaping future mobility landscapes.

Addressing environmental concerns and adapting to climate change are integral to future mobility planning. I9 suggests adopting electric and biodiesel technologies to reduce environmental impact: "Electric and biodiesel technologies should be adopted to minimize environmental impact". I11 emphasizes the importance of improving environmental disaster

prevention and optimizing river water usage: "Improving disaster prevention and optimizing river water use are crucial". I13 stresses the need to maintain green spaces and ecological corridors to enhance urban life quality: "We must maintain green spaces and ecological corridors for quality urban life". I15 highlights the efficiency of segregated, automated transport systems in reducing environmental impact: "Segregated, automated transport systems are key for reducing environmental impact". Collectively, these insights emphasize the necessity of integrating environmental sustainability into urban mobility planning to ensure resilient and livable metropolitan areas.

## METROPOLITAN REGION OF SERRA GAÚCHA (RMSG)

### Territorial

Interviewees consistently emphasize the emotional and historical ties they share with the *Serra Gaúcha* region, reflecting a deep sense of place and identity. For instance, I17 and I23 both highlight their personal and familial connections to the area, fostering a collective commitment to the region's development. I17 notes, "My great-grandparents were part of the first families to settle here", while I23 adds, "It is both historical and emotional". This shared connection reinforces the importance of emotional attachment as a driving force for regional progress, aligning with efforts to promote mobility and sustainability as community priorities.

Several interviewees, such as I18 and I22, stress their active roles in shaping the Metropolitan Region of Serra Gaúcha through their political and professional endeavours. Their dedication to building governance structures and advocating for policy changes reflects a shared determination to formalize regional cooperation. I18 mentions, "I worked tirelessly for the regulation of the law", highlighting their commitment to ensuring that regional governance is properly established. These efforts showcase a forward-thinking approach that combines professional advocacy with long-term regional planning objectives.

The need for regional governance and collaboration is a recurrent theme. Many interviewees, such as I19 and I18, discuss the difficulties of uniting municipalities under a common framework, emphasizing the necessity of coordinated governance. I19 underscores the need for a "unified approach", while I18 suggests a "governance model" to enhance collaboration. This focus on coordinated regional planning is essential to achieving both mobility solutions and sustainable development throughout the metropolitan region.

There is a consensus among the interviewees regarding the need for unified regional planning, calling for collaboration among municipalities to effectively address infrastructure

and mobility challenges. I19 and I24 stress the importance of fostering a regional mindset to create integrated infrastructure plans. I24 reflects on the fragmentation of governance and suggests that a unified regional approach would greatly enhance the region's capacity for economic and social development. Unified planning is crucial to ensuring that all municipalities benefit equally from advancements in mobility and sustainability.

Though not all interviewees delve deeply into mobility, there is a recognition that it is vital for the region's sustainability. References to METROPLAN and the need for enhanced infrastructure indicate that efficient transportation networks are key to fostering regional cohesion. I18 highlights the potential for high-speed rail, while I19 emphasizes the importance of connecting the region through electric trains. These initiatives are crucial for promoting sustainability and improving inter-municipal connectivity, addressing both current mobility challenges and future regional needs.

#### Scale

The insights gathered from the interviewees emphasize a profound need for regional collaboration and cohesive governance within the Metropolitan Region of *Serra Gaúcha*. As municipalities face shared socio-economic and infrastructural challenges, their interconnectedness requires coordinated planning and policies that transcend local boundaries. This section explores the critical themes of unified governance, mobility, sustainability, and regional identity, while addressing the necessity of overcoming individualism for collective growth.

The interviewees emphasize the interconnectedness of municipalities within the *Serra Gaúcha*, despite formal political boundaries. I17, I18, and I20 highlight how these municipalities function as a unified social and economic entity, particularly in transportation and economic activities. The need for regional cohesion is evident, with shared challenges and opportunities transcending individual municipal borders. As I17 “(...) we have a very democratic relationship”, or I18 “(...) today we understand that we are practically one city (...)”, or I20 “We have many similar problems, we have many problems that are regional and not just municipal”. The region's collective identity is strengthened by the recognition of this interdependence, driving the call for unified strategies.

A consensus emerges on the necessity for unified governance and regional planning. I19, I22, and I23 underscore the importance of regional governance structures to harmonize the municipalities' goals, particularly concerning mobility and infrastructure development. The absence of cohesive governance is seen as a significant barrier to coordinated progress, with

infrastructure challenges such as transportation and road networks requiring collective solutions across municipalities.

Mobility as a critical regional challenge is identified by several interviewees, including I21, I19, and I20. The movement of workers, goods, and tourists across municipal boundaries necessitates an efficient and integrated transportation network. I22 further notes that road expansions and infrastructure development must be approached from a regional perspective, beyond the scope of individual municipal planning. Effective mobility systems are pivotal for both the economic development and sustainability of the *Serra Gaúcha* region.

The interviewees emphasize the need for regional cooperation and sustainability as an urgent regional concern, closely tied to environmental and economic factors. I24 and I23 stress that environmental and developmental challenges must be addressed through regional cooperation, as isolated municipal efforts cannot effectively tackle these issues. As I23 mentioned “And the masterplan for the metropolitan region, it doesn't concern all the elements of the masterplan, but those elements that are necessary for integration” and “(...) The same community rules and then you have common rules”, complemented by I24 “Actually, it has to be a co-existence of co-operation, right, of complementarity, of trying to work on a joint vision of regional development”. Sustainability in the region depends on collective action in areas like resource management, environmental protection, and shared infrastructure, fostering long-term viability and resilience.

A recurring theme is the shared regional identity among municipalities within the *Serra Gaúcha*. I18, I21, and I22 describe a deep cultural and social connection that transcends municipal boundaries, reinforcing the idea of the *Serra Gaúcha* as a unified entity. This collective identity not only strengthens social ties but also serves as a foundation for regional branding and economic strategies, particularly in tourism and local industry development.

Several interviewees stress the need for regional planning and legislation. I20 and I22 highlight the absence of a regional authority to manage shared concerns, advocating for legislation that aligns regional interests. The lack of formal structures to govern the Metropolitan Region of *Serra Gaúcha* is seen as a barrier to the creation of cohesive policies that address shared infrastructure and socio-economic challenges. Regional legislation would provide a framework for synchronized development and resource management.

Finally, the interviewees argue for overcoming individualism for collective growth. I17, I19, and I22 emphasize that municipalities need to act collaboratively, sharing power and resources to achieve common goals. Overcoming entrenched localism is seen as critical to

unlocking the region's potential, allowing for a shared vision of development that benefits all municipalities in the RMSG.

#### Place

The interviewees collectively highlight key themes central to addressing the development and sustainability of the RMSG. These themes revolve around the need for regional cooperation, challenges in mobility and infrastructure, social pressures from population growth, and the imperative for effective environmental and resource management. These issues intersect across governance structures, logistical hurdles, and socio-environmental concerns, pointing toward the necessity of an integrated and cooperative regional strategy. The insights offered by the interviewees reflect a shared recognition of the region's challenges and an alignment on the need for comprehensive, collaborative solutions.

The importance of establishing a robust regional governance framework is a common theme. I17 emphasizes that "a governance formula and a deliberative council" should be created, alongside a development fund for the region. I19 echoes this, stressing that "municipalities must work together on preventive measures", particularly in response to natural disasters. I24 adds, "sometimes I need to give up certain things to advance together", illustrating the necessity of collective sacrifice for the greater regional good. Similarly, I21 believes that "having an organizational structure through a metropolitan region" would significantly enhance collaboration, addressing governance challenges that individual municipalities face when trying to coordinate development efforts.

Mobility is a critical issue, with many interviewees highlighting the strain on infrastructure. I18 points out that "we face a massive mobility problem, relying solely on overburdened roads", and highlights the detrimental impact of road damage on the region's logistics. I23 argues for a proactive approach, noting that "circulation routes must be planned throughout the metropolitan region", even if construction is not immediate. I21 further stresses that transportation is "a logistical challenge" due to the difficulty in moving goods from Serra Gaúcha to the Porto Alegre metropolitan area. These insights emphasize the pressing need for integrated regional transportation planning that can support economic activity and address existing bottlenecks.

The rapid growth of the population in Serra Gaúcha presents social challenges, particularly in managing rising vulnerabilities. I20 observes that the region is experiencing "economic growth, but also an increase in vulnerability", highlighting the socio-economic pressures accompanying population expansion. I22 notes that while there is an influx of workers seeking opportunities, "the challenge is the formation of these people", underscoring the need

for skills development to support regional industries. I24 adds that healthcare is under strain, stating, "the General Hospital serves 48 municipalities", showing that health services are no longer sustainable at the municipal level alone. These quotations collectively reflect the need for regional social services that can adapt to population growth and changing demographics.

Environmental sustainability is a recurring concern, particularly around resource management. I19 highlights the need for cooperation on key issues, noting, "municipalities should interact on water, tourism, and road issues". I23 discusses water supply challenges, stressing that "water supply is a significant problem", along with concerns about waste management. I17 adds to this by pointing out that "basic sanitation is still a concern", as many cities in the region lack adequate sewage systems. These insights highlight the importance of a coordinated approach to environmental sustainability, as resource management issues are too large and interconnected to be addressed by individual municipalities.

#### Urbanisation

After analysing the interviews, several common themes emerge regarding mobility and sustainability in the RMSG. The discussions focus on the relationship between urban and rural areas, the need for improved infrastructure, and the essential interdependence between municipalities. The goal is to explore how mobility functions as a shared regional concern and to identify key attributes necessary for the region's long-term sustainability.

Many interviewees emphasize the strong interconnection between urban and rural areas, with infrastructure playing a crucial role in connecting these zones. I17, I19, I20, and I24 discuss how paving roads and developing transport networks facilitate daily mobility and economic growth, particularly by linking rural production areas to urban markets. I19 highlights that "Caxias do Sul is a major supplier for the *Ceasa* market in Porto Alegre", showcasing the mutual dependence of urban centers and rural production. I20 adds that rural inhabitants rely on urban areas for work and services, underscoring the need for efficient mobility between these regions.

The quality and development of mobility and infrastructure are recurrent themes in the interviews. I18, I23, and I24 point out that mobility issues are exacerbated by poor road conditions, natural disasters blocking routes, and insufficient transport networks. These challenges hinder local and regional mobility, affecting everything from daily commutes to the broader logistics needed for economic activity. I23 stresses that "poorly coordinated zoning and road planning" threaten the sustainability of both urban and rural areas, especially as urban expansion increasingly encroaches on agricultural zones.

Sustainability is discussed in terms of balancing urban growth with the preservation of rural livelihoods and promoting responsible environmental practices. I18 and I21 underscore the need to ensure that urban expansion does not threaten agricultural spaces. I18 advocates for "incentives to rural entrepreneurship", aiming to keep families engaged in independent farming. Meanwhile, I20 mentions a reverse migration trend, where improved rural infrastructure is attracting people back to rural areas, emphasizing the need for these areas to sustain agricultural and residential functions without losing their environmental integrity.

Regional cooperation is seen as essential for addressing the shared challenges of mobility and sustainability. I19, I22, and I24 stress the importance of regional planning and cooperation in improving infrastructure, aligning environmental regulations, and supporting socio-economic development across the Serra Gaúcha. I19 highlights the "need for regional thinking" in addressing common issues like transportation and environmental protection. I22 adds that mental health and social support should be integrated into rural planning, indicating that mobility should be viewed holistically, taking into account both physical infrastructure and the well-being of communities.

#### Economy

The interviews highlight several key themes concerning the challenges and opportunities in the RMSG, particularly in mobility, sustainability, economic diversification, and regional cooperation. These themes reflect a shared understanding among the interviewees that regional collaboration is essential for addressing the region's logistical, economic, and environmental challenges. The discussions emphasize the importance of diversified industries, interdependence among municipalities, infrastructure development, and decentralization as crucial factors for sustainable regional growth.

The interviewees underscore the importance of economic diversification as a stabilizing force for the region. A wide range of industries, from agriculture and tourism to metal mechanics, contributes to the region's resilience in times of crisis. I18 notes that diversification balances the economy across municipalities, ensuring steady employment and income for local governments. Similarly, I21 reflects on how this diversification allows the region to face economic downturns more effectively: "Diversification helps us face crises". I24 also emphasizes that the region's diversity in industries, commerce, and services makes it stand out compared to other areas in the state.

A strong theme of interdependence among municipalities emerges, with interviewees recognizing that economic and logistical cooperation is essential for sustainable growth. I19 stresses that cities can no longer operate in isolation, as "the cities need to cooperate for

economic stability”. This is echoed by I24, who argues that metropolitan collaboration is crucial for economic and infrastructural development: “The metropolitan region is crucial for municipalities to work together”. I23 highlights the need to decentralize the region’s growth to ensure that all municipalities are adequately connected through proper infrastructure.

Mobility and infrastructure issues, particularly in light of natural disasters, are of significant concern. The region’s reliance on transport networks, especially roads, highlights the need for better planning and investment in these areas. I18 mentions that the region suffered from supply chain disruptions during recent floods, which exposed its vulnerability: “There was a supply shortage because we couldn’t access the cities”. I24 further emphasizes the importance of maintaining regional connectivity, warning that isolation due to infrastructural failures would be devastating for the region’s economy and mobility.

Decentralizing urban growth and economic activities is identified as a key strategy for promoting sustainability in the region. Several interviewees argue that decentralization can alleviate overcrowding in urban centers while ensuring that smaller municipalities are integrated into the broader regional development framework. I23 points out that creating decentralized hubs with proper infrastructure connections is essential for balanced growth. I24 criticizes the state’s focus on urban centers, stressing the need for a collaborative approach: “We must work together to decentralize attention from major cities”. This highlights the broader need for regional planning that includes all municipalities, fostering sustainable growth throughout the region.

#### Culture and Identity

The interviews reveal common themes concerning mobility, sustainability, cultural preservation, and regional collaboration in the RMSG. Key points include the importance of cultural preservation, the need for regional cooperation, managing urban growth, and ensuring sustainable development through effective governance. The interviewees highlight the intersection of these areas as essential for the region’s continued growth and resilience.

Many interviewees stress the need to preserve local culture and identity, especially as the region experiences growth. I17 emphasizes how municipal cooperation strengthens tourism and cultural heritage, stating, “through this union between municipalities, we strengthen tourism and the preservation of cultural heritage”. I18 reinforces this, noting the importance of each municipality maintaining its “historical ties through local festivals.” I20 adds that reinforcing the region’s Italian immigrant heritage is essential, not just for locals but for newcomers, saying, “we must strengthen our roots and show their importance to those who arrive”. The cultural diversity is seen as a cornerstone for regional identity and growth, with



I23 underscoring that "cultural diversity must be preserved and integrated into territorial planning."

There is widespread agreement on the necessity of collaboration among municipalities within the metropolitan framework to achieve shared goals in economic development and infrastructure. I19 highlights this by saying, "the participation of all municipalities in the metropolitan region impacts every area". I21 emphasizes that "sharing a vision with other municipalities makes it easier to achieve goals", while I24 notes that municipalities benefit from "seeking joint solutions to common problems". The consensus is that cooperation leads to more effective governance and shared prosperity.

Population mobility and urban expansion are seen as both challenges and opportunities for the region's development. I20 discusses the changing demographics, noting that "around 53% of the current population did not originally live here", pointing to shifts in cultural identity and urban dynamics. I22 stresses the importance of mobility infrastructure, stating, "we don't have a train, we barely have roads", highlighting the urgent need for investment in transportation networks to accommodate the region's growth and maintain its influence.

Effective governance and regulation are deemed essential for sustainable development, ensuring that growth aligns with cultural and environmental priorities. I18 calls for balanced regional development that respects local traditions, asserting that "we must work together for the development of Serra Gaúcha while maintaining each municipality's cultural traditions." I23 stresses the role of zoning in achieving this balance, noting that "master plans must include diverse activities and the preservation of historical heritage". The interviewees agree that governance structures and policies must be carefully crafted to guide sustainable growth while preserving the region's unique identity.

#### Innovation

The interviewees' insights reveal common challenges and opportunities in the RMSG, particularly regarding governance, infrastructure, leadership, and regional cooperation. They emphasize the need for strengthened collaboration among municipalities, highlighting the issues caused by fragmented planning and a lack of unified direction. Below are the key themes derived from the interviews, supported by relevant quotations.

Many interviewees stress the necessity of improving regional governance to foster effective collaboration among municipalities. The current lack of coordination hampers regional planning and infrastructure development. I17 points to the legislative efforts made to establish a governing council for the region, but laments the slow pace of its implementation: "(...) it was the union to regulate this law of 14,293 (...) creating the Deliberative Council of the

Metropolitan Region I18 discusses past cooperation to improve infrastructure but highlights that much more collaboration is required: (...) there has been this joint effort to improve the roads and the duplication of the Serra, but we still need more collaboration.” Similarly, I19 notes the absence of leadership, while I21 calls for the formalization of the region’s metropolitan structure through legislation: “(...) we have to strengthen our metropolitan region, we have to regulate it with all the municipalities having a law.” I24 reinforces the need for adequate resources to support the region’s governance framework: “(...) authorisations have been given for the creation of the metropolitan region council, but there are still difficulties with resources ”.” These concerns reflect a strong desire for improved regional governance to address shared challenges.

Inadequate infrastructure, particularly in transportation and mobility, is a recurrent theme. Interviewees agree that poor regional coordination exacerbates mobility issues, slowing economic development. I17 underscores the importance of an integrated transportation system: “(...) transport of the integrated road system, this is extremely important”, while I18 emphasises road projects that remain unfinished: “(...) the construction of many roads (...) duplication between São Vendelino and Farroupilha is part of this project”. I20 criticizes the lack of regional thinking, observing that municipalities act independently rather than cohesively: “(...) nothing has been thought out regionally, we're thinking individually as an island”. I22 sees airport projects like Vila Oliva as key to improving logistics: “(...) our Vila Oliva airport project is a form of logistics”, while I23 calls for major territorial planning to address bottlenecks between key cities: “(...) Caxias and Farroupilha, this corridor is a problem (...) there should be major initiatives for macro territorial planning”. These responses indicate that more strategic, region-wide infrastructure planning is essential to resolve these issues.

Several interviewees express frustration with the lack of leadership, which has stalled regional progress. They argue that stronger, more committed leadership is necessary to push forward critical initiatives. I19 highlights the absence of serious leadership for metropolitan development: “(...) there is a lack of leadership that really takes the development of the metropolitan region seriously”, while I21 admits that even those in leadership roles have not fully understood their responsibilities: “(...) we haven't been able to work properly (...) we still don't understand our role, and I also include myself as a culprit”. I24 refers to political setbacks that have undermined resource allocation to the region: “(...) there were setbacks when the idea of allocating resources to the metropolitan region was questioned”. These sentiments suggest that without decisive political will, the region’s development will continue to lag.

The slow pace of addressing regional concerns, such as infrastructure development and resource management, is a key point of frustration. Interviewees agree that municipalities focus on their own interests, preventing collective solutions. I20 observes that there has been little evolution in regional cooperation, with municipalities remaining focused on individual goals: “(...) I haven't seen any evolution (...) we're still thinking individually”. I23 echoes this by critiquing mayors for prioritizing local concerns over regional ones: “(...) each mayor thinks of his own navel in his own city, and this prevents the resolution of regional problems”. I24 notes that while there have been meetings and legislative efforts, the establishment of a regional management council has not progressed as expected: “(...) despite meetings and laws, the creation of a regional management council has not yet progressed as expected”. This highlights the need for a shift in focus from individual to collective municipal interests for regional advancement.

Net

The interviewees collectively emphasize key issues related to mobility, sustainability, and governance in the RMSG, underscoring the need for strategic investments, regional cooperation, and long-term planning. Their insights reveal common concerns around governance gaps, infrastructure deficiencies, public transport challenges, and the necessity for coordinated investments in mobility solutions. These elements are crucial for promoting sustainable regional development and enhancing urban mobility.

Many interviewees stress the absence of coordinated governance among municipalities as a significant obstacle to achieving efficient regional mobility and sustainability. I17 highlights the importance of establishing a regional governance structure, specifically mentioning the "*Conselho Deliberativo*." I21 points out the lack of coordination between municipalities, while I23 emphasizes the need for immediate planning efforts to prevent further inefficiencies. I24 notes that cooperation across federal, state, and local levels is crucial to solving infrastructure problems. “If we had a metropolitan region... we could work together, but now each municipality is heading in different directions”, says I21, illustrating the disjointed planning efforts. Similarly, I23 adds, “Municipalities need to sit down and start working on this together—it’s one of the most serious issues we have”.

A recurring theme is the urgent need for infrastructure improvements, especially regarding highways and transport links. I18 highlights the region's historical struggles for road development, calling for duplications and viaducts to ease traffic flow. I24 focuses on rail transport and innovative solutions to address infrastructure damage caused by climate events. I19 points to the significance of the Caxias do Sul airport, stressing the need for comprehensive

solutions to maintain mobility. “Fundamentally, we need the duplication of many roads here”, says I18, pointing to an essential need for regional connectivity. I24 underscores the broader challenge, saying, “We need to look at alternatives like a rapid train between Gramado and Porto Alegre”.

The decline in public transportation, driven by competition from ride-sharing services like Uber, is a major concern. I20 criticizes the long-term public transport concessions and argues that cheaper alternatives have significantly reduced ridership. He points to the absence of national subsidies for public transport as a barrier to revitalizing the sector. I22 adds that METROPLAN, which is supposed to represent regional mobility, has failed to address these issues effectively. I20 notes, “People will choose whatever is most convenient, comfortable, and affordable”, emphasizing how ride-sharing is undermining traditional public transport systems. I22 also questions METROPLAN’s role, stating, “No one really knows what METROPLAN is doing for regional mobility”.

All interviewees agree on the need for long-term investments in mobility infrastructure to ensure sustainable growth. I24 calls for the exploration of alternative transport systems such as rail and water routes. I21 underscores the importance of recent investments in airports and ports for economic resilience. However, both I22 and I19 lament the lack of leadership and coordination, which delays the implementation of these critical projects. “We are still facing very precarious mobility issues”, says I24, emphasizing the need for comprehensive strategies. I19 adds, “We need to find alternatives now to address the impacts on mobility”.

#### Climate Change

The interviewees collectively emphasize the pressing challenges and opportunities regarding mobility and sustainability in the RMSG. Key themes include the impact of climate change, the need for preventive planning, fragmented regional governance, environmental sustainability programs, and the importance of leveraging technology and data for future resilience. These shared insights underscore the need for comprehensive strategies to address the region’s infrastructure and environmental challenges while promoting long-term sustainability.

Regarding Climate Change and Impact on Mobility, all interviewees agree that climate change is significantly affecting mobility infrastructure in the *Serra Gaúcha* region. Severe weather events, such as flooding and landslides, have created challenges for transportation networks. I17 highlights the region’s struggle with “excessive rainfall, landslides, and road blockages”, while I20 stresses the need to rethink planning, stating, “we must change our

approach to neighborhood and road planning". These views reveal a consensus on the necessity for better infrastructure planning to cope with climate-induced risks.

Several interviewees stress the urgency of implementing preventive measures and establishing long-term governance frameworks to address both infrastructure challenges and climate risks as a Need for Preventive Planning and Long-term Governance. I18 emphasizes the lack of "governmental organization and long-term governance plans", while I24 praises the current efforts, such as "reforestation and protection of slopes" to mitigate future disasters. The consensus points to the need for sustainable planning that anticipates environmental challenges and fosters resilience.

The fragmented governance across municipalities hinders coordinated action on mobility and environmental issues as Lack of Integrated Regional Coordination. I19 laments that "as a metropolitan region, nothing is happening ", while I20 warns of inefficiency when municipalities act alone, stating, "each municipality doing its own thing leads to waste and inefficiency". The absence of a unified regional strategy impedes progress, reinforcing the need for improved collaboration to achieve cohesive solutions.

Programs Several interviewees emphasize ongoing efforts to enhance environmental sustainability and resilience in the region. I24 discusses initiatives like "reforestation and soil conservation programs", while I23 underscores the importance of addressing "land permeability" to prevent flooding. These programs reflect the region's growing commitment to integrating environmental considerations into planning, but they also highlight the need for broader implementation to effectively tackle sustainability challenges.

The need for integrating technology and data into decision-making is another recurring theme. I22 stresses that the region must "use available technology and data to prepare for disasters", while I20 critiques the current system, calling it "a failure in monitoring and predicting environmental risks". Leveraging data and technological innovations will be crucial in building resilience and improving future infrastructure and mobility planning.

#### Foresight, future thinks

The interviews highlight several critical themes concerning mobility, infrastructure, governance, and sustainability in the RMSG. The interviewees emphasize the importance of long-term planning, regional collaboration, investment in technological solutions, and sustainable development. These insights collectively underscore the need for a coordinated and forward-thinking approach to urban planning and infrastructure improvements, with a focus on ensuring the region's economic and environmental resilience.

The necessity for long-term mobility and infrastructure planning is a key concern shared by the interviewees. I17 emphasizes the potential of high-speed rail systems, advocating for a "What would the regional railway actually be?" to improve mass transit. Similarly, I18 stresses the importance of a plan "Ideally, we should have a plan with visibility for the next 30, 40 years of development, investment and works". I20 and I22 also highlight the critical role of road networks in regional mobility, while I23 emphasizes the need for territorial planning to interconnect cities through a robust transport system. Strategic, long-term planning is viewed as essential for sustainable development in the region.

Several interviewees point out the lack of coordinated governance as a barrier to effective regional development. I19 stresses the importance of establishing a metropolitan governance structure that can manage long-term projects for the region's benefit "It's important to create this management of the Serra Gaúcha Metropolitan Region so that in 2050 we can realise the impacts that have begun". I24 envisions a leadership role for the region's metropolitan council, which could coordinate efforts across multiple municipalities. Similarly, I23 calls for regional leadership that prioritizes coordinated planning and decision-making, ensuring that projects are implemented effectively. Stronger regional governance is essential to facilitate cross-city collaboration and drive large-scale projects forward.

The interviewees also emphasize the need for investing in sustainable and technologically advanced transport solutions. I17 discusses the future potential of AI-driven buses, envisioning a time when "cars and buses transport people without drivers". I18 envisions the introduction of electric trains "(...) have a connection here through some mobility, some electric train", while I22 points out the potential for a modern, sustainable mobility system that enhances both safety and comfort. Investment in innovative and green technologies is seen as crucial for building a livable and economically vibrant metropolitan region "(...) it can become a place (...) of modern, sustainable mobility here for our region that is comfortable and safe for all of us".

Improving connectivity between cities is recognized as key to promoting economic growth and social inclusion. I18 notes that better infrastructure is critical for reducing costs and attracting industrial and tourism developments. I19 emphasizes the importance of connecting cities not only through vehicle routes but also through bicycle paths. I20 envisions the region as a model for Brazil, while I21 stresses the need for improved planning and organization to realize this vision. A well-integrated transport network is seen as fundamental to fostering regional economic prosperity and enhancing residents' quality of life.

The interviewees also express concern about the environmental challenges facing the region, particularly the need to address climate change and promote sustainable urban growth. I22 points to the increasing threat of extreme weather events, such as droughts and floods, resulting from climate change. I23 warns against the negative impacts of uncontrolled urban expansion, which provide local and intelligent plans “(...) both municipal and regional, it is fundamentally the construction of intelligent master plans, intelligent laws that will make planning effective”. I24 emphasizes the importance of aligning the region's development with the goals of sustainable development, advocating for environmentally friendly policies and infrastructure. Sustainability is recognized as a core priority for the region's future development.

## APPENDIX D – QUANTITATIVE DATES AND RESULTS

Table 38 - Data in quantitative research

Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
1	1	1	7	7	5	5	4	6	5	5	2	2	5	3	1	7	6	4	5	6	4	5
2	2	1	5	1	6	6	6	6	6	6	5	6	7	6	1	6	5	5	7	7	6	7
3	3	1	2	2	1	3	6	4	5	5	4	4	4	5	2	5	6	4	4	6	6	6
4	4	1	6	5	5	5	5	4	2	3	5	5	3	5	4	6	6	6	6	5	5	5
5	5	1	4	6	2	3	5	6	4	6	6	2	1	1	3	6	3	3	4	7	7	6
6	6	1	4	7	6	6	6	4	3	5	2	3	5	5	1	5	5	5	3	6	6	6
7	7	1	5	6	5	6	7	7	3	7	6	5	7	6	1	7	7	6	6	7	4	5
8	9	1	2	2	3	6	6	6	7	5	6	5	6	3	1	5	6	4	4	4	6	4
9	10	1	6	5	5	6	6	6	6	6	6	6	6	6	3	5	6	5	5	5	6	6
10	11	1	5	6	4	5	7	6	7	6	5	6	6	5	1	4	6	4	4	6	7	7
11	12	1	2	7	5	7	7	7	6	7	3	6	7	2	1	4	4	4	7	7	7	7
12	13	1	2	4	3	4	5	4	6	6	6	5	6	5	3	2	5	4	5	3	5	3
13	14	1	5	6	5	6	6	6	5	6	6	5	6	5	6	7	7	6	5	6	6	5
14	15	1	5	1	6	6	7	7	7	7	6	2	7	6	1	7	5	4	4	6	6	6
15	16	1	4	1	1	6	6	6	7	5	6	3	6	4	1	7	7	7	7	7	5	6
16	17	1	5	2	2	6	6	6	5	7	2	5	6	5	2	5	5	3	5	7	7	7
17	18	1	3	2	2	6	6	6	3	5	6	5	5	4	4	3	5	6	4	5	5	4
18	19	1	6	2	5	7	7	7	6	7	6	6	5	5	1	6	6	3	5	7	7	6
19	20	1	6	6	6	6	6	6	3	5	6	4	6	6	2	6	6	6	6	4	6	7
20	21	1	5	5	4	3	6	3	6	6	1	3	5	1	1	6	6	5	3	5	5	3
21	22	1	5	1	1	5	7	7	7	7	5	5	7	4	1	2	6	4	2	7	7	7
22	23	1	2	2	2	6	6	5	5	5	6	6	6	5	1	6	5	6	6	7	5	6
23	24	1	5	5	6	6	7	6	6	6	6	5	6	7	1	7	5	4	5	6	5	6
24	25	1	2	4	2	6	7	6	6	7	5	6	6	3	1	4	5	4	5	7	6	7
25	26	1	6	6	5	7	7	7	6	7	6	5	7	7	1	6	5	6	5	7	7	7
26	27	1	3	5	2	6	6	6	6	5	5	5	6	5	1	5	6	5	6	7	6	6
27	28	1	5	6	5	5	4	2	6	6	6	6	6	6	1	6	5	4	5	6	4	7
28	29	1	3	5	2	6	6	6	6	6	6	6	5	5	1	6	6	6	6	6	6	6



Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
29	30	1	6	2	2	6	7	7	7	7	5	6	7	5	1	4	7	4	6	7	7	7
30	31	1	6	5	4	6	6	6	6	7	6	6	7	6	2	6	6	4	6	6	6	6
31	32	1	3	5	4	3	7	4	2	6	5	6	6	5	2	6	6	6	6	6	6	6
32	33	1	2	7	6	6	6	6	6	7	7	5	7	7	1	7	7	6	6	7	7	7
33	34	1	4	6	4	6	6	6	3	6	3	5	6	3	1	5	6	5	4	6	4	7
34	35	1	2	5	5	6	5	6	2	6	5	1	7	5	1	6	6	4	4	7	7	7
35	36	1	6	5	5	6	7	5	6	6	5	5	5	6	1	6	7	6	5	7	7	6
36	37	1	4	6	6	4	6	5	6	6	5	3	6	3	1	6	6	5	4	6	6	6
37	38	1	7	3	3	4	5	6	5	3	4	2	3	4	1	4	6	4	5	6	4	6
38	39	1	6	5	5	6	6	2	7	6	6	5	6	3	1	7	6	3	3	6	7	5
39	40	1	3	3	2	4	5	6	3	7	1	5	6	5	1	6	6	3	6	3	4	6
40	41	1	3	1	3	2	3	3	6	5	2	1	3	1	5	5	6	5	4	1	5	2
41	42	1	6	5	4	4	6	3	6	7	6	5	7	6	1	4	4	6	5	7	6	7
42	43	1	7	6	7	6	6	7	6	3	6	7	7	6	2	6	6	4	6	6	7	7
43	44	1	4	1	1	4	7	4	6	6	6	6	7	6	2	6	6	4	6	7	4	5
44	45	1	5	6	6	5	6	4	3	6	3	5	5	5	1	6	5	4	5	5	5	6
45	50	1	6	5	2	6	7	6	7	7	7	6	6	6	1	4	6	4	4	7	6	7
46	51	1	5	3	5	5	5	4	7	6	6	6	6	6	2	3	4	5	5	4	6	6
47	52	1	4	3	2	4	6	4	7	6	6	6	6	5	1	5	6	5	5	7	6	6
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49	54	1	2	5	4	5	6	6	6	6	6	6	6	7	2	6	6	5	6	7	6	6
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52	57	1	6	5	6	5	5	5	6	4	3	3	3	5	1	7	7	6	6	7	6	5
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54	59	1	4	4	4	4	6	6	5	7	3	6	6	6	1	4	7	6	6	7	5	6
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56	61	1	5	6	4	4	7	6	6	7	7	6	7	6	1	7	7	4	3	7	6	7
57	62	1	6	7	5	5	5	6	3	6	6	2	7	5	1	6	6	6	5	6	5	4
58	63	1	6	4	6	5	7	5	5	5	5	3	5	5	1	6	6	6	5	6	6	5
59	64	1	2	6	2	6	6	6	7	6	4	5	7	6	1	6	5	3	3	7	7	7
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Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
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62	67	1	4	3	3	4	3	4	5	3	4	4	3	5	4	5	4	2	5	3	4	4
63	68	1	4	3	3	4	4	4	4	5	4	4	4	4	4	4	4	4	4	4	4	4
64	69	1	5	4	3	4	6	5	6	6	6	6	6	6	1	6	6	6	6	7	7	7
65	70	1	5	7	4	6	7	6	5	7	5	5	6	6	2	5	7	5	6	6	5	6
66	71	1	4	2	2	5	6	4	5	4	4	3	6	5	4	4	5	4	4	6	5	4
67	72	1	3	3	2	4	6	5	5	5	5	5	6	2	1	6	6	4	5	7	4	6
68	73	1	4	1	1	1	7	6	7	6	6	4	6	6	1	2	2	3	3	7	5	5
69	74	1	5	2	2	4	3	4	5	6	6	3	6	3	2	4	5	4	3	7	5	6
70	75	1	5	5	5	6	7	6	2	7	4	5	7	6	1	6	7	7	7	7	7	6
71	76	1	5	6	6	6	6	5	6	6	6	6	6	6	5	5	5	6	6	5	6	6
72	77	1	6	3	6	4	3	6	3	5	6	5	5	5	3	6	2	4	5	3	2	2
73	78	1	2	6	6	6	2	5	2	2	6	5	7	1	6	2	6	6	1	5	2	6
74	79	1	2	1	3	2	6	2	2	6	1	5	6	2	7	6	6	1	3	5	2	2
75	80	1	6	2	5	5	6	2	2	5	1	6	2	6	2	2	6	2	2	6	2	6
76	81	1	2	6	2	6	2	2	2	6	7	7	2	6	1	5	7	7	6	6	2	6
77	82	1	2	2	6	6	6	2	5	3	3	4	6	6	2	2	2	3	3	3	1	2
78	84	1	2	2	6	2	6	1	2	6	2	2	1	6	2	6	6	6	6	1	2	1
79	85	1	3	6	6	2	6	2	3	6	6	6	5	2	5	1	6	6	2	6	2	6
80	86	1	6	2	1	3	3	2	2	2	1	3	3	2	2	3	1	6	3	5	6	2
81	88	1	2	6	6	6	2	6	6	6	2	6	2	6	2	6	2	6	6	6	2	6
82	90	1	6	5	6	6	6	2	2	6	6	2	6	3	5	6	6	2	6	2	1	2
83	91	1	2	6	6	2	6	2	2	6	6	2	6	6	6	6	6	2	2	6	2	6
84	92	1	2	5	6	6	6	2	2	6	5	2	6	6	6	2	6	6	2	6	2	6
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87	95	1	6	2	6	2	6	6	2	6	6	1	6	3	7	6	1	6	2	5	1	6
88	96	1	2	6	6	2	6	2	2	2	6	2	2	6	2	2	6	6	6	1	2	6
89	98	1	2	3	5	5	5	1	5	4	5	3	5	5	7	2	2	4	4	3	2	3
90	99	1	2	2	3	3	3	2	3	5	6	6	6	6	2	6	6	3	5	2	1	2
91	100	1	6	5	6	6	2	2	6	5	6	6	2	6	6	6	2	5	2	6	2	5
92	101	1	2	5	6	5	2	2	3	6	6	1	2	6	2	2	5	3	2	1	2	3

Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
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94	104	1	3	2	2	1	1	2	6	1	6	2	2	1	5	1	2	1	2	1	5	2
95	105	1	3	2	2	2	1	2	7	3	2	1	2	2	6	1	3	2	1	3	2	1
96	107	1	6	3	6	5	5	2	5	2	2	5	2	6	6	2	6	2	2	6	2	6
97	108	1	3	2	5	2	6	2	2	2	6	2	6	3	3	2	6	3	6	6	2	2
98	109	1	2	2	3	3	3	3	5	2	1	3	2	1	6	2	1	3	3	3	1	2
99	110	1	2	1	2	1	3	2	5	2	2	3	2	1	7	2	2	1	3	2	2	3
100	111	1	2	2	1	1	2	2	7	2	1	3	1	3	7	3	5	6	6	5	1	3
101	112	1	6	2	1	1	1	5	6	1	2	6	2	1	5	2	2	1	6	6	2	2
102	113	1	2	5	5	6	5	5	2	2	6	3	2	6	6	2	6	6	2	2	1	2
103	114	1	2	1	2	1	3	1	6	2	1	3	6	6	2	3	3	1	6	3	1	2
104	115	1	1	1	3	1	3	2	5	2	3	6	2	3	5	1	3	2	1	2	2	1
105	116	1	2	2	1	3	2	3	6	2	1	1	3	3	5	2	2	2	1	6	2	3
106	117	1	2	6	3	2	3	1	6	3	4	3	4	4	4	4	4	5	4	5	2	4
107	118	1	2	4	5	2	5	1	6	5	1	4	5	5	3	2	2	6	5	6	1	2
108	119	1	2	5	2	2	3	2	2	2	6	6	6	6	2	6	6	3	6	2	1	3
109	120	1	2	2	6	5	6	2	2	6	3	2	1	2	6	1	6	2	6	2	1	2
110	121	1	2	5	5	5	5	2	3	6	6	2	3	2	2	2	6	2	2	2	2	3
111	122	1	5	1	5	1	5	2	7	6	6	2	6	3	6	5	2	6	5	2	1	2
112	123	1	2	5	2	6	6	1	6	1	3	2	6	6	6	6	2	6	2	5	2	6
113	124	1	3	3	3	6	2	2	3	2	2	1	6	1	2	1	6	1	6	1	1	6
114	125	1	2	5	5	2	3	2	2	6	3	6	6	6	5	2	1	6	2	3	1	2
115	126	1	3	6	3	6	2	2	2	3	6	2	6	6	7	2	2	6	3	2	3	1
116	127	2	2	1	3	1	4	1	4	2	6	7	7	3	1	2	4	7	3	4	1	4
117	128	2	2	5	2	1	6	2	3	5	2	2	2	2	4	7	7	3	2	5	7	7
118	129	2	2	2	5	3	6	5	7	5	2	3	3	2	2	6	7	3	2	3	6	5
119	130	2	1	2	2	3	3	2	6	3	3	5	3	5	5	5	5	5	3	1	7	6
120	131	2	5	6	6	3	6	2	6	6	1	6	6	3	2	5	6	5	1	3	6	6
121	132	2	2	2	3	5	5	6	7	5	2	3	2	1	2	6	6	2	2	2	7	4
122	133	2	3	6	7	5	5	6	6	7	6	6	6	5	3	5	6	5	3	2	7	7
123	134	2	5	5	5	5	6	5	7	6	2	2	5	3	2	6	6	5	2	2	7	5
124	135	2	4	3	6	6	6	5	6	6	5	4	5	5	2	6	6	4	4	5	7	6

Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
125	136	2	1	2	2	6	5	4	3	6	2	2	6	5	4	4	5	5	3	1	6	3
126	137	2	2	5	2	4	2	4	7	1	3	7	2	2	5	7	7	3	3	1	6	3
127	138	2	5	3	5	6	6	6	6	6	5	3	5	5	3	6	6	5	2	2	6	5
128	139	2	2	3	6	2	6	2	6	5	6	5	6	5	3	6	6	2	3	1	6	2
129	140	2	1	5	6	4	1	5	7	6	1	5	5	3	3	5	5	5	5	5	6	5
130	141	2	1	3	7	1	1	5	6	3	2	5	2	2	1	6	6	5	4	2	7	7
131	142	2	5	7	6	5	1	5	7	6	5	1	5	5	5	5	6	2	2	6	5	7
132	144	2	3	4	5	2	2	2	7	5	2	3	4	2	5	5	7	2	2	2	6	5
133	145	2	2	1	4	4	6	4	7	6	5	2	6	5	3	6	6	6	3	7	7	4
134	146	2	5	4	2	6	6	5	7	6	5	5	6	2	2	6	6	3	2	2	7	6
135	147	2	2	1	4	2	7	3	7	1	3	2	1	1	2	6	6	2	1	4	7	6
136	148	2	3	1	5	1	5	2	7	2	1	3	1	1	2	7	6	1	1	7	7	6
137	149	2	5	2	5	6	4	5	4	5	2	4	4	4	2	6	6	5	4	3	7	6
138	150	2	5	6	6	6	5	6	6	5	5	5	5	5	4	4	4	4	5	4	7	5
139	151	2	1	1	1	5	1	2	3	5	2	5	5	1	3	5	6	2	1	1	7	3
140	152	2	5	5	5	4	6	4	7	6	6	6	6	6	2	3	3	5	4	2	6	6
141	153	2	1	6	7	5	4	6	3	7	3	2	4	4	4	6	6	4	3	7	7	6
142	154	2	2	4	2	4	2	6	6	3	2	5	2	2	2	6	5	4	2	6	6	5
143	155	2	2	3	3	2	2	3	6	5	5	3	5	5	2	2	2	2	2	2	5	2
144	156	2	1	4	6	1	6	2	6	6	6	5	5	5	4	6	6	5	2	2	5	5
145	157	2	5	7	7	5	5	5	7	5	6	6	5	5	3	4	4	4	3	2	6	6
146	159	2	5	2	5	5	7	5	7	5	6	5	6	5	3	3	5	5	5	3	6	6
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149	162	2	2	3	3	2	2	3	3	3	2	1	3	2	3	5	6	2	2	6	7	6
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151	164	2	5	7	7	7	3	5	5	3	5	2	5	3	3	5	5	3	3	4	5	5
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153	166	2	6	6	6	6	6	5	6	3	2	3	3	3	5	3	3	3	2	1	5	1
154	167	2	2	5	6	5	5	2	3	5	2	2	5	5	3	3	2	3	2	3	7	3
155	168	2	5	1	2	6	5	3	5	5	6	5	5	5	2	7	7	5	3	1	7	5
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158	171	2	1	6	7	7	5	4	7	6	3	1	4	1	2	4	5	1	4	3	7	6
159	172	2	3	5	4	4	6	2	6	5	2	1	3	3	2	5	5	3	2	1	7	6
160	173	2	2	5	6	6	6	3	3	5	5	2	5	1	2	6	5	3	5	6	6	6
161	174	2	5	7	7	6	2	3	7	3	3	6	6	3	5	2	5	1	3	1	7	6
162	175	2	1	6	6	2	5	5	3	5	1	1	3	3	3	5	3	4	1	1	5	5
163	176	2	2	2	3	7	3	2	3	3	1	1	2	2	2	4	4	2	2	2	7	5
164	177	2	1	5	6	5	6	6	7	5	3	2	3	2	1	4	6	3	4	7	7	6
165	178	2	5	6	5	6	6	6	7	6	5	2	6	5	3	3	6	4	4	5	6	5
166	179	2	2	6	3	6	6	5	7	5	2	3	6	5	2	6	6	3	3	2	6	6
167	180	2	6	6	5	3	5	2	7	5	5	6	6	5	5	4	3	3	2	2	7	3
168	182	2	1	3	5	6	7	5	6	3	5	3	5	5	2	7	7	5	2	7	7	6
169	184	2	6	6	6	7	7	5	6	7	5	5	7	5	1	7	6	5	5	5	7	7
170	185	2	2	1	2	4	6	3	5	2	3	2	5	1	2	6	6	2	1	2	7	7
171	186	2	6	6	7	7	7	7	7	6	5	2	7	5	3	4	6	5	4	3	6	6
172	187	2	3	6	5	6	6	5	5	6	2	2	5	3	3	7	7	2	3	3	7	7
173	188	2	2	5	6	2	1	1	4	2	1	1	2	1	3	6	5	1	2	5	7	7
174	189	2	5	6	5	3	6	6	6	6	5	5	5	5	2	6	6	5	5	6	7	6
175	191	2	2	5	7	1	6	5	7	7	3	6	6	3	4	2	2	2	2	2	6	2
176	192	2	3	5	4	6	7	6	5	6	3	5	5	5	3	6	6	5	5	2	4	5
177	193	2	7	7	6	3	3	2	1	5	1	2	1	1	5	3	6	1	2	2	7	1
178	194	2	3	2	2	6	6	3	6	6	5	6	6	6	4	4	5	4	4	3	6	4
179	195	2	1	5	5	5	2	5	7	5	5	2	3	5	2	6	3	2	2	3	7	6
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185	202	2	2	7	7	2	6	3	7	1	2	5	6	1	7	6	7	2	2	6	1	1
186	203	2	6	6	6	6	6	6	6	6	6	6	6	6	3	5	6	6	2	2	6	5
187	204	2	5	5	5	5	6	5	6	6	5	5	5	2	3	6	6	5	2	2	7	5
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190	207	2	7	6	7	5	3	5	5	5	3	3	4	2	2	6	6	5	2	1	2	6
191	208	2	1	6	7	2	4	3	7	3	4	1	2	3	1	7	6	1	2	3	7	5
192	209	2	2	2	6	3	5	5	6	1	2	5	5	2	5	5	7	3	2	1	7	3
193	210	2	5	5	6	4	3	3	7	6	3	2	2	5	3	5	6	4	4	7	6	7
194	211	2	5	3	3	2	5	2	7	1	3	6	3	3	2	2	4	3	2	2	7	4
195	212	2	7	7	7	7	7	5	7	6	2	5	5	5	3	4	4	7	5	3	7	3
196	213	2	6	7	6	6	5	6	7	5	5	7	6	6	5	6	7	5	5	7	7	6
197	214	2	2	2	2	6	2	2	6	4	1	1	1	1	1	7	7	1	1	7	7	6
198	215	2	1	5	5	5	5	6	6	5	5	1	3	1	3	6	6	5	1	7	7	6
199	216	2	4	4	5	4	3	3	6	5	2	2	5	2	3	3	5	2	2	5	6	5
200	217	2	4	3	4	6	3	3	3	6	2	3	6	4	4	6	4	3	4	2	7	4
201	218	2	1	4	5	4	5	4	6	3	3	3	5	3	3	5	5	4	2	5	3	5
202	219	2	2	1	2	4	5	2	7	5	4	3	4	2	3	7	7	4	4	7	7	6
203	220	2	4	5	6	6	2	5	6	1	1	2	2	3	2	4	6	2	2	2	6	4
204	221	2	1	5	5	1	6	2	6	6	5	3	3	2	3	6	5	3	4	6	7	6
205	222	2	2	3	2	4	3	5	6	5	5	3	2	2	3	5	5	6	5	5	7	3
206	223	2	2	4	5	2	6	2	7	6	5	6	6	3	1	7	7	4	4	7	7	7
207	225	2	2	5	5	4	6	3	7	6	2	2	2	1	5	7	6	4	3	6	6	6
208	226	2	1	7	7	3	3	2	3	2	2	3	2	1	5	6	7	3	2	7	7	6
209	227	2	7	5	3	1	7	1	7	7	1	1	1	1	1	7	6	2	1	6	7	6
210	228	2	3	7	6	6	2	4	6	3	1	3	4	3	1	7	6	5	5	6	6	4
211	229	2	2	2	1	6	5	5	7	6	3	6	5	2	2	5	7	6	4	6	7	5
212	231	2	5	6	6	5	3	2	2	2	1	2	2	1	1	6	6	6	2	2	5	2
213	232	2	5	2	2	4	1	2	7	6	2	1	3	5	3	6	6	4	2	2	6	5
214	233	2	5	6	5	3	6	6	7	5	3	1	6	5	2	5	5	2	3	1	7	5
215	234	2	2	4	5	4	2	2	6	2	1	2	5	2	1	5	6	2	2	6	6	6
216	235	2	2	2	4	1	5	5	6	6	1	1	5	5	3	5	3	4	3	2	6	2
217	238	2	5	6	6	3	2	3	5	5	2	1	2	1	1	5	5	1	1	3	6	5
218	239	2	1	1	1	6	6	5	7	6	2	2	6	1	5	5	5	5	5	3	4	6
219	240	2	2	1	1	4	3	3	6	3	2	3	3	2	6	6	6	3	3	1	6	5
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Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
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222	243	2	2	6	7	5	5	1	7	1	2	2	3	2	5	5	7	2	2	3	7	5
223	244	2	2	5	7	6	2	2	7	1	1	1	2	1	1	6	6	3	1	7	7	4
224	245	2	2	5	6	4	6	3	7	6	5	2	6	5	1	6	3	5	3	7	6	6
225	247	2	5	7	5	2	1	4	6	1	1	1	3	1	1	4	7	3	2	1	7	6
226	248	2	1	1	1	6	2	1	6	1	1	1	1	1	1	6	2	2	1	6	6	1
227	249	2	3	1	1	4	5	5	7	5	2	1	5	1	5	6	7	4	5	7	7	5
228	250	2	5	1	1	5	3	6	7	7	5	3	5	5	1	6	6	5	6	1	6	5
229	251	3	5	6	6	5	6	6	6	6	5	5	6	5	3	5	2	5	6	2	6	6
230	252	3	7	6	6	6	6	6	5	6	5	6	5	5	2	3	3	3	3	3	6	6
231	253	3	5	5	3	6	5	5	6	6	6	5	6	5	6	5	5	2	5	1	6	6
232	254	3	5	3	5	6	5	5	7	5	7	5	6	6	3	4	4	5	5	1	7	7
233	255	3	3	5	5	4	6	4	4	5	5	5	5	6	3	4	4	6	4	4	4	6
234	256	3	5	7	7	5	3	5	7	5	6	5	5	5	2	6	6	5	5	5	7	5
235	257	3	5	6	6	3	2	2	6	1	2	3	2	2	1	1	5	2	1	1	7	6
236	259	3	5	2	4	5	6	5	5	5	3	4	3	2	3	5	6	5	5	6	6	5
237	260	3	2	3	6	2	4	3	6	5	3	3	2	2	3	5	5	2	1	2	6	5
238	261	3	2	5	5	2	3	3	5	2	2	2	2	3	3	2	1	2	2	1	6	1
239	262	3	3	6	6	5	5	6	6	6	1	3	6	3	2	6	5	5	2	2	6	5
240	263	3	3	7	7	4	2	4	7	2	7	5	4	2	2	7	7	4	3	1	7	1
241	264	3	1	2	6	1	2	2	7	2	4	2	2	1	1	7	6	2	3	1	7	7
242	265	3	2	5	7	7	2	2	7	6	5	5	5	5	5	2	6	3	3	1	7	3
243	266	3	4	3	3	4	2	6	7	6	5	5	6	5	2	4	6	4	6	6	6	5
244	267	3	2	2	6	4	5	2	7	5	3	6	5	2	2	6	5	4	1	1	7	4
245	268	3	5	6	6	6	6	6	6	6	5	5	5	5	5	5	5	5	4	6	6	6
246	269	3	1	3	2	3	5	2	6	4	2	5	2	2	5	5	5	5	5	1	6	2
247	270	3	5	6	6	2	1	2	7	4	3	1	3	1	1	7	7	5	5	2	7	6
248	271	3	2	6	3	2	2	2	7	3	2	2	2	2	1	3	6	2	2	7	6	6
249	272	3	5	6	6	3	6	6	6	3	3	5	3	2	3	6	6	3	2	7	6	3
250	273	3	2	3	6	6	7	6	7	5	5	5	6	5	5	6	5	3	2	2	7	7
251	274	3	1	4	1	1	4	6	7	7	7	4	4	7	2	4	6	4	4	5	7	6
252	275	3	2	2	3	3	5	4	6	4	4	4	4	4	3	4	2	4	3	2	6	4

Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
253	276	3	1	6	7	6	2	2	4	6	2	1	2	1	1	6	6	1	2	1	7	6
254	278	3	7	7	7	1	6	4	5	5	2	2	4	2	5	4	7	4	5	3	7	6
255	279	3	5	6	7	2	7	7	7	7	7	2	5	5	6	7	6	6	6	1	7	3
256	280	3	3	5	3	4	5	6	6	3	3	1	2	2	2	6	6	2	2	1	7	3
257	281	3	5	7	7	5	6	2	7	5	3	2	5	2	1	6	6	5	2	1	7	5
258	282	3	2	6	6	2	1	2	6	3	2	2	2	2	5	6	2	2	2	1	6	6
259	283	3	2	1	3	4	5	3	7	5	2	5	6	3	6	5	5	3	5	6	7	7
260	284	3	7	5	6	2	2	5	3	6	2	5	5	3	2	5	6	6	5	1	6	6
261	285	3	5	5	5	6	6	4	7	7	6	1	6	3	2	6	6	5	5	1	7	5
262	286	3	2	7	7	2	3	2	5	3	1	2	2	1	2	6	4	1	1	1	7	5
263	287	3	1	2	3	6	2	6	5	3	3	1	2	2	3	6	5	5	5	1	3	2
264	288	3	1	5	6	7	7	5	7	1	1	1	1	1	1	7	7	1	1	7	2	3
265	289	3	4	2	6	6	7	6	6	7	2	2	2	5	3	5	1	4	2	1	7	2
266	290	3	3	7	6	4	7	5	7	7	5	5	5	5	5	7	7	7	5	5	7	7
267	291	3	1	2	6	6	1	2	7	3	7	3	3	2	2	6	6	2	3	1	1	6
268	292	3	1	7	6	2	3	6	7	5	1	5	2	1	3	5	5	6	5	7	7	7
269	293	3	1	7	6	6	2	2	7	5	2	2	3	2	3	4	3	3	2	1	6	2
270	294	3	6	5	7	2	7	2	7	6	5	5	4	5	2	2	5	2	6	2	6	5
271	295	3	5	5	5	2	1	5	7	1	3	3	2	2	3	3	5	3	2	1	7	6
272	296	3	2	5	6	5	5	5	6	6	1	2	5	2	2	7	7	5	1	1	5	6
273	297	3	2	6	6	2	6	5	7	6	3	5	6	6	3	4	6	4	5	7	7	4
274	298	3	7	7	7	6	4	5	5	4	3	2	4	3	1	5	4	4	4	1	7	5
275	299	3	2	7	7	5	3	4	5	3	5	4	5	4	3	4	2	4	4	2	6	5
276	300	3	5	6	5	4	2	5	6	2	1	2	3	2	1	7	7	4	2	1	6	2
277	301	3	3	6	6	5	3	5	7	5	5	2	5	5	2	3	6	5	5	5	7	5
278	302	3	5	6	6	6	3	5	7	7	6	7	5	6	2	1	1	6	6	1	6	7
279	303	3	2	5	5	2	6	3	5	3	2	1	2	2	2	6	5	2	2	5	6	4
280	304	3	5	7	7	6	6	6	6	7	7	7	7	6	6	2	1	5	6	1	7	7
281	305	3	1	1	5	1	5	1	7	5	1	1	1	1	5	5	7	1	1	1	5	5
282	306	3	2	1	2	1	1	2	6	2	2	2	2	2	1	5	3	3	4	4	4	4
283	307	3	7	6	5	6	3	1	7	5	1	1	6	2	1	6	6	1	1	1	7	7
284	308	3	2	2	3	2	2	1	2	6	2	1	2	2	1	6	6	2	2	1	6	1



Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
285	309	3	5	6	5	6	5	5	3	5	1	1	5	2	2	5	2	2	3	4	6	5
286	310	3	2	4	4	4	5	3	6	5	5	5	3	3	5	5	6	5	4	3	6	5
287	311	3	5	7	7	5	6	5	6	7	6	7	7	5	2	2	1	3	6	1	7	5
288	312	3	6	6	7	2	5	5	7	6	2	2	6	5	2	5	5	5	5	6	7	7
289	313	3	4	2	2	4	6	4	7	3	5	2	4	5	3	5	4	4	2	1	7	5
290	314	3	3	3	3	2	6	4	7	5	4	6	4	5	4	2	1	2	3	5	7	4
291	315	3	2	7	7	6	5	5	5	6	6	6	6	5	3	5	3	5	6	5	6	7
292	316	3	2	1	2	3	5	4	6	5	5	5	5	3	3	6	6	4	4	1	6	5
293	317	3	2	2	1	2	7	2	7	4	7	4	6	4	1	7	5	4	2	1	7	5
294	318	3	3	6	6	5	2	4	7	2	2	2	2	2	3	6	5	2	2	1	7	2
295	319	3	3	6	6	2	3	3	7	3	2	3	2	3	2	3	3	2	3	1	6	6
296	320	3	2	3	3	2	3	3	7	3	5	2	2	2	2	6	5	3	3	1	6	5
297	321	3	7	6	7	2	6	2	7	7	3	6	6	2	2	1	1	4	6	1	7	1
298	322	3	2	5	7	2	6	5	7	2	7	7	7	7	3	2	1	3	6	1	6	7
299	324	3	7	1	1	1	6	1	3	5	5	1	6	5	1	6	2	2	5	1	7	1
300	325	3	5	1	5	1	5	5	7	3	5	5	3	4	3	5	5	3	6	1	7	5
301	326	3	1	1	1	4	5	1	7	6	1	1	5	1	1	6	2	1	2	1	7	4
302	327	3	4	2	1	4	4	4	4	1	2	1	1	2	1	4	4	2	2	2	6	3
303	328	3	1	4	7	4	5	4	3	3	3	1	3	2	2	6	6	5	4	5	2	2
304	329	3	5	1	1	3	3	2	6	2	3	1	3	2	2	5	4	2	2	1	6	4
305	330	3	2	1	5	4	6	5	2	5	1	1	2	3	3	5	2	4	2	2	6	2
306	331	3	2	6	6	2	6	6	6	6	2	6	6	2	2	6	2	2	6	5	6	6
307	332	3	2	6	5	2	1	5	7	3	3	6	2	2	1	2	1	1	2	1	7	6
308	333	3	3	5	6	5	2	3	6	6	2	4	5	3	3	3	2	3	3	2	3	4
309	334	3	6	6	7	6	6	3	7	6	5	6	6	5	5	4	4	5	5	6	6	6
310	335	3	3	7	7	4	5	5	7	5	6	6	6	5	5	3	3	5	5	1	5	5
311	336	3	5	5	7	1	5	1	7	3	6	5	5	5	2	3	5	2	2	1	7	6
312	337	3	2	5	4	6	2	5	4	3	2	5	2	4	5	2	2	4	4	1	4	6
313	338	3	2	5	6	2	6	3	6	7	6	5	6	6	6	6	2	6	6	1	6	3
314	339	3	5	5	5	6	2	5	6	3	2	3	2	3	3	6	6	3	5	5	6	6
315	340	3	5	6	6	3	6	3	7	5	3	3	4	3	2	4	4	3	3	1	5	5
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Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
317	342	3	2	2	2	4	6	6	6	6	2	6	6	6	3	6	7	6	5	2	7	3
318	343	3	6	6	5	5	6	6	6	7	7	7	6	6	3	2	1	5	6	1	6	7
319	344	3	1	5	6	4	6	5	7	6	5	1	5	2	1	7	7	5	2	5	7	5
320	345	3	1	6	6	5	2	5	6	5	2	5	5	5	3	2	2	3	2	2	6	6
321	346	3	3	1	3	6	5	6	7	6	3	5	2	2	6	4	7	5	3	1	5	3
322	347	3	3	6	7	6	5	2	7	5	1	6	5	5	2	2	2	3	2	1	7	3
323	348	3	4	5	7	2	3	6	7	3	5	5	4	3	1	4	4	6	4	1	7	6
324	349	3	1	2	2	6	6	6	7	7	6	6	6	5	2	5	5	4	5	2	6	5
325	350	3	5	5	6	6	2	5	7	2	3	2	2	2	2	6	6	2	2	5	6	5
326	351	3	2	5	7	2	7	1	7	6	5	3	5	5	3	3	2	1	3	1	7	3
327	352	3	2	6	6	4	3	4	5	5	5	5	5	2	2	6	6	5	3	2	6	6
328	353	3	1	5	5	6	2	1	7	6	1	2	7	3	5	6	5	2	1	1	7	6
329	354	3	3	6	6	5	5	5	6	5	6	5	5	2	2	6	5	5	5	4	6	6
330	355	3	5	7	6	5	6	5	5	5	2	3	2	3	3	5	5	5	2	5	6	7
331	356	3	5	3	1	1	1	3	7	4	1	1	1	3	3	6	5	1	2	5	7	5
332	357	3	2	2	2	6	6	4	6	6	2	2	6	4	4	6	6	4	2	6	6	6
333	358	3	2	2	2	6	6	2	6	2	2	2	6	2	2	6	6	6	2	6	2	2
334	359	3	7	6	6	6	7	7	7	7	5	7	7	7	3	7	5	7	7	7	7	7
335	360	3	2	1	2	3	5	5	6	3	1	1	3	5	2	5	7	4	1	1	6	2
336	361	3	3	3	3	4	5	4	5	5	3	4	5	5	3	6	6	2	4	3	7	5
337	362	3	5	5	5	6	5	5	6	6	5	5	5	5	2	5	3	3	5	1	6	5
338	363	3	5	1	1	4	5	4	6	6	1	5	5	3	3	2	1	4	5	5	5	3
339	364	3	3	2	3	5	6	3	7	7	1	3	6	5	5	2	6	3	1	1	7	5
340	365	3	5	1	7	7	3	2	7	5	5	6	3	5	2	5	3	3	3	1	7	7
341	366	3	3	5	5	5	6	6	7	5	3	5	5	5	2	6	5	5	5	1	6	5
342	367	3	1	3	5	4	6	2	7	7	1	3	3	1	5	2	2	2	3	1	7	6
343	368	3	4	5	5	6	7	4	7	7	6	7	7	6	1	6	2	6	6	1	6	6
344	369	3	6	2	2	2	6	2	7	7	1	5	5	5	4	1	1	1	5	1	1	5
345	370	3	4	2	5	5	5	6	7	5	4	5	1	1	5	6	5	6	5	5	7	5
346	371	3	3	2	5	4	3	5	6	6	6	6	6	3	2	4	6	3	3	6	7	6
347	372	3	7	7	6	3	5	5	6	6	1	1	3	2	2	6	3	3	2	7	7	2
348	373	3	6	7	7	3	6	6	5	7	7	5	6	6	1	6	2	3	6	2	7	7

Tot.	n°	Cl.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
349	374	3	4	7	7	5	4	5	7	7	7	7	7	5	7	1	1	5	4	1	5	7
350	375	3	2	6	6	2	4	1	6	6	6	6	6	6	6	6	6	2	2	6	6	6
351	376	3	5	7	7	6	5	6	7	6	6	7	6	5	6	4	1	6	6	6	6	6
352	377	3	5	6	6	5	5	5	6	6	6	5	6	5	4	5	5	3	3	4	7	6
353	378	3	2	5	4	4	5	5	3	3	3	3	5	5	4	6	6	4	2	4	7	3
354	379	3	5	6	6	4	5	5	3	7	5	5	5	5	2	3	3	4	5	2	6	2
355	380	3	6	6	6	6	7	5	7	7	7	6	6	6	6	5	5	6	5	2	6	6
356	381	3	2	6	7	2	2	6	7	6	6	6	5	6	6	6	2	1	2	2	7	6
357	382	3	3	5	7	2	6	6	7	5	3	5	5	4	3	7	6	4	3	1	7	5
358	383	3	4	6	3	6	5	4	6	6	1	5	5	2	3	4	5	4	1	1	6	5
359	384	3	5	3	5	4	3	4	6	6	6	5	6	4	2	4	5	5	2	1	6	5
360	385	3	1	6	6	4	7	6	7	6	6	5	6	5	3	6	6	4	6	7	6	5
361	386	3	2	1	2	2	5	1	7	7	5	6	5	5	3	1	1	2	4	4	7	2
362	387	3	1	7	7	1	1	4	7	4	6	6	3	2	2	3	2	2	2	1	7	6

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
1	1	1	4	3	5	6	6	2	2	3	4	3	4	4	5	6	6	6	6	4	4	6
2	2	1	7	6	6	6	6	7	7	7	7	6	6	6	6	6	7	7	7	7	7	5
3	3	1	6	5	5	6	4	4	6	5	4	4	5	5	4	2	6	4	4	4	4	4
4	4	1	6	6	5	6	6	3	6	5	5	3	4	3	3	2	5	5	5	6	7	6
5	5	1	7	1	1	2	6	1	5	5	6	7	7	7	7	1	1	1	1	1	1	1
6	6	1	6	6	6	6	6	3	5	5	6	5	3	5	5	1	4	7	7	7	6	7
7	7	1	6	5	5	7	7	5	3	7	7	5	6	3	6	5	6	6	7	6	6	5
8	9	1	6	6	5	7	6	4	6	7	5	5	7	5	4	3	4	6	6	7	4	4
9	10	1	6	7	5	6	6	6	6	6	6	5	6	5	6	6	5	6	6	6	5	6
10	11	1	6	4	5	6	7	6	6	5	2	5	4	5	5	5	6	4	5	5	2	2
11	12	1	5	7	7	7	7	7	5	7	7	7	7	5	2	2	2	1	7	7	5	4
12	13	1	4	5	4	4	5	5	5	6	5	5	5	5	4	5	5	7	7	7	7	7
13	14	1	6	7	6	7	6	3	6	6	6	3	6	5	6	3	3	5	7	7	6	5
14	15	1	4	6	6	7	5	2	6	6	5	5	5	5	5	2	6	5	5	6	4	3
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Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
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17	18	1	3	6	4	4	6	5	3	3	4	3	4	4	6	6	5	3	5	5	4	3
18	19	1	5	7	6	7	6	6	3	6	7	5	7	4	3	4	5	5	6	6	4	2
19	20	1	6	6	6	6	6	6	6	6	6	6	2	6	6	6	6	2	1	2	4	1
20	21	1	3	6	6	3	3	3	4	6	1	2	5	2	1	2	4	3	5	4	2	3
21	22	1	5	6	7	7	7	6	4	3	7	3	7	3	3	6	7	7	7	7	3	2
22	23	1	5	5	5	6	5	6	5	6	5	6	5	6	6	4	5	6	7	6	4	4
23	24	1	5	5	5	7	5	5	5	4	5	5	5	6	5	2	2	5	2	3	2	2
24	25	1	4	7	6	5	6	6	5	7	7	3	5	3	5	5	4	6	7	7	4	4
25	26	1	6	7	7	7	7	5	5	6	7	6	6	6	7	5	6	6	7	7	7	6
26	27	1	5	5	6	7	6	5	6	5	6	5	5	5	5	4	4	6	7	6	5	4
27	28	1	5	6	5	6	6	6	5	7	5	6	4	6	6	6	6	5	6	5	4	5
28	29	1	5	6	5	6	5	6	6	6	5	6	4	6	6	6	5	6	6	6	4	5
29	30	1	7	5	6	7	7	6	7	6	7	6	7	5	6	6	4	7	6	7	6	6
30	31	1	5	6	4	7	6	6	5	6	5	6	5	6	5	6	6	6	5	6	4	4
31	32	1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
32	33	1	7	7	7	7	7	6	7	7	7	7	6	7	7	7	7	7	7	7	7	5
33	34	1	4	7	5	7	6	6	4	5	4	3	4	5	5	3	3	5	5	5	4	4
34	35	1	5	7	7	7	7	1	1	4	5	3	5	3	6	5	6	5	7	7	4	1
35	36	1	6	5	7	7	6	4	5	6	7	5	5	5	6	2	3	4	6	6	6	5
36	37	1	6	5	5	6	6	3	5	5	6	5	6	5	5	5	6	6	5	5	5	6
37	38	1	2	1	1	1	1	2	1	4	1	5	4	5	4	2	3	1	5	1	1	4
38	39	1	5	7	6	6	7	6	7	7	5	5	6	5	5	6	6	5	5	5	4	5
39	40	1	6	5	5	7	2	5	2	5	1	5	5	5	5	5	6	6	5	3	6	5
40	41	1	2	6	6	2	5	1	4	5	1	2	4	2	3	1	1	6	7	6	3	6
41	42	1	7	7	7	7	7	6	7	7	7	5	4	6	6	5	6	7	6	6	5	6
42	43	1	7	7	7	7	7	7	7	7	7	6	7	7	7	6	7	7	7	7	7	7
43	44	1	4	6	6	6	3	6	5	5	4	5	4	5	5	2	4	4	4	4	4	4
44	45	1	4	6	5	3	5	5	6	5	5	2	4	3	6	5	5	5	5	5	3	4
45	50	1	6	7	4	7	7	6	6	6	6	6	6	6	6	5	6	6	6	6	4	4
46	51	1	4	5	5	4	5	5	5	5	5	4	6	5	3	4	4	6	4	5	6	4
47	52	1	6	6	6	7	7	7	7	6	7	6	6	6	6	5	6	6	6	6	4	4

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
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49	54	1	6	6	6	7	6	6	6	6	6	6	6	6	6	6	6	6	7	5	6	4
50	55	1	1	1	1	6	1	2	5	5	1	2	4	3	5	5	4	1	1	1	1	4
51	56	1	7	7	7	7	7	6	5	6	7	6	7	5	3	6	4	6	7	7	4	3
52	57	1	7	5	5	6	7	3	6	6	5	6	6	6	6	7	3	6	6	7	5	4
53	58	1	6	6	6	6	7	5	3	2	5	5	4	5	2	3	3	6	6	6	4	4
54	59	1	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
55	60	1	5	5	2	7	7	7	1	5	6	7	4	6	7	7	6	3	6	5	3	5
56	61	1	7	7	7	7	7	6	7	7	7	6	6	6	6	3	5	7	7	7	4	5
57	62	1	5	5	5	7	6	2	4	5	5	5	5	5	5	2	3	4	5	5	5	4
58	63	1	5	5	6	6	6	3	3	5	6	5	3	5	5	3	3	5	5	3	4	4
59	64	1	7	5	4	7	7	6	6	7	7	5	6	3	7	6	6	6	7	7	4	4
60	65	1	6	6	5	6	6	3	5	6	5	3	5	5	6	3	5	5	5	5	6	5
61	66	1	6	7	7	5	7	5	5	5	7	5	6	5	5	5	6	6	5	5	5	6
62	67	1	3	4	4	4	4	5	4	3	3	4	4	4	5	5	3	3	4	3	4	4
63	68	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
64	69	1	4	6	6	7	6	6	7	7	7	6	6	6	6	6	5	5	7	6	4	4
65	70	1	6	6	5	5	6	6	6	6	6	7	5	6	6	6	5	3	4	5	6	6
66	71	1	4	5	4	3	5	4	6	5	5	3	4	4	4	5	5	4	4	5	5	4
67	72	1	5	5	6	3	3	3	6	3	6	3	4	3	6	5	5	6	5	5	4	2
68	73	1	6	6	6	7	5	3	1	5	7	5	6	7	1	6	7	7	4	4	4	1
69	74	1	5	6	3	4	6	3	6	6	6	6	6	6	4	3	6	2	5	5	4	4
70	75	1	6	6	6	7	5	5	6	6	6	5	6	6	6	6	6	5	4	5	5	4
71	76	1	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5
72	77	1	6	2	1	6	3	6	6	2	6	5	2	6	2	6	2	2	4	5	3	1
73	78	1	6	2	5	1	6	6	7	6	1	6	6	2	6	2	5	2	6	1	6	2
74	79	1	2	6	2	6	6	2	2	2	6	6	6	6	5	6	6	2	2	2	6	6
75	80	1	6	6	6	6	2	6	2	6	6	6	6	6	6	6	6	2	2	6	6	6
76	81	1	2	2	3	5	6	2	6	7	5	7	7	2	6	6	6	1	6	6	6	6
77	82	1	2	3	2	3	3	2	6	6	6	2	2	7	6	1	6	1	5	6	6	6
78	84	1	2	1	6	2	1	5	6	2	6	2	1	6	2	1	2	6	1	1	2	2
79	85	1	2	6	6	6	2	5	2	1	6	6	2	6	6	3	5	2	6	2	5	6

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
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81	88	1	6	6	5	6	6	6	6	6	6	2	6	6	6	6	5	6	6	2	6	6
82	90	1	5	6	2	6	6	2	6	2	6	6	6	6	6	6	2	1	6	2	2	6
83	91	1	2	2	2	2	3	2	2	5	6	6	6	1	2	6	5	2	2	3	3	2
84	92	1	6	6	5	6	1	2	6	2	6	2	2	6	6	2	2	2	3	2	2	2
85	93	1	2	6	6	2	6	2	2	6	1	2	6	5	6	1	2	1	2	6	2	6
86	94	1	6	6	2	6	6	6	3	5	5	5	6	6	5	2	6	2	6	6	2	3
87	95	1	6	6	5	6	2	6	6	7	6	7	7	6	7	3	6	2	1	5	6	2
88	96	1	6	2	2	6	2	6	6	2	6	1	6	2	5	6	2	2	6	2	6	6
89	98	1	1	6	2	1	3	5	5	4	3	3	2	5	5	5	6	5	5	4	5	5
90	99	1	3	2	2	5	6	6	3	2	6	6	2	4	3	6	2	3	3	5	5	5
91	100	1	5	6	6	2	2	5	2	6	2	5	6	5	2	6	6	2	6	5	2	5
92	101	1	6	5	5	2	6	2	6	5	6	6	6	2	3	6	2	2	5	5	3	2
93	103	1	3	2	2	6	2	6	2	6	2	6	5	2	6	2	2	2	5	6	6	6
94	104	1	5	3	4	5	5	6	6	5	2	6	6	6	6	3	6	1	2	2	1	2
95	105	1	5	6	2	2	1	3	6	6	2	3	2	1	6	2	2	2	2	6	2	2
96	107	1	2	2	6	6	6	6	6	6	3	2	2	5	6	6	6	2	3	5	3	6
97	108	1	2	1	3	6	5	2	6	5	3	6	2	6	5	6	6	2	2	4	3	3
98	109	1	1	2	2	1	3	1	3	5	2	2	2	2	2	3	2	1	2	1	2	2
99	110	1	2	3	3	1	1	2	2	3	3	3	4	4	4	2	5	1	2	2	3	6
100	111	1	3	3	5	5	3	5	5	3	5	5	5	5	5	5	5	1	2	2	1	3
101	112	1	6	6	1	5	1	3	2	6	2	3	2	6	6	6	6	1	1	3	3	2
102	113	1	2	3	1	2	1	2	3	1	2	2	2	3	3	2	1	1	2	2	3	2
103	114	1	2	1	2	2	3	6	6	2	2	6	6	2	2	6	2	1	2	3	6	5
104	115	1	2	3	3	2	3	2	3	5	2	3	2	2	2	5	2	1	2	3	2	2
105	116	1	3	3	6	2	5	6	6	6	6	6	2	3	6	6	6	2	1	2	2	2
106	117	1	3	5	4	3	3	4	5	3	2	1	3	6	6	6	6	1	2	2	1	1
107	118	1	2	6	2	2	1	6	6	2	1	6	1	6	6	6	6	2	1	2	1	6
108	119	1	6	5	6	5	1	2	5	2	6	2	6	2	6	6	6	1	2	5	2	5
109	120	1	2	1	6	1	2	3	2	2	6	2	6	3	6	6	6	1	5	5	6	6
110	121	1	6	6	6	3	3	6	2	6	2	6	2	6	2	6	3	1	2	6	2	2
111	122	1	2	1	5	2	6	2	1	2	1	2	2	2	6	1	2	2	3	6	1	2

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
112	123	1	2	6	2	6	2	3	2	6	2	6	2	6	6	2	5	2	5	2	6	3
113	124	1	2	2	6	2	6	3	1	6	1	6	1	5	1	6	2	2	6	2	6	2
114	125	1	2	6	6	2	6	2	6	2	6	2	3	1	6	6	6	2	2	1	6	6
115	126	1	5	6	2	6	2	6	2	6	6	2	2	6	6	6	6	1	6	6	2	6
116	127	2	1	5	7	6	4	7	3	5	7	7	6	7	4	4	1	1	2	1	3	4
117	128	2	7	7	7	3	7	2	6	1	7	2	7	2	1	1	4	5	7	4	6	2
118	129	2	5	5	6	3	6	3	5	7	5	2	2	2	2	3	2	5	6	7	3	3
119	130	2	5	6	6	3	5	5	5	6	6	3	6	2	2	2	6	6	6	6	5	2
120	131	2	6	6	6	3	6	6	6	6	1	2	4	1	2	6	2	1	6	6	6	1
121	132	2	3	6	5	2	7	2	3	3	6	3	4	1	1	1	3	2	6	7	3	3
122	133	2	5	7	7	5	5	6	7	7	4	5	5	3	5	5	6	5	5	7	5	4
123	134	2	6	6	6	5	7	1	7	1	7	1	6	1	1	2	7	5	7	7	6	2
124	135	2	7	6	6	4	7	4	5	6	7	5	7	5	4	3	3	6	7	7	6	4
125	136	2	4	4	5	2	7	2	5	3	5	1	3	2	2	1	4	5	5	7	4	2
126	137	2	5	6	6	1	6	6	5	7	6	1	4	3	1	2	4	7	7	7	1	1
127	138	2	5	7	7	5	6	3	3	3	5	3	3	2	1	2	1	7	7	7	3	3
128	139	2	5	6	6	3	5	5	5	5	5	2	3	2	2	1	6	6	6	6	3	2
129	140	2	5	5	5	1	5	5	5	6	6	1	5	1	1	5	5	6	6	6	6	5
130	141	2	6	6	7	2	7	5	2	5	6	2	4	2	2	5	3	5	7	6	3	2
131	142	2	5	6	7	6	7	1	5	6	7	2	5	2	1	1	3	7	7	4	4	1
132	144	2	3	4	7	5	7	5	5	5	7	4	6	5	1	6	6	5	7	6	1	2
133	145	2	7	6	7	5	7	2	5	5	7	5	4	5	3	2	4	5	7	7	2	2
134	146	2	2	7	7	5	7	5	5	6	7	2	6	2	5	6	6	6	7	6	3	4
135	147	2	3	7	6	5	7	2	3	5	7	1	6	1	1	2	2	3	7	7	1	2
136	148	2	2	7	7	2	7	5	7	6	7	2	7	2	1	3	1	3	7	7	1	5
137	149	2	5	6	6	6	7	4	5	6	3	2	4	5	4	1	6	5	6	7	2	4
138	150	2	5	6	6	4	4	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6
139	151	2	7	7	7	1	7	3	5	6	3	2	7	2	1	2	1	5	5	7	1	1
140	152	2	6	6	6	6	6	6	5	6	5	6	5	5	4	6	6	5	6	5	5	3
141	153	2	4	6	6	6	7	2	3	6	7	3	4	2	2	2	3	6	7	7	3	2
142	154	2	3	6	6	5	5	5	5	5	5	2	2	2	2	4	4	5	7	6	4	3
143	155	2	2	6	6	2	6	2	6	6	6	2	2	2	2	2	2	6	6	6	2	2

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
144	156	2	5	6	4	5	5	5	6	6	3	2	2	3	1	5	5	5	5	5	2	5
145	157	2	5	6	6	3	6	6	5	6	6	5	3	5	5	5	6	7	7	7	6	6
146	159	2	7	7	7	5	7	3	6	6	6	6	3	5	3	3	1	5	7	7	3	5
147	160	2	7	6	5	3	6	1	7	7	5	5	5	4	3	1	3	7	5	6	4	5
148	161	2	5	5	6	1	7	2	5	5	7	3	3	3	2	2	2	7	7	7	2	3
149	162	2	7	7	6	5	7	1	3	5	7	2	7	2	2	2	6	5	7	7	6	1
150	163	2	3	6	6	3	6	5	6	6	6	2	6	2	3	2	2	4	6	6	2	2
151	164	2	5	3	3	4	3	3	4	4	3	2	2	2	2	2	2	1	3	2	2	5
152	165	2	6	4	5	7	7	7	5	6	7	6	5	6	5	6	6	6	7	6	4	2
153	166	2	3	6	6	2	3	3	6	6	3	3	3	2	3	2	3	3	3	3	3	6
154	167	2	3	6	6	2	6	5	2	5	6	2	3	3	3	3	4	6	6	6	4	2
155	168	2	5	6	7	5	6	5	6	6	5	6	6	2	2	5	6	6	5	6	2	3
156	169	2	6	6	6	2	6	2	6	6	6	6	5	2	2	2	2	6	6	6	6	6
157	170	2	5	5	5	2	7	6	1	6	6	2	2	1	1	2	3	6	7	6	1	4
158	171	2	4	6	6	3	5	1	4	6	6	3	6	2	2	3	4	4	6	7	4	6
159	172	2	6	6	6	3	6	2	4	5	6	3	3	2	2	2	2	6	6	6	3	3
160	173	2	6	7	6	3	5	5	3	5	5	5	5	1	1	3	3	7	6	6	3	2
161	174	2	7	7	7	2	7	6	2	6	7	3	6	1	1	2	1	6	7	7	2	7
162	175	2	5	5	5	1	7	1	4	5	4	1	4	1	1	1	3	6	7	6	6	6
163	176	2	5	6	6	2	7	1	5	5	6	2	5	2	1	2	1	4	6	6	5	4
164	177	2	2	7	7	2	1	2	5	5	6	3	1	1	3	5	2	2	6	7	1	1
165	178	2	4	6	6	5	6	2	5	5	7	5	6	5	5	5	5	5	6	6	5	4
166	179	2	3	6	6	6	7	3	5	7	7	1	2	1	2	2	2	3	7	7	3	2
167	180	2	7	6	7	1	7	6	2	6	6	6	2	2	5	5	6	6	6	7	2	2
168	182	2	3	7	7	5	7	3	5	6	7	5	2	2	1	2	5	6	7	7	7	3
169	184	2	5	7	7	7	7	5	5	6	7	5	5	3	3	2	5	7	7	7	7	5
170	185	2	7	7	7	2	7	2	2	2	7	2	7	1	1	1	1	3	6	7	4	2
171	186	2	5	6	6	5	5	2	4	6	2	2	5	2	2	1	5	2	2	4	3	4
172	187	2	5	7	7	6	7	1	2	5	6	1	2	1	5	3	5	7	7	7	2	2
173	188	2	7	7	7	3	2	3	3	7	3	1	1	1	2	1	3	4	3	5	5	2
174	189	2	5	6	6	6	7	5	5	6	6	5	6	3	3	3	3	5	7	6	3	5
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Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
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177	193	2	1	7	6	1	7	1	5	5	7	3	5	1	1	1	1	5	7	6	5	1
178	194	2	6	6	6	2	6	4	5	5	6	5	4	3	3	4	5	4	6	6	2	4
179	195	2	3	5	7	5	5	2	5	6	1	2	4	2	3	2	6	7	5	6	3	3
180	196	2	4	6	6	3	6	3	5	5	6	2	2	2	1	1	4	5	6	2	4	2
181	197	2	7	7	7	6	5	3	5	7	7	1	7	1	2	1	5	7	7	3	1	1
182	198	2	7	7	7	6	7	7	5	7	7	6	7	6	7	5	7	7	7	7	6	6
183	199	2	6	7	7	6	7	6	3	7	7	5	5	4	4	2	6	7	7	7	5	7
184	201	2	5	5	5	5	6	5	3	5	2	3	5	3	2	2	6	4	5	3	2	2
185	202	2	2	1	4	6	2	6	4	6	1	1	1	2	2	6	5	1	2	5	1	1
186	203	2	6	6	6	2	6	6	5	5	6	2	5	2	5	2	5	6	6	6	6	7
187	204	2	6	6	6	2	7	5	5	2	7	5	6	1	1	2	2	7	7	4	6	4
188	205	2	4	7	7	2	7	3	4	2	7	2	2	2	2	2	5	7	7	7	1	1
189	206	2	3	3	3	3	3	3	3	2	2	3	3	3	1	3	3	1	1	2	3	3
190	207	2	5	2	4	5	7	3	5	5	6	3	4	3	4	3	4	4	4	6	4	4
191	208	2	7	7	7	2	7	1	7	3	7	1	2	1	2	2	4	7	6	6	7	1
192	209	2	6	6	6	5	5	6	6	6	7	2	1	1	1	5	5	6	6	5	2	2
193	210	2	6	5	5	5	6	3	6	6	3	3	6	2	2	6	4	3	5	6	2	2
194	211	2	3	6	6	5	6	6	2	4	6	2	3	2	2	3	3	6	6	2	2	2
195	212	2	4	5	7	3	7	5	2	3	7	5	7	2	1	5	6	7	7	4	4	2
196	213	2	5	6	7	4	7	7	5	7	7	3	6	3	2	3	4	7	7	2	2	4
197	214	2	7	7	7	6	7	1	6	6	7	2	6	2	2	2	2	7	7	7	4	1
198	215	2	7	7	7	5	7	1	5	6	7	1	1	1	1	1	5	5	7	6	6	3
199	216	2	6	5	5	5	7	2	5	5	7	2	5	2	1	1	3	5	7	5	2	5
200	217	2	5	6	6	3	6	4	5	4	6	3	6	3	5	5	5	6	6	5	4	5
201	218	2	2	6	6	5	7	3	5	5	6	2	2	2	3	2	2	3	4	6	2	2
202	219	2	4	7	7	5	7	4	5	6	7	1	4	1	3	3	3	5	7	4	4	4
203	220	2	4	4	4	4	7	2	2	4	7	1	4	2	2	2	2	2	6	4	4	4
204	221	2	5	6	5	6	5	5	6	6	5	3	3	2	3	2	4	3	6	4	2	2
205	222	2	3	6	5	3	5	3	4	3	6	3	6	3	3	3	4	5	6	6	5	4
206	223	2	7	7	7	1	7	5	6	7	7	2	7	2	2	1	1	7	7	7	4	1
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209	227	2	2	7	7	2	7	1	6	7	7	1	1	1	1	3	1	1	7	7	1	1
210	228	2	4	4	5	3	2	5	5	5	4	1	1	1	5	3	1	6	2	4	2	1
211	229	2	7	7	7	5	7	6	5	6	7	4	6	4	3	6	4	2	7	4	1	1
212	231	2	2	6	6	2	6	2	2	2	6	1	3	1	1	1	3	6	6	6	6	3
213	232	2	5	5	7	5	6	2	5	7	7	2	6	2	1	6	5	5	5	2	2	1
214	233	2	5	1	5	5	5	1	5	5	7	1	7	1	1	2	3	5	7	5	2	6
215	234	2	3	5	5	5	6	2	5	6	6	2	4	2	4	3	5	4	6	5	2	2
216	235	2	2	5	6	2	6	2	1	1	6	2	1	1	1	2	5	6	6	6	2	2
217	238	2	3	5	5	3	5	1	2	5	4	2	5	1	1	1	2	2	5	6	3	2
218	239	2	5	5	5	6	6	5	1	5	5	1	3	1	1	1	5	5	6	6	1	4
219	240	2	6	6	6	3	3	5	3	5	2	2	5	2	3	3	2	5	2	7	4	4
220	241	2	5	5	6	5	7	5	5	4	5	5	6	5	3	5	6	5	5	5	3	5
221	242	2	7	7	6	6	5	3	7	7	3	3	6	5	5	3	5	5	6	5	4	5
222	243	2	2	7	7	5	7	2	2	5	7	2	6	1	1	2	6	7	7	7	1	5
223	244	2	2	6	7	2	2	1	5	5	7	1	2	1	2	1	1	7	7	6	2	1
224	245	2	5	5	6	5	5	2	6	6	5	3	5	2	2	1	4	3	5	5	3	3
225	247	2	6	6	6	3	7	1	2	2	3	1	6	1	1	2	2	3	6	4	4	2
226	248	2	6	6	6	2	6	1	6	6	2	1	6	1	1	1	2	6	2	6	2	2
227	249	2	5	6	6	5	6	1	5	5	5	1	4	2	5	2	4	5	5	7	2	1
228	250	2	5	5	7	6	6	5	5	7	5	5	5	3	3	3	5	6	6	5	3	3
229	251	3	5	6	6	5	6	5	5	6	7	5	6	5	3	5	5	6	6	6	5	6
230	252	3	5	6	6	2	6	6	6	6	6	6	6	3	3	3	5	6	6	6	6	6
231	253	3	3	6	6	2	6	3	3	3	6	5	6	2	2	2	2	6	6	6	2	5
232	254	3	6	7	7	6	6	6	6	6	5	5	5	5	5	1	2	3	5	5	5	5
233	255	3	4	2	3	5	1	5	5	5	1	4	4	5	3	3	5	1	3	3	4	4
234	256	3	5	6	6	3	6	5	5	5	6	5	6	3	5	2	5	6	6	6	5	4
235	257	3	7	7	7	1	7	3	2	3	7	1	6	1	1	1	4	7	7	6	4	1
236	259	3	5	5	5	4	7	3	5	4	6	3	4	2	2	2	5	4	5	4	4	4
237	260	3	6	6	6	6	6	2	6	6	3	2	2	3	3	2	4	6	6	6	2	1
238	261	3	2	6	6	6	6	2	2	2	6	1	6	1	1	1	2	4	7	4	4	2
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Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
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241	264	3	6	4	6	3	6	2	7	6	4	6	6	3	3	1	4	4	6	4	1	1
242	265	3	7	7	7	3	6	3	3	4	7	3	1	5	3	2	6	4	7	7	3	4
243	266	3	6	7	7	5	6	5	5	5	7	5	5	5	5	2	6	6	6	4	3	4
244	267	3	7	5	6	5	7	6	5	7	6	5	4	2	3	3	5	3	7	5	4	4
245	268	3	6	6	6	3	7	6	6	6	7	5	5	5	5	5	5	6	7	6	5	2
246	269	3	5	6	6	2	2	5	5	6	2	1	1	2	2	2	2	6	6	4	1	2
247	270	3	5	7	6	1	7	1	5	5	7	3	6	1	5	5	3	7	7	6	6	6
248	271	3	6	6	5	6	7	2	6	3	6	2	6	3	2	2	2	6	6	4	6	1
249	272	3	6	6	6	2	6	5	5	6	6	3	5	2	2	2	7	3	6	6	3	3
250	273	3	5	7	7	6	6	5	6	6	2	3	7	3	6	2	1	6	6	6	4	4
251	274	3	4	6	6	1	7	2	2	2	5	6	4	6	6	3	6	6	6	7	4	4
252	275	3	4	6	6	4	4	4	5	4	4	3	5	1	3	3	5	4	5	5	2	2
253	276	3	5	7	6	5	6	1	3	3	7	2	2	1	1	1	2	7	7	6	6	6
254	278	3	2	7	7	2	7	2	5	4	3	1	6	1	5	7	1	4	7	5	4	4
255	279	3	3	7	7	5	3	3	5	7	6	5	4	1	5	1	5	4	5	6	1	1
256	280	3	4	6	6	3	6	2	5	6	6	5	5	2	1	2	5	6	5	6	4	2
257	281	3	5	6	5	5	6	2	6	5	7	5	6	2	5	2	2	6	6	4	3	5
258	282	3	6	3	5	3	7	3	4	6	5	1	4	1	1	1	5	5	7	6	5	4
259	283	3	6	7	6	2	6	5	6	6	6	3	5	3	3	3	2	5	6	5	6	3
260	284	3	6	6	6	5	4	2	6	5	4	1	4	2	5	3	5	5	3	5	4	3
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262	286	3	3	6	6	1	5	2	3	3	6	1	2	1	1	1	1	7	5	5	1	2
263	287	3	5	2	6	3	1	1	5	6	1	3	3	4	2	1	5	1	1	1	1	2
264	288	3	3	3	3	4	7	4	1	1	4	1	7	1	1	1	4	1	4	2	2	3
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266	290	3	7	7	7	5	7	5	5	5	7	5	5	5	5	5	3	5	5	5	5	5
267	291	3	4	4	4	1	1	5	6	6	1	5	4	5	1	2	3	1	1	4	4	1
268	292	3	5	5	6	5	7	2	5	6	1	3	5	1	1	1	3	1	6	5	4	2
269	293	3	5	6	4	2	6	2	5	2	1	2	2	2	2	2	6	1	6	6	2	2
270	294	3	3	6	6	5	6	5	5	6	6	5	4	5	2	2	4	5	6	6	4	2
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Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
272	296	3	5	5	5	5	7	5	5	6	1	1	2	1	6	6	1	4	3	6	6	3
273	297	3	6	7	6	4	7	5	6	5	7	2	2	2	4	1	5	7	7	6	2	2
274	298	3	4	6	6	4	5	2	6	5	6	3	4	3	1	2	2	6	6	6	3	4
275	299	3	4	4	3	3	4	4	5	5	5	5	4	4	3	3	4	5	4	3	3	4
276	300	3	4	4	1	1	2	3	5	2	2	2	5	2	2	5	4	4	5	4	4	3
277	301	3	4	6	7	4	7	2	5	5	6	3	5	3	3	2	3	6	7	7	4	4
278	302	3	6	6	6	5	5	7	5	7	7	6	6	6	6	6	4	5	7	7	5	5
279	303	3	2	4	4	4	4	1	5	5	4	2	2	2	3	1	3	3	4	4	1	4
280	304	3	7	7	7	5	7	7	6	7	7	6	5	6	1	5	7	7	7	7	2	4
281	305	3	5	1	3	1	5	1	3	6	6	1	6	1	1	1	1	5	5	3	1	1
282	306	3	1	1	4	6	6	6	3	7	4	6	4	3	5	4	5	3	3	5	5	5
283	307	3	7	7	7	1	7	1	1	2	6	1	4	1	2	1	2	7	7	7	5	1
284	308	3	2	7	7	1	7	1	5	5	6	2	2	2	2	1	2	3	6	6	2	2
285	309	3	5	6	6	3	6	2	5	2	6	2	5	2	3	2	6	6	6	6	2	1
286	310	3	6	6	6	5	7	5	5	5	7	5	3	2	2	1	5	5	5	4	3	2
287	311	3	6	6	6	7	6	7	6	7	7	6	4	6	5	5	1	3	4	5	2	5
288	312	3	7	7	7	5	7	2	5	6	7	2	6	2	2	3	5	7	7	6	2	2
289	313	3	4	4	6	4	6	3	3	6	1	3	4	3	3	2	4	2	2	4	4	4
290	314	3	6	6	6	2	6	6	6	6	6	4	3	5	6	2	2	7	7	7	3	2
291	315	3	6	6	6	3	7	6	5	6	6	6	6	5	3	5	2	6	6	6	5	5
292	316	3	7	6	6	3	5	5	2	3	5	4	4	5	2	2	4	5	5	6	5	4
293	317	3	7	6	6	3	6	5	4	6	6	2	3	3	3	2	4	5	4	6	4	4
294	318	3	6	6	6	2	6	2	4	4	6	2	4	2	3	1	2	5	7	6	2	2
295	319	3	7	6	6	3	7	3	6	7	5	3	4	1	1	5	6	6	7	6	5	1
296	320	3	3	5	5	2	5	3	5	5	6	2	3	2	3	3	5	2	4	5	2	3
297	321	3	1	6	6	2	7	6	1	1	6	2	1	1	1	3	1	6	7	3	2	2
298	322	3	6	6	5	5	7	7	5	7	6	6	6	5	5	3	4	6	7	6	5	4
299	324	3	4	4	4	5	6	1	3	1	6	3	4	2	2	1	4	4	4	4	1	1
300	325	3	7	7	7	2	7	6	4	3	7	6	3	3	2	5	2	3	5	4	4	4
301	326	3	4	6	4	1	6	1	1	5	4	6	4	1	1	2	4	3	2	4	1	2
302	327	3	3	6	6	1	1	1	5	4	7	2	6	1	1	1	3	4	6	6	6	2
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305	330	3	5	6	6	2	5	1	4	4	5	2	5	1	5	5	3	5	6	6	4	6
306	331	3	6	6	6	2	6	6	6	6	6	2	6	2	2	2	6	2	6	2	2	6
307	332	3	7	6	7	1	5	6	5	6	5	5	6	2	3	5	1	7	6	7	1	1
308	333	3	3	6	6	2	6	3	2	6	6	2	6	6	2	6	4	4	6	6	2	2
309	334	3	5	5	4	5	6	6	3	6	6	6	5	5	1	3	4	7	6	7	5	5
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311	336	3	3	7	7	6	6	5	6	6	3	5	6	2	3	2	6	6	5	6	6	4
312	337	3	4	2	4	5	3	5	4	3	1	2	2	6	5	3	4	4	3	2	2	4
313	338	3	4	5	4	2	2	5	5	6	6	6	4	5	5	3	5	3	5	4	4	2
314	339	3	6	5	6	5	6	3	5	6	5	2	5	2	3	1	2	5	5	2	2	2
315	340	3	5	4	4	4	6	2	6	5	5	3	4	3	5	3	3	5	5	5	4	4
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319	344	3	4	5	5	3	6	2	5	5	6	3	6	2	3	1	4	6	6	6	6	3
320	345	3	2	6	6	2	6	5	2	2	6	2	2	2	2	2	4	6	5	6	2	2
321	346	3	3	5	5	2	7	3	6	5	7	3	2	5	3	3	5	2	5	5	3	4
322	347	3	2	7	7	1	7	6	2	7	7	2	3	2	1	1	3	6	6	7	2	3
323	348	3	4	4	6	4	4	6	5	7	4	3	4	3	2	1	1	4	5	4	1	4
324	349	3	6	6	6	5	6	6	5	5	7	3	6	3	5	1	1	6	7	6	1	2
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327	352	3	2	4	6	3	5	5	6	6	3	5	4	5	5	3	6	5	3	5	6	5
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330	355	3	6	5	6	5	6	5	5	6	3	5	6	5	3	5	3	6	6	6	6	3
331	356	3	5	7	5	2	7	1	4	5	5	1	4	3	3	1	2	7	7	2	2	4
332	357	3	6	2	6	4	6	2	2	6	6	2	4	4	6	2	6	6	4	4	4	2
333	358	3	6	6	6	2	6	2	6	6	6	2	2	2	2	2	2	6	6	6	2	6
334	359	3	7	7	7	7	7	7	7	7	7	4	7	5	7	5	7	7	7	7	7	7
335	360	3	3	6	5	3	6	2	3	3	7	2	4	2	1	1	5	6	7	5	3	4

Tot.	n°	Cl.	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
336	361	3	7	7	7	1	7	4	5	6	7	4	4	4	2	5	5	6	7	7	5	1
337	362	3	5	6	6	5	5	5	3	6	6	5	6	5	3	3	3	5	6	6	3	4
338	363	3	3	5	5	1	5	5	5	6	5	2	5	3	3	2	2	5	5	5	3	3
339	364	3	7	7	7	5	6	3	5	2	7	2	3	2	2	2	3	5	6	6	3	6
340	365	3	7	7	7	5	7	6	3	5	7	6	6	5	3	3	3	5	6	7	2	3
341	366	3	4	6	6	3	6	5	3	6	6	3	3	5	2	3	5	5	6	6	5	4
342	367	3	2	7	7	1	6	3	3	7	6	1	3	1	1	2	1	5	6	6	2	2
343	368	3	5	6	6	1	7	7	7	7	7	6	6	6	7	5	5	6	7	7	1	4
344	369	3	4	4	7	7	2	4	3	1	3	4	2	4	2	1	6	7	2	5	2	3
345	370	3	7	7	7	4	6	6	3	4	7	5	7	5	4	3	5	7	7	7	2	3
346	371	3	5	6	6	4	6	6	2	5	6	5	3	3	2	5	4	5	6	4	3	5
347	372	3	3	6	7	2	7	1	5	3	7	1	7	1	1	2	2	7	7	7	6	7
348	373	3	6	6	6	6	6	5	6	7	7	6	6	5	4	5	4	6	7	7	6	5
349	374	3	4	7	1	2	7	7	7	7	7	6	7	5	5	4	7	7	7	7	1	1
350	375	3	4	6	6	2	4	6	6	6	7	6	2	4	4	6	2	7	6	6	1	6
351	376	3	6	6	6	3	7	7	6	7	6	6	6	5	3	3	6	6	6	6	6	3
352	377	3	6	7	7	3	7	5	3	6	6	5	6	5	5	5	5	6	7	7	6	3
353	378	3	4	6	6	3	6	3	4	4	5	2	4	2	2	2	3	3	6	4	4	2
354	379	3	5	6	6	3	5	5	3	6	6	3	4	1	5	2	5	5	2	2	4	4
355	380	3	6	5	6	6	5	6	6	6	6	6	6	5	5	5	6	6	6	4	5	5
356	381	3	6	6	6	6	6	6	6	6	7	6	6	6	5	5	6	7	7	7	6	6
357	382	3	6	3	7	3	3	5	2	5	6	3	2	5	2	3	6	6	6	6	5	3
358	383	3	2	6	6	1	6	5	2	6	6	1	6	1	5	2	6	6	6	4	4	2
359	384	3	5	6	5	2	5	6	6	6	5	6	6	5	5	1	6	5	4	5	5	6
360	385	3	6	6	6	5	7	5	2	4	7	5	6	5	5	4	4	7	7	6	4	4
361	386	3	3	4	2	7	7	6	7	7	7	4	3	4	2	1	3	1	3	3	3	5
362	387	3	1	6	7	6	6	6	5	6	7	5	3	5	5	2	4	6	6	6	1	1

Tot.	n°	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
1	1	1	4	4	3	4	6	4	4	3	4	5	4	5			2	27
2	2	1	6	6	6	6	6	6	6	6	6	6	6	6			1	36

Tot.	n°	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
3	3	1	4	5	3	3	3	3	4	5	3	3	2	5			2	39
4	4	1	6	5	4	5	5	4	5	5	7	6	6	6			1	57
5	5	1	1	1	1	4	1	1	1	6	1	1	5	1			1	42
6	6	1	6	7	5	6	6	6	6	6	6	6	6	6			2	37
7	7	1	6	5	6	6	6	5	6	6	6	6	4	6			1	64
8	9	1	6	4	4	5	5	4	5	7	5	5	6	5			2	36
9	10	1	6	5	6	6	6	6	6	6	6	6	6	6			2	48
10	11	1	2	3	4	4	5	4	6	6	4	4	2	4			1	44
11	12	1	3	2	5	2	6	6	6	7	5	4	7	7			2	69
12	13	1	7	7	7	5	4	5	5	5	5	5	5	5			2	40
13	14	1	6	6	5	6	6	5	6	6	6	5	5	6			1	36
14	15	1	4	4	5	6	5	5	4	5	5	4	2	5			1	32
15	16	1	6	6	3	4	4	4	4	3	5	4	4	4			1	25
16	17	1	2	2	3	6	6	3	5	6	4	4	2	6			2	61
17	18	1	2	3	4	4	3	5	3	4	3	4	6	5			2	48
18	19	1	4	2	2	5	6	3	6	5	4	4	1	2			2	36
19	20	1	4	2	1	4	7	5	6	6	6	6	6	6			1	32
20	21	1	3	4	3	4	1	3	5	4	3	4	2	4			1	30
21	22	1	3	4	2	7	5	4	7	7	7	5	6	7			2	43
22	23	1	4	4	5	4	4	4	4	4	4	4	2	4			1	42
23	24	1	5	5	5	5	6	3	3	5	5	7	3	7			2	46
24	25	1	1	2	2	3	5	4	2	5	4	4	4	4			1	63
25	26	1	6	6	7	7	6	7	7	6	5	5	5	5			2	47
26	27	1	4	5	5	5	5	4	6	5	5	4	3	5			2	42
27	28	1	5	4	5	5	6	4	5	5	4	4	6	5			2	48
28	29	1	3	5	4	6	2	4	6	5	4	5	4	5			2	42
29	30	1	7	7	6	6	7	6	7	7	7	7	1	6			2	45
30	31	1	4	4	5	5	5	4	4	6	4	4	4	6			2	50
31	32	1	6	6	6	6	6	6	6	6	6	6	6	6			2	37
32	33	1	5	3	3	6	6	5	7	7	6	6	5	6			1	37
33	34	1	4	4	4	4	4	4	5	6	5	4	3	3			2	41
34	35	1	1	2	2	5	5	4	5	2	5	4	1	5			1	36

Tot.	n°	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
35	36	1	3	3	4	5	4	5	5	6	5	2	3	5			1	51
36	37	1	5	5	5	5	5	4	5	5	5	5	5	5			1	37
37	38	1	1	4	1	4	1	1	5	7	3	4	1	4			2	42
38	39	1	5	5	5	4	5	4	5	5	6	5	7	5			1	40
39	40	1	6	5	5	6	5	5	6	2	6	5	4	5			2	36
40	41	1	5	5	1	1	2	1	2	2	2	2	2	2			2	37
41	42	1	5	6	6	6	7	7	7	7	7	6	6	6			1	35
42	43	1	7	7	7	6	7	7	7	7	7	7	7	7			2	29
43	44	1	4	3	4	4	4	4	5	5	4	4	4	3			1	33
44	45	1	3	3	3	3	3	3	4	5	5	4	3	4			2	56
45	50	1	4	4	4	6	7	4	6	6	4	4	7	6			2	36
46	51	1	3	5	4	6	4	4	3	3	5	4	6	6			2	22
47	52	1	5	5	5	6	6	4	6	6	4	4	3	6			2	40
48	53	1	5	4	5	5	5	5	6	6	4	4	5	6			2	56
49	54	1	6	5	5	5	5	4	5	6	5	5	3	6			2	38
50	55	1	1	4	4	3	1	5	5	3	4	4	1	1			2	27
51	56	1	5	3	5	5	5	3	5	6	3	4	4	6			1	40
52	57	1	5	5	6	7	5	4	6	7	5	5	7	7			1	61
53	58	1	5	5	4	5	6	4	6	5	4	4	2	4			1	41
54	59	1	6	1	6	6	6	6	6	6	6	6	2	6			2	32
55	60	1	2	1	5	5	3	3	6	6	4	4	5	5			2	40
56	61	1	7	4	4	5	7	4	7	7	7	7	2	6			1	38
57	62	1	4	3	5	4	5	4	5	5	5	6	5	5			1	58
58	63	1	4	3	5	5	5	4	5	5	4	4	5	5			1	62
59	64	1	6	3	5	6	7	5	5	6	5	5	5	5			1	29
60	65	1	5	6	4	5	4	5	5	5	3	5	5	4			2	50
61	66	1	6	5	6	5	6	5	5	5	5	5	5	5			2	28
62	67	1	4	3	4	4	4	3	3	4	4	4	4	3			1	19
63	68	1	4	4	4	4	4	4	4	4	4	4	4	4			2	19
64	69	1	5	4	5	5	5	4	6	5	4	4	4	5			1	29
65	70	1	5	6	6	6	6	6	5	6	6	6	6	6			2	20
66	71	1	4	4	3	4	4	4	4	4	5	4	4	7			1	18



Tot.	n°	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
67	72	1	2	4	4	5	2	4	2	3	3	4	2	5			1	19
68	73	1	6	2	1	4	6	1	2	3	1	1	1	1			1	22
69	74	1	2	5	4	6	5	4	6	5	4	4	2	6			1	20
70	75	1	4	5	2	2	4	3	4	5	5	5	5	6			2	21
71	76	1	5	6	6	6	6	6	6	6	6	5	6	6			2	35
72	77	1	5	6	1	6	1	6	2	6	2	6	1	2			1	20
73	78	1	6	6	2	6	6	2	2	5	2	6	5	1			2	24
74	79	1	6	6	6	5	6	5	3	6	6	1	2	1			2	25
75	80	1	6	2	7	6	6	6	2	2	2	2	2	6			1	28
76	81	1	2	6	2	2	1	1	5	5	6	6	7	6			1	30
77	82	1	1	6	2	1	1	6	7	5	1	6	1	6			2	32
78	84	1	6	6	2	6	3	6	2	2	2	5	2	6			1	29
79	85	1	5	6	5	6	6	6	5	6	2	1	2	3			1	35
80	86	1	5	6	6	3	5	6	2	5	6	6	2	6			1	34
81	88	1	6	6	6	6	6	5	5	2	5	2	6	6			2	26
82	90	1	6	6	2	6	6	1	6	6	6	2	6	6			1	21
83	91	1	2	6	6	2	6	6	6	2	6	6	6	5			1	24
84	92	1	6	2	6	6	2	2	2	2	6	6	6	2			2	24
85	93	1	2	6	2	6	6	2	6	2	6	5	3	2			2	20
86	94	1	2	2	6	5	2	6	2	3	2	6	3	6			2	23
87	95	1	2	3	1	5	2	2	6	5	6	2	2	6			2	22
88	96	1	2	3	6	3	6	2	6	2	6	6	2	5			2	26
89	98	1	6	5	2	6	2	3	6	5	6	2	2	2			2	28
90	99	1	5	6	6	6	6	3	2	1	2	2	2	2			2	29
91	100	1	6	2	2	6	6	6	6	6	5	6	5	2			1	24
92	101	1	2	3	6	6	6	5	6	6	1	2	2	5			2	29
93	103	1	3	1	6	1	1	6	6	2	1	2	1	5			2	30
94	104	1	3	2	5	2	6	2	6	2	2	2	2	6			1	23
95	105	1	6	6	2	2	2	1	2	6	2	2	6	6			2	29
96	107	1	3	6	6	2	5	6	5	3	6	2	2	3			2	22
97	108	1	2	2	6	5	5	3	3	6	6	4	4	5			1	25
98	109	1	1	2	3	2	1	2	2	1	3	1	2	2			2	29

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
99	110	1	6	2	5	5	6	6	2	2	2	3	5	2			1	29
100	111	1	1	6	3	5	5	6	6	5	2	2	5	6			2	49
101	112	1	3	2	1	1	3	3	3	2	2	1	1	5			2	45
102	113	1	3	2	1	2	2	3	3	2	2	3	1	2			1	23
103	114	1	6	6	1	1	3	5	5	2	6	2	2	2			1	26
104	115	1	1	2	2	1	3	3	6	6	6	5	6	6			2	19
105	116	1	1	2	1	1	2	1	1	2	2	1	6	6			2	34
106	117	1	2	6	2	1	2	1	3	2	2	1	6	2			2	43
107	118	1	2	6	5	1	6	2	1	6	2	6	2	6			1	39
108	119	1	2	5	3	1	6	2	6	2	2	1	6	6			1	18
109	120	1	2	3	5	6	3	6	2	2	5	3	6	5			2	25
110	121	1	6	2	2	2	6	6	6	6	6	6	6	2			1	27
111	122	1	2	1	6	2	6	1	2	6	1	6	2	6			1	21
112	123	1	5	2	2	6	5	2	2	6	2	6	2	6			2	38
113	124	1	1	6	1	2	3	6	6	2	6	1	6	1			1	29
114	125	1	2	1	6	2	6	5	2	6	6	2	6	6			1	29
115	126	1	6	2	2	6	2	6	6	2	6	2	2	6			2	27
116	127	2	4	6	7	1	4	1	3	5	5	5	4	1	Não		1	
117	128	2	2	1	1	4	4	1	2	2	4	4	3	4	Sim	Florianópolis	1	26
118	129	2	2	2	1	1	1	1	1	1	1	1	1	1	Não		2	40
119	130	2	2	2	2	6	6	2	5	6	5	6	1	6	Sim	Litoral	1	49
120	131	2	1	1	1	6	6	1	1	2	6	6	1	1	Não		2	37
121	132	2	4	3	3	5	3	2	2	1	3	2	5	3	Sim	Cidreira	2	40
122	133	2	5	5	5	4	3	3	3	4	5	5	6	5	Sim	Balneário Camboriú	2	66
123	134	2	2	2	2	7	2	2	2	2	2	2	5	7	Sim	Dois Irmãos	2	59
124	135	2	2	4	2	5	7	2	7	7	6	6	6	7	Sim	Outro estado	2	45
125	136	2	2	2	1	5	4	1	2	2	1	2	1	6	Sim	Ivoti	1	35
126	137	2	1	1	1	4	1	1	5	2	3	1	5	5	Sim	Estância Velha	1	36
127	138	2	2	2	2	2	3	2	2	2	3	3	2	3	Não		2	63
128	139	2	2	2	1	1	2	1	2	2	2	2	1	2	Sim		1	44
129	140	2	6	6	2	4	2	2	6	4	2	2	2	6	Não		2	58
130	141	2	2	2	2	3	1	5	1	2	2	2	5	5	Sim	Chopininho	1	54

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
131	142	2	2	1	1	7	5	1	5	6	5	3	7	6	Não		2	63
132	144	2	1	1	1	1	2	1	6	3	2	4	5	5	Sim	Exterior	1	32
133	145	2	2	2	1	1	1	1	1	2	2	2	5	2	Sim	Lyon	1	31
134	146	2	7	7	2	3	3	2	2	4	2	6	2	7	Sim	Florianópolis	1	23
135	147	2	1	1	1	1	1	1	1	1	1	1	1	1	Não		2	28
136	148	2	1	1	1	3	1	1	1	1	1	1	3	7	Sim		2	30
137	149	2	1	1	1	4	4	1	4	5	4	5	2	4	Não		1	38
138	150	2	6	6	6	6	6	6	6	6	6	6	6	6	Não		2	44
139	151	2	2	2	2	2	2	2	2	2	2	2	1	2	Não		2	46
140	152	2	3	3	5	5	7	6	6	4	6	4	7	5	Não		1	48
141	153	2	2	2	2	2	1	1	1	2	2	2	7	2	Não		1	67
142	154	2	2	1	1	4	2	1	3	3	2	2	4	5	Não		1	37
143	155	2	2	2	6	6	5	2	6	2	5	5	1	2	Sim	Osório	2	33
144	156	2	2	2	2	5	5	2	2	2	2	5	2	5	Não		1	60
145	157	2	3	3	5	6	6	5	6	5	5	5	6	6	Sim	Gravataí	2	67
146	159	2	3	3	5	5	6	5	5	5	6	3	2	3	Sim		2	65
147	160	2	4	5	5	4	6	4	7	3	3	3	1	5	Sim	Torres	2	69
148	161	2	1	2	1	2	2	1	1	1	2	2	1	2	Sim	Rio de Janeiro	1	41
149	162	2	7	1	1	6	6	2	6	2	5	6	4	6	Não		2	53
150	163	2	2	2	2	2	5	2	2	2	2	2	2	2	Não		1	46
151	164	2	2	5	5	5	5	3	4	3	3	3	7	3	Sim		2	64
152	165	2	2	2	1	6	5	1	5	5	4	4	1	4	Não		1	53
153	166	2	2	3	3	3	2	3	3	3	3	3	6	5	Sim	Florianópolis	2	73
154	167	2	2	2	2	6	3	2	5	2	2	3	3	6	Não		2	73
155	168	2	2	2	3	5	5	2	5	3	6	6	1	5	Não		2	70
156	169	2	6	6	6	3	6	6	6	6	6	6	6	5	Sim	Garopaba	2	50
157	170	2	2	3	1	1	1	1	1	1	1	1	7	6	Sim	Não sabe	1	44
158	171	2	1	1	1	4	2	1	2	3	1	1	2	6	Não		2	67
159	172	2	2	2	2	2	2	2	2	2	2	2	6	6	Sim	Não sabe	2	50
160	173	2	3	3	2	6	5	2	3	5	5	5	2	5	Sim	Santo Ângelo	2	43
161	174	2	3	2	1	1	1	1	1	1	1	1	7	7	Não		2	48
162	175	2	6	6	1	1	4	2	2	2	2	2	2	2	Sim	Cachoeira do Bom Jesus	1	64

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
163	176	2	4	4	1	1	1	1	1	1	1	1	7	6	Não		1	57
164	177	2	2	2	1	2	1	1	1	1	1	1	6	2	Sim	Cuba	1	61
165	178	2	5	5	3	3	5	3	3	3	3	3	6	5	Sim		1	44
166	179	2	2	2	1	1	3	2	5	2	2	1	2	3	Sim	Xangri-lá	2	50
167	180	2	1	1	1	1	1	2	2	2	1	2	5	3	Sim	Curitiba	1	44
168	182	2	1	2	1	2	3	1	1	3	1	3	3	1	Sim	Curitiba	2	39
169	184	2	2	1	1	6	5	1	1	1	1	5	2	6	Não		1	70
170	185	2	1	1	1	1	1	1	1	1	1	2	5	1	Sim	Lisboa	1	43
171	186	2	2	2	2	5	5	2	5	3	5	3	5	6	Sim		1	54
172	187	2	1	1	1	1	1	1	1	1	1	2	5	7	Sim	Estado de Santa Catarina	2	73
173	188	2	2	1	1	6	6	2	7	2	2	2	6	5	Não		1	37
174	189	2	2	2	3	2	3	5	5	5	5	5	5	6	Não		2	75
175	191	2	1	1	1	1	4	2	2	1	2	2	2	2	Não		2	73
176	192	2	5	5	5	4	3	3	3	5	2	3	6	5	Não		1	23
177	193	2	1	2	2	1	1	3	1	1	1	2	7	3	Não		1	59
178	194	2	6	6	2	2	2	2	2	4	4	4	2	6	Não		1	20
179	195	2	6	5	5	6	6	3	5	6	6	6	6	5	Não		1	78
180	196	2	1	1	2	2	2	1	3	2	3	2	1	6	Sim	Florianópolis	2	60
181	197	2	1	1	1	5	2	1	4	4	4	5	2	7	Não		1	19
182	198	2	6	5	5	6	6	5	7	6	7	6	7	6	Não		1	27
183	199	2	5	5	4	6	5	5	4	5	4	5	6	7	Não	Litoral	2	43
184	201	2	4	2	2	3	3	3	3	2	2	6	2	2	Não		1	37
185	202	2	1	1	1	3	1	3	2	2	2	2	7	1	Sim	Balneário Camboriú	2	55
186	203	2	5	2	2	6	6	5	6	6	5	6	6	6	Sim	Nova Petrópolis	1	54
187	204	2	2	5	2	5	2	2	5	2	5	6	4	6	Sim	Não sabe	2	41
188	205	2	1	1	1	2	1	1	1	1	1	1	4	1	Sim	Não sabe	1	39
189	206	2	3	3	3	1	1	4	2	1	2	2	2	3	Não		2	49
190	207	2	6	5	5	6	2	2	3	4	4	4	4	4	Sim	Florianópolis	1	51
191	208	2	1	1	1	6	1	1	1	1	1	1	4	1	Não		2	35
192	209	2	2	1	2	1	2	1	3	3	2	4	2	5	Sim	Florianópolis	2	41
193	210	2	2	2	2	2	5	2	2	2	4	3	6	5	Não		1	58
194	211	2	2	2	2	2	5	2	1	1	1	4	4	5	Não		1	27

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
195	212	2	3	4	6	5	4	3	3	4	5	6	7	7	Sim	Não sabe	1	31
196	213	2	4	4	4	6	7	4	7	5	6	6	1	6	Não		1	30
197	214	2	1	1	1	1	1	1	1	1	1	1	1	7	Sim	Florianópolis	1	44
198	215	2	1	2	2	1	1	2	2	2	1	2	2	6	Não		1	40
199	216	2	5	5	5	5	5	3	5	2	5	5	2	6	Não		2	59
200	217	2	3	3	3	4	5	2	5	5	5	6	6	6	Sim	Cachoeirinha	2	66
201	218	2	1	1	1	2	3	1	2	2	2	2	4	5	Não		1	52
202	219	2	3	3	3	3	4	4	3	3	4	4	1	3	Sim		2	38
203	220	2	2	2	2	2	4	2	4	4	2	2	6	2	Sim	Bento Gonçalves	2	48
204	221	2	2	2	2	3	2	2	2	2	2	2	5	2	Não		1	47
205	222	2	3	2	2	6	5	2	2	3	3	2	2	3	Sim	Porto Alegre	2	54
206	223	2	1	1	2	2	1	1	1	1	1	1	1	6	Sim	Nova Petrópolis	2	47
207	225	2	6	4	2	7	7	4	3	3	3	5	4	7	Sim	Não sabe	2	47
208	226	2	1	1	1	2	2	1	3	1	4	1	7	2	Não		1	61
209	227	2	1	1	1	2	2	1	1	1	1	1	2	1	Não		1	68
210	228	2	2	3	2	1	4	1	3	2	3	3	6	2	Não			40
211	229	2	2	1	1	4	2	1	5	2	3	2	1	5	Não		2	37
212	231	2	3	3	3	6	6	5	5	2	3	3	5	2	Sim	Capão da Canoa	1	77
213	232	2	4	2	1	6	5	3	6	3	5	4	1	5	Sim	Florianópolis	1	61
214	233	2	1	1	1	3	1	1	2	2	5	5	7	2	Não		2	70
215	234	2	2	2	1	1	2	2	1	2	2	2	4	2	Sim	Florianópolis	2	46
216	235	2	6	2	2	2	2	2	2	4	4	4	2	4	Sim	Capão da Canoa	1	67
217	238	2	1	2	1	1	1	1	2	2	2	2	5	5	Sim	Nova Petrópolis	1	67
218	239	2	1	1	1	1	1	1	5	5	1	1	1	2	Não		1	55
219	240	2	2	3	2	7	5	2	1	7	5	5	1	4	Sim		1	39
220	241	2	6	5	3	5	6	3	5	5	5	4	4	5	Não		2	76
221	242	2	2	2	1	5	5	2	3	3	3	5	6	5	Não		1	49
222	243	2	3	3	2	1	2	1	1	1	1	1	6	2	Não		2	52
223	244	2	1	1	5	7	6	5	7	7	1	2	7	1	Sim		1	60
224	245	2	4	3	3	6	6	3	6	5	5	6	4	6	Não		1	80
225	247	2	2	2	2	1	1	2	2	6	5	7	7	6	Não		2	58
226	248	2	6	1	2	1	2	1	6	2	2	6	2	6	Sim	Florianópolis	1	68

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
227	249	2	1	1	1	5	4	1	3	5	5	5	4	5	Sim	Florianópolis	2	34
228	250	2	5	5	5	5	6	5	5	3	3	3	7	5	Não		1	73
229	251	3	4	4	5	5	5	6	5	5	5	6	7	6	Não		1	54
230	252	3	5	6	2	6	3	3	6	6	6	6	6	6	Não		2	59
231	253	3	5	6	5	3	2	2	2	2	2	2	2	2	Não		2	66
232	254	3	4	5	5	6	5	5	6	6	6	6	2	4	Não		2	74
233	255	3	1	2	3	3	5	3	4	4	5	4	6	4	Não		2	52
234	256	3	5	5	3	5	5	3	5	3	5	5	7	5	Não		2	64
235	257	3	2	2	2	1	2	2	2	1	3	5	6	7	Sim		2	64
236	259	3	5	4	4	5	4	4	4	5	5	5	6	6	Não		1	51
237	260	3	2	2	2	2	2	2	2	4	2	2	3	2	Sim	Florianópolis	2	69
238	261	3	4	2	4	7	7	2	7	2	5	5	3	4	Não		2	72
239	262	3	2	2	2	2	2	2	2	2	2	2	2	2	Não		1	59
240	263	3	1	3	4	4	5	4	4	4	4	4	7	7	Sim	Litoral	1	28
241	264	3	1	1	1	6	6	1	6	6	4	6	7	6	Não		2	44
242	265	3	6	5	4	7	7	2	3	5	3	2	5	3	Sim		2	50
243	266	3	2	4	3	4	2	2	2	2	5	5	5	6	Sim	Ibiacá	1	65
244	267	3	4	4	2	2	4	1	4	4	3	5	3	4	Sim	Não sabe	2	40
245	268	3	2	2	3	5	5	4	6	5	4	4	6	5	Sim	Litoral	1	46
246	269	3	1	1	1	1	1	2	2	2	2	2	1	4	Não		2	44
247	270	3	5	5	1	2	3	1	6	5	2	5	6	2	Sim		1	58
248	271	3	4	4	2	5	6	2	6	6	6	6	2	6	Não		1	47
249	272	3	3	2	2	2	2	2	2	2	2	2	5	3	Não		2	31
250	273	3	2	2	2	7	4	3	2	3	3	5	3	6	Sim	Torres	2	67
251	274	3	1	6	4	4	2	4	2	2	2	2	1	4	Não		2	52
252	275	3	3	3	3	3	2	2	2	2	2	3	6	3	Sim	Estado de Santa Catarina	2	63
253	276	3	6	2	2	2	2	2	6	2	2	6	6	2	Não	Caxias do Sul	1	45
254	278	3	1	2	1	1	1	1	1	1	1	1	2	2	Sim	Lisboa	2	62
255	279	3	1	1	1	1	1	1	1	3	1	3	5	5	Não		1	71
256	280	3	2	2	1	6	6	3	4	4	6	6	1	6	Sim	Florianópolis	2	38
257	281	3	6	2	3	3	5	5	5	3	5	5	7	5	Sim	Florianópolis	2	57
258	282	3	6	2	5	5	2	2	6	5	5	6	6	4	Sim	Povegliano	2	63

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
259	283	3	3	5	3	5	5	5	3	3	3	5	1	2	Não		2	47
260	284	3	5	5	3	3	3	2	2	3	3	3	2	1	Sim	Interior São Francisco de Paula	1	75
261	285	3	5	5	3	5	6	4	2	3	3	5	6	6	Sim	Miami	2	69
262	286	3	1	2	2	1	1	2	2	2	1	1	6	6	Não		2	68
263	287	3	1	1	2	3	2	2	1	6	3	6	1	6	Sim	Garibaldi	2	49
264	288	3	4	4	1	1	1	1	1	1	1	1	1	1	Não	Estados Unidos,	2	44
265	289	3	6	2	2	5	4	2	2	2	3	2	4	2	Sim	Camboriú	2	50
266	290	3	5	5	5	5	5	5	5	5	5	5	7	5	Sim		1	31
267	291	3	1	1	1	4	4	1	1	3	3	4	1	4	Sim			56
268	292	3	3	3	5	1	3	3	3	1	3	5	1	5	Não		2	45
269	293	3	2	2	2	2	2	2	2	2	2	2	5	2	Não		2	46
270	294	3	2	2	2	4	4	2	2	5	4	4	2	4	Sim	Chapecó	2	57
271	295	3	2	1	1	1	2	2	2	1	2	2	2	2	Não		2	44
272	296	3	2	3	1	1	2	1	2	4	4	5	7	5	Sim	Flores da Cunha	2	52
273	297	3	2	3	3	4	5	2	2	6	6	6	7	6	Não		2	66
274	298	3	4	3	4	2	5	5	2	4	3	3	7	6	Não		2	62
275	299	3	3	3	3	3	3	3	3	4	3	4	6	3	Sim		2	65
276	300	3	1	5	5	3	1	1	1	3	5	2	6	4	Sim		2	36
277	301	3	5	5	3	5	5	4	3	5	4	4	7	5	Sim	Litoral	2	49
278	302	3	5	5	5	4	5	4	5	6	5	5	5	4	Sim	Bento Gonçalves	1	33
279	303	3	4	4	4	2	2	2	4	2	3	2	6	2	Não		2	53
280	304	3	2	2	1	2	2	1	2	2	2	4	6	2	Não		1	28
281	305	3	1	1	1	1	1	1	1	1	1	1	1	1	Sim	Miami	2	47
282	306	3	4	4	3	3	2	1	1	1	1	4	4	3	Sim		2	46
283	307	3	1	1	1	7	6	1	5	1	3	1	7	7	Sim	Florianópolis	2	41
284	308	3	1	2	2	2	2	1	1	1	1	2	2	2	Sim		2	55
285	309	3	3	2	2	6	6	2	6	2	2	6	6	2	Sim	Curitiba	2	57
286	310	3	2	2	3	5	5	3	4	4	2	2	4	4	Sim	João Pessoa	2	63
287	311	3	3	2	1	6	4	2	4	2	2	4	6	7	Não		2	57
288	312	3	2	3	2	2	3	2	2	2	2	3	6	3	Sim	Porto Alegre		78
289	313	3	4	4	4	4	4	4	4	2	2	4	1	4	Não		2	45

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
290	314	3	2	2	2	2	2	2	4	4	3	3	1	2	Não		2	46
291	315	3	5	5	5	5	5	5	5	5	5	5	6	6	Não		1	42
292	316	3	4	4	3	2	2	2	2	2	2	2	2	3	Sim	Florianópolis	2	48
293	317	3	4	4	4	2	2	3	6	4	3	4	4	4	Não		1	61
294	318	3	2	2	1	4	2	1	2	2	2	2	5	2	Sim		2	57
295	319	3	1	1	1	7	7	1	7	7	7	7	7	7	Não		2	31
296	320	3	3	4	3	2	2	2	2	2	2	2	4	3	Não		2	61
297	321	3	5	3	2	3	3	1	3	2	1	5	2	2	Sim	São Francisco de Paula	2	73
298	322	3	5	5	4	3	6	5	6	6	6	6	6	6	Sim	Não sabe	2	39
299	324	3	1	1	1	1	1	1	1	1	1	1	1	1	Sim	Camboriú	1	58
300	325	3	4	3	4	2	4	2	2	4	2	3	7	3	Sim	Estado de Santa Catarina	2	50
301	326	3	4	5	2	4	1	2	1	1	1	4	1	1	Sim	Não sabe	1	47
302	327	3	2	2	2	2	2	2	2	2	3	2	4	6	Não		2	67
303	328	3	1	2	1	2	1	1	2	2	2	2	6	2	Sim		2	50
304	329	3	2	2	2	5	5	2	2	2	2	2	1	4	Sim	Florianópolis	2	48
305	330	3	5	6	2	6	4	2	6	5	6	7	5	6	Não		1	68
306	331	3	6	2	2	6	6	6	2	6	6	6	6	6	Não		1	52
307	332	3	1	1	1	4	4	1	1	1	1	1	5	1	Sim	Ivoti	2	38
308	333	3	4	4	4	4	3	4	4	4	4	4	5	6	Não		1	60
309	334	3	5	5	5	4	6	5	3	5	5	3	2	5	Não		1	55
310	335	3	5	5	3	4	4	4	3	3	3	4	6	3	Sim	Caxias do Sul, Porto Alegre	2	24
311	336	3	5	5	5	6	6	2	2	2	3	6	6	6	Não		1	67
312	337	3	4	4	4	4	4	3	3	5	4	4	1	6	Não		2	46
313	338	3	2	2	2	1	2	1	1	1	1	4	2	5	Sim		2	67
314	339	3	2	2	2	5	3	2	2	5	5	5	5	5	Sim	Garibaldi	2	48
315	340	3	5	5	5	4	3	4	3	3	3	3	5	5	Não		2	64
316	341	3	2	1	2	7	5	2	2	2	2	5	1	3	Não		2	33
317	342	3	2	2	2	6	5	2	2	2	2	3	1	5	Sim	Florianópolis	2	28
318	343	3	1	2	2	2	2	2	2	2	2	5	2	1	Sim	Bento Gonçalves	1	41
319	344	3	5	5	5	5	5	4	6	6	5	5	6	6	Sim	Capão da Canoa	1	58
320	345	3	5	2	2	2	2	2	2	2	2	2	3	2	Não		2	45
321	346	3	3	2	1	1	1	1	1	1	1	1	1	4	Não		2	46



Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
322	347	3	1	1	1	1	1	1	2	3	2	2	5	7	Não		2	41
323	348	3	5	2	1	3	5	3	4	4	5	4	5	5	Sim		2	46
324	349	3	2	2	3	1	1	1	1	5	5	3	6	1	Não		2	61
325	350	3	2	2	2	2	2	2	2	2	2	2	2	2	Não		2	71
326	351	3	6	2	1	1	3	1	2	3	2	3	7	6	Não		2	37
327	352	3	5	5	5	6	4	6	5	5	4	6	6	6	Não		1	53
328	353	3	2	2	2	6	7	3	3	3	3	3	7	3	Não		1	36
329	354	3	5	3	3	5	5	3	3	4	5	5	6	5	Não		2	59
330	355	3	5	5	5	6	5	5	5	6	6	6	7	6	Não		2	51
331	356	3	1	1	1	3	1	1	1	4	1	4	2	2	Sim	Florianópolis	1	52
332	357	3	4	6	2	4	4	6	5	5	2	2	6	6	Não		2	27
333	358	3	6	6	2	6	6	2	6	6	6	6	2	2	Sim		1	22
334	359	3	7	7	7	7	7	7	7	7	7	7	4	7	Não		1	20
335	360	3	4	3	2	2	2	2	5	4	4	4	2	5	Não		1	19
336	361	3	1	1	1	3	2	1	5	3	3	3	5	1	Sim		1	19
337	362	3	5	5	3	5	5	3	3	3	3	3	2	3	Não		1	40
338	363	3	1	1	2	2	2	2	2	4	4	4	1	4	Sim	Caxias do Sul	1	32
339	364	3	6	6	6	3	5	6	5	5	5	5	1	6	Não		1	28
340	365	3	3	3	1	1	1	3	3	1	2	3	6	5	Sim	Garibaldi	1	66
341	366	3	6	5	3	2	3	3	4	4	4	5	1	6	Não		1	50
342	367	3	1	1	1	2	2	2	6	6	5	5	5	6	Não		1	33
343	368	3	6	6	4	5	6	1	1	5	4	5	2	6	Sim	Curitiba	1	32
344	369	3	6	2	1	2	1	3	3	5	2	4	2	6	Sim		1	32
345	370	3	4	7	4	7	7	7	7	4	4	4	1	4	Não		1	26
346	371	3	6	5	2	2	2	2	2	2	2	3	4	2	Sim	Porto Alegre	1	26
347	372	3	7	2	2	2	5	1	2	5	5	5	6	7	Não		1	76
348	373	3	6	2	5	5	3	5	5	6	5	3	6	6	Não		2	45
349	374	3	4	2	4	1	7	1	7	7	7	5	5	5	Sim	Flores da Cunha	2	29
350	375	3	4	1	1	4	4	4	1	3	4	2	7	7	Não		2	44
351	376	3	3	3	5	3	4	4	5	4	4	5	6	5	Não		2	35
352	377	3	2	2	2	6	6	4	4	4	4	4	6	6	Sim	Carlos Barbosa	1	65
353	378	3	3	2	2	5	3	2	3	3	4	4	5	4	Não		1	19

Tot.	nº	Cl.	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56
354	379	3	3	3	3	5	5	5	4	5	4	5	5	5	Não		1	77
355	380	3	5	5	6	6	6	6	6	6	6	7	7	5	Não		1	62
356	381	3	2	2	2	5	6	2	6	6	6	6	6	7	Sim	Carlos Barbosa	1	62
357	382	3	6	6	2	5	3	1	2	5	2	2	7	6	Não		2	59
358	383	3	2	2	1	1	2	1	2	2	2	4	1	6	Não		1	45
359	384	3	2	3	3	4	5	5	5	4	5	5	6	6	Sim	Florianópolis	1	33
360	385	3	4	4	5	5	5	4	2	2	4	4	5	5	Não		1	55
361	386	3	6	5	4	1	6	4	1	5	5	1	2	6	Sim	Caxias do Sul	1	20
362	387	3	1	1	1	1	1	1	1	1	1	1	7	2	Sim	Para outro país	1	51

Tot.	nº	Cl.	Q57	Q58	Q59	Q60
1	1	1	Indian	Master's degree	5	Barking and Dagenham
2	2	1	Sri Lankan	Master's degree	1	Barnet
3	3	1	German	Higher education	1	Barnet
4	4	1	Spain	Higher education	17	Bexley
5	5	1	brazilian	Doctorate	9	Brent
6	6	1	Brasileiro	Higher education	7	Brent
7	7	1	Brazilian	Incomplete higher education	30	Brent
8	9	1	British	Master's degree	14	Bromley
9	10	1	Brazilian	Master's degree	2	Camden
10	11	1	British	Master's degree	18	Camden
11	12	1	UK	Master's degree	69	City of London
12	13	1	Chinese	Doctorate	20	City of London
13	14	1	Italian	Higher education	7	City of Westminster
14	15	1	Brazilian	Master's degree	5	Croydon
15	16	1	Brazilian	Higher education	4	Croydon
16	17	1	Mexico	Master's degree	3	Ealing
17	18	1	Italy	Higher education	10	Ealing
18	19	1	British and Italian	Master's degree	9	Ealing
19	20	1	british	Higher education	30	Ealing
20	21	1	British	Higher education	30	Ealing

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
21	22	1	UK	Higher education	13	Hackney
22	23	1	Brazilian	Master's degree	3	Hackney
23	24	1	Brazilian	Master's degree	1	Hammersmith and Fulham
24	25	1	British	Higher education	35	Hammersmith and Fulham
25	26	1	Brazilian	Master's degree	2	Hammersmith and Fulham
26	27	1	British	Higher education	15	Hammersmith and Fulham
27	28	1	Iranian	Higher education	3	Hammersmith and Fulham
28	29	1	British	Higher education	14	Hammersmith and Fulham
29	30	1	Brazilian	Higher education	10	Hammersmith and Fulham
30	31	1	Uk	Higher education	5	Hammersmith and Fulham
31	32	1	British	Higher education	37	Hammersmith and Fulham
32	33	1	Brazilian	Higher education	2	Hammersmith and Fulham
33	34	1	USA	Master's degree	17	Hammersmith and Fulham
34	35	1	Brazilian	Incomplete higher education	4	Haringey
35	36	1	Polish	Higher education	16	Havering
36	37	1	Brazilian	Incomplete higher education	22	Hillingdon
37	38	1	Brazilian	Master's degree	4	Hounslow
38	39	1	Iranian	Master's degree	1	Hounslow
39	40	1	Hungarian	Higher education	14	Hounslow
40	41	1	Brazilian	Certificate of Secondary Education (GCSE) incomplete	35	Lambeth
41	42	1	Italian	Master's degree	5	Lambeth
42	43	1	Nigeria	Master's degree	1	Lewisham
43	44	1	British	Incomplete higher education	33	Lewisham
44	45	1	British	Master's degree	29	Lewisham
45	50	1	Brazilian	Incomplete higher education	6	Richmond upon Thames
46	51	1	Russian	Higher education	2	Royal Borough of Kensington and Chelsea
47	52	1	Colombian	Master's degree	16	Royal Borough of Kensington and Chelsea
48	53	1	UK	Doctorate	22	Royal Borough of Kingston upon Thames
49	54	1	Brazilian	Higher education	5	Southwark

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
50	55	1	English	Higher education	5	Southwark
51	56	1	Italian	Master's degree	11	Southwark
52	57	1	Dutch	Master's degree	13	Sutton
53	58	1	Brazilian	Master's degree	4	Tower Hamlets
54	59	1	Brazilian	Master's degree	5	Tower Hamlets
55	60	1	Brazilian	Higher education	11	Wandsworth
56	61	1	Italian	Master's degree	5	Wandsworth
57	62	1	Greek	Certificate of Secondary Education (GCSE)	11	Islington
58	63	1	Indian	Higher education	26	Merton
59	64	1	Syrian	Master's degree	2	Newham
60	65	1	Iran	Higher education	17	Merton
61	66	1	Bulgaria	Certificate of Secondary Education (GCSE)	4	Brent
62	67	1	Spanish	Higher education	4	City of London
63	68	1	Spanish	Higher education	3	City of Westminster
64	69	1	Russian	Master's degree	3	Royal Borough of Kensington and Chelsea
65	70	1	British	Higher education	7	Barking and Dagenham
66	71	1	Bangladeshi	Certificate of Secondary Education (GCSE)	5	Barking and Dagenham
67	72	1	British	Higher education	19	Tower Hamlets
68	73	1	British	Higher education	22	Royal Borough of Kensington and Chelsea
69	74	1	Italian	Certificate of Secondary Education (GCSE)	2	Enfield
70	75	1	British	Incomplete higher education	21	Newham
71	76	1	British	Higher education	5	City of London
72	77	1	British	Higher education	4	Bexley
73	78	1	British	Certificate of Secondary Education (GCSE) incomplete	10	Brent
74	79	1	British	Master's degree	7	City of London
75	80	1	British	Higher education	8	Brent
76	81	1	British	Doctorate	4	City of London
77	82	1	Polish	Higher education	8	City of London
78	84	1	Polish	Higher education	19	Ealing

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
79	85	1	Polish	Higher education	25	Ealing
80	86	1	Polish	Higher education	16	City of London
81	88	1	Turkish	Incomplete higher education	24	Brent
82	90	1	Turkish	Higher education	21	Barnet
83	91	1	Turkish	Incomplete higher education	24	Ealing
84	92	1	Turkish	Higher education	24	Bexley
85	93	1	Brazilian	Certificate of Secondary Education (GCSE)	20	Merton
86	94	1	Brazilian	Certificate of Secondary Education (GCSE) incomplete	23	Brent
87	95	1	Brazilian	Incomplete higher education	22	Camden
88	96	1	Brazilian	Incomplete higher education	26	City of Westminster
89	98	1	Russian	Higher education	28	Bexley
90	99	1	Russian	Higher education	25	City of London
91	100	1	Russian	Certificate of Secondary Education (GCSE) incomplete	24	City of London
92	101	1	Russian	Higher education	27	Bexley
93	103	1	Russian	Certificate of Secondary Education (GCSE) incomplete	30	Bromley
94	104	1	Russian	Certificate of Secondary Education (GCSE) incomplete	13	Barnet
95	105	1	Russian	Higher education	24	Enfield
96	107	1	Russian	Higher education	21	City of London
97	108	1	Russian	Certificate of Secondary Education (GCSE) incomplete	25	Lambeth
98	109	1	British	Certificate of Secondary Education (GCSE) incomplete	29	City of London
99	110	1	British	Higher education	29	Harrow
100	111	1	British	Certificate of Secondary Education (GCSE) incomplete	49	Enfield
101	112	1	Turkish	Certificate of Secondary Education (GCSE) incomplete	25	Harrow
102	113	1	Turkish	Incomplete higher education	23	Enfield
103	114	1	Turkish	Certificate of Secondary Education (GCSE) incomplete	26	Hounslow

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
104	115	1	Turkish	Certificate of Secondary Education (GCSE)	19	Croydon
105	116	1	British	Certificate of Secondary Education (GCSE) incomplete	26	Hillingdon
106	117	1	Polish	Certificate of Secondary Education (GCSE) incomplete	43	City of London
107	118	1	Polish	Higher education	15	Bromley
108	119	1	Polish	Higher education	18	City of London
109	120	1	Polish	Higher education	25	Croydon
110	121	1	Polish	Incomplete higher education	27	Haringey
111	122	1	Brazilian	Higher education	21	City of London
112	123	1	Brazilian	Master's degree	24	City of London
113	124	1	Polish	Higher education	12	Ealing
114	125	1	Turkish	Higher education	19	Islington
115	126	1	Brazilian	Master's degree	13	Croydon
116	127	2		Certificate of Secondary Education (GCSE) incomplete		Alvorada
117	128	2	Brasileira	Higher education	16	Porto Alegre
118	129	2	Brasileira	Master's degree	13	Novo Hamburgo
119	130	2	Brasileira	Master's degree	24	Novo Hamburgo
120	131	2	Brasileira	Higher education	37	Novo Hamburgo
121	132	2	Brasileira	Incomplete higher education	40	Sapucaia do Sul
122	133	2	Brasileira	Higher education	40	Novo Hamburgo
123	134	2	Brasileira	Higher education	53	Novo Hamburgo
124	135	2	Brasileira	Doctorate	45	Porto Alegre
125	136	2	Brasileira	Higher education	35	Novo Hamburgo
126	137	2	Brasileira	Higher education	11	Estância Velha
127	138	2	Brasileira	Higher education	48	São Leopoldo
128	139	2	Brasileira	Higher education	44	Novo Hamburgo
129	140	2	Brasileira	Higher education	42	Dois Irmãos
130	141	2	Brasileira	Higher education	44	Dois Irmãos
131	142	2	Brasileira	Master's degree	45	Porto Alegre
132	144	2	Brasileira	Master's degree	32	Porto Alegre
133	145	2	Brasileira e Italiana	Higher education	27	Porto Alegre

Tot.	nº	Cl.	Q57	Q58	Q59	Q60
134	146	2	Brasileira	Incomplete higher education	23	Porto Alegre
135	147	2	Brasileira	Higher education	21	Porto Alegre
136	148	2	Brasileira	Higher education	30	Porto Alegre
137	149	2	Brasileira	Master's degree	20	Porto Alegre
138	150	2	Brasileira	Higher education	10	Portão
139	151	2	Brasileira	Master's degree	4	Eldorado do Sul
140	152	2	Brasileira	Higher education	2	Dois Irmãos
141	153	2	Brasileira	Master's degree	50	Porto Alegre
142	154	2	Brasileira	Master's degree	7	Porto Alegre
143	155	2	Brasileira	Higher education	13	Santo Antônio da Patrulha
144	156	2	Brasileira	Master's degree	45	Porto Alegre
145	157	2	Brasileira	Higher education	10	Glorinha
146	159	2	Brasileira	Higher education	45	Porto Alegre
147	160	2	Brasileira	Higher education	69	Porto Alegre
148	161	2	Brasileira	Higher education	7	Porto Alegre
149	162	2	Brasileira	Higher education	50	Porto Alegre
150	163	2	Brasileira	Ensino Médio Completo	41	Porto Alegre
151	164	2	Brasileira	Master's degree	64	Porto Alegre
152	165	2	Brasileira	Higher education	38	Porto Alegre
153	166	2	Brasileira	Higher education	73	Porto Alegre
154	167	2	Brasileira	Incomplete higher education	73	Capela de Santana
155	168	2	Brasileira	Higher education	55	Porto Alegre
156	169	2	Brasileira	Higher education	35	Porto Alegre
157	170	2	Brasileira	Master's degree	9	Ivoti
158	171	2	Brasileira	Higher education	52	Porto Alegre
159	172	2	Brasileira	Higher education	50	Porto Alegre
160	173	2	Brasileira	Higher education	24	Porto Alegre
161	174	2	Brasileira	Master's degree	42	Ivoti
162	175	2	Brasileira	Ensino Médio Completo	62	Porto Alegre
163	176	2	Brasileira	Master's degree	57	Gravataí
164	177	2	Brasileira	Master's degree	61	Porto Alegre
165	178	2	Brasileira	Incomplete higher education	20	Cachoeirinha

<b>Tot.</b>	<b>n°</b>	<b>Cl.</b>	<b>Q57</b>	<b>Q58</b>	<b>Q59</b>	<b>Q60</b>
166	179	2	Brasileira	Higher education	40	Porto Alegre
167	180	2	Brasileira	Higher education	8	Ivoti
168	182	2	Brasileira	Higher education	39	Porto Alegre
169	184	2	Brasileira	Ensino Médio Completo	45	Porto Alegre
170	185	2	Brasileira	Master's degree	30	Porto Alegre
171	186	2	Brasileira	Doctorate	54	Porto Alegre
172	187	2	Brasileira	Ensino Médio Completo	45	Porto Alegre
173	188	2	Brasileira	Master's degree	37	Viamão
174	189	2	Brasileira	Higher education	40	Porto Alegre
175	191	2	Brasileira	Master's degree	30	São Jerônimo
176	192	2	Brasileira	Incomplete higher education	22	Campo Bom
177	193	2	Brasileira	Ensino Médio Completo	30	Eldorado do Sul
178	194	2	Brasileira	Incomplete higher education	1	Novo Hamburgo
179	195	2	Brasileira	Higher education	78	Porto Alegre
180	196	2	Brasileira	Incomplete higher education	48	Porto Alegre
181	197	2	Brasileira	Ensino Médio Completo	19	Porto Alegre
182	198	2	Brasileira	Higher education	23	Montenegro
183	199	2	Brasileira	Higher education	43	Montenegro
184	201	2	Brasileira	Ensino Médio Completo	19	Montenegro
185	202	2	Brasileira	Incomplete higher education	55	Montenegro
186	203	2	Brasileira	Higher education	30	Montenegro
187	204	2	Brasileira	Higher education	40	Canoas
188	205	2	Brasileira	Higher education	1	Canoas
189	206	2	Brasileira	Higher education	20	Porto Alegre
190	207	2	Brasileira	Master's degree	36	Porto Alegre
191	208	2	Brasileira	Higher education	8	Porto Alegre
192	209	2	Brasileira	Master's degree	41	Porto Alegre
193	210	2	Brasileira	Incomplete higher education	33	Canoas
194	211	2	Brasileira	Higher education	27	Ivoti
195	212	2	Brasileira	Higher education	3	Portão
196	213	2	Brasileira	Higher education	30	Portão
197	214	2	Brasileira	Higher education	44	Porto Alegre



Tot.	n°	Cl.	Q57	Q58	Q59	Q60
198	215	2	Brasileira	Higher education	13	Porto Alegre
199	216	2	Brasileira	Higher education	40	Porto Alegre
200	217	2	Brasileira	Higher education	37	Alvorada
201	218	2	Brasileira	Higher education	47	Porto Alegre
202	219	2	Brasileira	Higher education	15	Porto Alegre
203	220	2	Brasileira	Master's degree	10	Porto Alegre
204	221	2	Brasileira	Higher education	16	Porto Alegre
205	222	2	Brasileira	Higher education	28	Cachoeirinha
206	223	2	Brasileira	Higher education	47	Porto Alegre
207	225	2	Brasileira	Master's degree	22	Viamão
208	226	2	Brasileira	Higher education	40	Porto Alegre
209	227	2	Brasileira	Master's degree	40	Porto Alegre
210	228	2	Brasileira	Higher education	25	Porto Alegre
211	229	2	Brasileira	Higher education	37	Porto Alegre
212	231	2	Brasileira	Higher education	50	Porto Alegre
213	232	2	Brasileira	Higher education	61	Porto Alegre
214	233	2	Brasileira	Higher education	70	Porto Alegre
215	234	2	Brasileira	Higher education	46	Porto Alegre
216	235	2	Brasileira	Higher education	45	São Leopoldo
217	238	2	Brasileira	Incomplete higher education	34	Porto Alegre
218	239	2	Brasileira	Master's degree	15	Porto Alegre
219	240	2	Brasileira	Higher education	39	Porto Alegre
220	241	2	Brasileira	Master's degree	76	Porto Alegre
221	242	2	Brasileira	Higher education	1	Porto Alegre
222	243	2	Brasileira	Higher education	52	Canoas
223	244	2	Brasileira	Higher education	20	Porto Alegre
224	245	2	Brasileira	Higher education	74	Porto Alegre
225	247	2	Brasileira	Ensino Médio Completo	36	Canoas
226	248	2	Brasileira	Ensino Médio Completo	68	Porto Alegre
227	249	2	Brasileira	Higher education	34	Porto Alegre
228	250	2	Brasileira	Master's degree	73	Porto Alegre
229	251	3	Brasileira	Higher education	54	São Marcos

<b>Tot.</b>	<b>n°</b>	<b>Cl.</b>	<b>Q57</b>	<b>Q58</b>	<b>Q59</b>	<b>Q60</b>
230	252	3	Brasileira	Ensino Médio Completo	30	São Marcos
231	253	3	Brasileira	Higher education	55	Farroupilha
232	254	3	Brasileira	Incomplete higher education	54	Caxias do Sul
233	255	3	Brasileira	Higher education	52	Caxias do Sul
234	256	3	Brasileira	Doctorate	33	Caxias do Sul
235	257	3	Brasileira	Master's degree	64	Caxias do Sul
236	259	3	Brasileira	Higher education	51	Caxias do Sul
237	260	3	Brasileira	Incomplete higher education	3	Caxias do Sul
238	261	3	Brasileira	Higher education	72	Caxias do Sul
239	262	3	Brasileira	Higher education	59	Caxias do Sul
240	263	3	Brasileira	Higher education	22	Caxias do Sul
241	264	3	Brasileira	Higher education	44	Caxias do Sul
242	265	3	Brasileira	Master's degree	60	Caxias do Sul
243	266	3	Brasileira	Ensino Médio Completo	49	Caxias do Sul
244	267	3	Brasileira	Higher education	40	Caxias do Sul
245	268	3	Brasileira	Higher education	46	Farroupilha
246	269	3	Brasileira	Higher education	44	Caxias do Sul
247	270	3	Brasileira	Higher education	58	Caxias do Sul
248	271	3	Brasileira	Ensino Médio Completo	47	Caxias do Sul
249	272	3	Brasileira	Higher education	31	Farroupilha
250	273	3	Brasileira	Master's degree	41	Caxias do Sul
251	274	3	Brasileira	Master's degree	52	Caxias do Sul
252	275	3	Brasileira	Incomplete higher education	44	Caxias do Sul
253	276	3	Brasileira	Higher education	19	Caxias do Sul
254	278	3	Brasileira	Higher education	35	Caxias do Sul
255	279	3	Brasileira	Higher education	71	Caxias do Sul
256	280	3	Brasileira	Higher education	38	Caxias do Sul
257	281	3	Brasileira	Higher education	57	Caxias do Sul
258	282	3	Brasileira	Incomplete higher education	54	Caxias do Sul
259	283	3	Brasileira	Higher education	47	Caxias do Sul
260	284	3	Brasileira	Higher education	65	Caxias do Sul
261	285	3	Brasileira	Incomplete higher education	69	Caxias do Sul

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
262	286	3	Brasileira	Higher education	68	Caxias do Sul
263	287	3	Brasileira	Higher education	47	Caxias do Sul
264	288	3	Brasileira	Higher education	44	Caxias do Sul
265	289	3	Brasileira	Incomplete higher education	50	Caxias do Sul
266	290	3	Brasileira	Higher education	31	Caxias do Sul
267	291	3	Brasileira	Higher education	53	Caxias do Sul
268	292	3	Brasileira	Higher education	40	Caxias do Sul
269	293	3	Brasileira	Master's degree	46	Caxias do Sul
270	294	3	Brasileira	Incomplete higher education	27	Pinto Bandeira
271	295	3	Brasileira	Higher education	12	Bento Gonçalves
272	296	3	Brasileira	Higher education	52	Caxias do Sul
273	297	3	Brasileira	Incomplete higher education	66	Caxias do Sul
274	298	3	Brasileira	Ensino Médio Completo	58	Caxias do Sul
275	299	3	Brasileira	Higher education	64	Flores da Cunha
276	300	3	Brasileira	Master's degree	36	Caxias do Sul
277	301	3	Brasileira	Master's degree	49	Caxias do Sul
278	302	3	Brasileira	Higher education	7	Monte Belo do Sul
279	303	3	Brasileira	Higher education	53	Caxias do Sul
280	304	3	Brasileira	Higher education	28	Monte Belo do Sul
281	305	3	Brasileira	Higher education	17	Caxias do Sul
282	306	3	Brasileira	Higher education	46	Caxias do Sul
283	307	3	Brasileira	Higher education	41	Caxias do Sul
284	308	3	Brasileira	Higher education	55	Caxias do Sul
285	309	3	Brasileira	Certificate of Secondary Education (GCSE) incomplete	47	Caxias do Sul
286	310	3	Brasileira	Higher education	63	Caxias do Sul
287	311	3	Brasileira	Ensino Médio Completo	57	Monte Belo do Sul
288	312	3	Brasileira	Higher education	50	Caxias do Sul
289	313	3	Brasileira	Higher education	45	Caxias do Sul
290	314	3	Brasileira	Higher education	2	Flores da Cunha
291	315	3	Brasileira	Higher education	42	Monte Belo do Sul
292	316	3	Brasileira	Higher education	35	Caxias do Sul

Tot.	n°	Cl.	Q57	Q58	Q59	Q60
293	317	3	Brasileira	Master's degree	61	Farroupilha
294	318	3	Brasileira	Higher education	57	Caxias do Sul
295	319	3	Brasileira	Higher education	31	Monte Belo do Sul
296	320	3	Brasileira	Incomplete higher education	61	Caxias do Sul
297	321	3	Brasileira	Higher education	48	Carlos Barbosa
298	322	3	Brasileira	Higher education	39	Monte Belo do Sul
299	324	3	Brasileira	Certificate of Secondary Education (GCSE) incomplete	58	Flores da Cunha
300	325	3	Brasileira	Higher education	46	Caxias do Sul
301	326	3	Brasileira	Master's degree	47	Bento Gonçalves
302	327	3	Brasileira	Higher education	54	Caxias do Sul
303	328	3	Brasileira	Incomplete higher education	6	Caxias do Sul
304	329	3	Brasileira	Higher education	48	Caxias do Sul
305	330	3	Brasileira	Doctorate	68	Caxias do Sul
306	331	3	Brasileira	Certificate of Secondary Education (GCSE) incomplete	37	Flores da Cunha
307	332	3	Brasileira	Higher education	38	Carlos Barbosa
308	333	3	Brasileira	Higher education	60	Antônio Prado
309	334	3	Brasileira	Ensino Médio Completo	55	Ipê
310	335	3	Brasileira	Higher education	20	Flores da Cunha
311	336	3	Brasileira	Higher education	52	Caxias do Sul
312	337	3	Brasileira	Higher education	46	Bento Gonçalves
313	338	3	Brasileira	Incomplete higher education	67	Flores da Cunha
314	339	3	Brasileira	Higher education	48	Bento Gonçalves
315	340	3	Brasileira	Incomplete higher education	50	Caxias do Sul
316	341	3	Brasileira	Higher education	33	Caxias do Sul
317	342	3	Brasileira	Higher education	28	Caxias do Sul
318	343	3	Brasileira	Higher education	41	Monte Belo do Sul
319	344	3	Brasileira	Higher education	38	Caxias do Sul
320	345	3	Brasileira	Higher education	27	Ipê
321	346	3	Brasileira	Higher education	46	Caxias do Sul
322	347	3	Brasileira	Higher education	38	Farroupilha

<b>Tot.</b>	<b>n°</b>	<b>Cl.</b>	<b>Q57</b>	<b>Q58</b>	<b>Q59</b>	<b>Q60</b>
323	348	3	Brasileira	Master's degree	37	Farroupilha
324	349	3	Brasileira	Higher education	61	Caxias do Sul
325	350	3	Brasileira	Higher education	24	Caxias do Sul
326	351	3	Brasileira	Higher education	37	Farroupilha
327	352	3	Brasileira	Master's degree	52	Bento Gonçalves
328	353	3	Brasileira	Master's degree	6	Caxias do Sul
329	354	3	Brasileira	Incomplete higher education	40	Farroupilha
330	355	3	Brasileira	Master's degree	51	Caxias do Sul
331	356	3	Brasileira	Higher education	52	Caxias do Sul
332	357	3	Brasileira	Incomplete higher education	2	Caxias do Sul
333	358	3	Brasileira	Incomplete higher education	22	Caxias do Sul
334	359	3	Brasileira	Incomplete higher education	20	Carlos Barbosa
335	360	3	Brasileira	Ensino Médio Completo	19	Caxias do Sul
336	361	3	Brasileira	Incomplete higher education	19	Farroupilha
337	362	3	Brasileira	Higher education	20	Flores da Cunha
338	363	3	Brasileira	Master's degree	32	São Marcos
339	364	3	Brasileira	Incomplete higher education	27	Farroupilha
340	365	3	Brasileira	Master's degree	66	Bento Gonçalves
341	366	3	Brasileira	Higher education	50	Bento Gonçalves
342	367	3	Brasileira	Higher education	33	São Marcos
343	368	3	Brasileira	Higher education	32	São Marcos
344	369	3	Brasileira	Ensino Médio Completo	32	São Marcos
345	370	3	Brasileira	Higher education	26	Bento Gonçalves
346	371	3	Brasileira	Higher education	16	Bento Gonçalves
347	372	3	Brasileira	Higher education	76	Caxias do Sul
348	373	3	Brasileira	Higher education	45	Nova Roma do Sul
349	374	3	Brasileira	Higher education	29	Nova Roma do Sul
350	375	3	Brasileira	Higher education	44	Nova Roma do Sul
351	376	3	Brasileira	Higher education	35	Nova Roma do Sul
352	377	3	Brasileira	Higher education	65	Farroupilha
353	378	3	Brasileira	Incomplete higher education	19	Caxias do Sul
354	379	3	Brasileira	Higher education	43	Flores da Cunha

<b>Tot.</b>	<b>n°</b>	<b>Cl.</b>	<b>Q57</b>	<b>Q58</b>	<b>Q59</b>	<b>Q60</b>
355	380	3	Brasileira	Higher education	62	Flores da Cunha
356	381	3	Brasileira	Ensino Médio Completo	52	Flores da Cunha
357	382	3	Brasileira	Higher education	59	Caxias do Sul
358	383	3	Brasileira	Higher education	25	Caxias do Sul
359	384	3	Brasileira	Master's degree	33	Farroupilha
360	385	3	Brasileira	Higher education	28	Bento Gonçalves
361	386	3	Brasileira	Incomplete higher education	18	São Marcos
362	387	3	Brasileira	Master's degree	16	Garibaldi

Source: Elaborated by the author (2024)

## APPENDIX E – RELATIONSHIPS BETWEEN THE CONCEPTS ANNOUNCED AND THE CASE STUDIES

Table 39 - Direct relationship between the concepts announced and the case studies

(continue)			
Concepts	Regional Scale - RMSG	National Scale - RMPA	Global Scale - Greater London
Territorial	Total area: 4,606.11 km <sup>2</sup> . Population: 860,499 (IBGE, 2022). Population Density: 186.81 inhabitants/km <sup>2</sup> . Established in 2013. Unregulated and not operational. Strong personal connection to the territory. In this case you don't vote to elect the mayor (or authority) of the Metropolitan Region	Total area: 10,344.553 km <sup>2</sup> . Population: 4,018,013 (IBGE, 2022). Population Density: 388.41 inhabitants/km <sup>2</sup> . Established in 1973 <sup>1</sup> . Regulated and partially operational. Strong personal connection to the territory. In this case you don't vote to elect the mayor (or authority) of the Metropolitan Region	Total area: 1,600 km <sup>2</sup> . Population: 8,800,000 (CENSUS, 2021). Population Density: 5,500 inhabitants/km <sup>2</sup> . Established in 1855. Regulated and operational. Strong personal connection to the territory. In this case you vote to elect the Mayor of Greater London.
Scale	Country divided into states and cities. Main city integrated in the urban centers hierarchy as regional capital B (IBGE).	Country divided into states and cities. Main city integrated in the urban centers hierarchy as a metropolis (IBGE). State capital.	Country divided into regions, counties, and unitary authorities <sup>2</sup> . It is the London region and the country's capital.
Place	Municipalities partially integrated into two State Planning Regions <sup>1</sup> , COREDE Serra and Campos de Cima da Serra. Divided among municipalities like Vacaria, Monte Alegre dos Campos, Campestre da Serra, São Francisco de Paula, and others. Area with steep topography located between plateau and mountains. Region between the main rivers Cai and Antas.	Municipalities fully integrated into two State Planning Regions*, COREDEs Metropolitan Delta of Jacuí and Vale do Rio dos Sinos, and partially into three COREDEs, Paranhana Vale do Cai, and Centro-Sul. Typical plain region located on a plateau, few municipalities in the mountain ascent area. Region between rivers with greater influence from the Guaíba River.	Located between two regions, East and South East. Regarding unitary authorities, it borders Thurrock to the east and Buckinghamshire and Slough to the west; non-metropolitan counties Hertfordshire and Essex to the north, Surrey to the south, and Kent to the southwest. Characterized by its centrality. Typically flat area. Region between rivers, with greater influence from the Thames River.
Urbanisation	Urbanisation rate in 2010 <sup>3</sup> was 91.62%.	Urbanisation rate in 2000 <sup>4</sup> was 95.51%; in 2010 <sup>4</sup> was 96.90.	London has an Urbanisation rate of around 1% <sup>5</sup> .
Economy	Diversified economy with national and some international reach.	Diversified economy with national and some international reach.	Diversified economy with global reach.
Culture and Identity	Dominant Italian culture with traditions in the gastronomy and tourism sectors, featuring traditional routes and festivals related to the cultivation of family farming products.	No specific traditional culture identified. The gaucho culture predominates, and some municipalities recognize German and Luso-Brazilian culture.	Strong cultural relationship according to the diversity of ethnicities and migration. Wide variety of cultural events and venues.
Innovation	Set of regional universities and research recognized as a reference for the country.	Set of universities recognized as a reference for the country.	World reference in the number of universities, research, and headquarters of global and financial companies.

(continuation)

Concepts	Regional Scale - RMSG	National Scale - RMPA	Global Scale - Greater London
Net	Primarily composed of federal highways BR 116, 470, and state highways RS 444, 122, 453, 437. Regional airport in operation (regular and private flights). Tourist-use rail transport. No waterway mode.	Primarily composed of federal highways BR 116, 386, 290, state highways RS 118, 020, 030, and 040. International airport in operation (regular and private flights). Railway mode operates cargo and passenger transport. Waterway mode operates through the public port and private-use terminals (TUPs) and integration with other municipalities and ferry services for passengers and vehicles.	Integrated transportation networks. Road mode mainly M25, M1, M40, M4, M3, M23, M20, M11, A1, A10, M1-A12, A13, A2, A20, A22, A23, A3, A316, A4, M5, A40, A41. Rail mode has 272 subway stations, waterway through docks and Thames River, and 6 airports.
Climate Change	No formal policy or documentation on this subject	No formal policy or documentation on this subject	Has a formal policy and document on this subject
Foresight, Future Thinks	No defined and measurable official projects or plans regarding the future.	No defined and measurable official projects or plans regarding the future.	Has well-defined and measurable official projects and plans regarding the future.

Source: Elaborated by the author (2024).

Table notes:

<sup>1</sup> Source: Decree 54.572/2019 - RS AL Legal System and SEPLAG/DEPLAN 06/2020.

<sup>2</sup> ONS Geography. Counties and Unitary Authorities (2023) Map in United Kingdom.<sup>32</sup>

<sup>3</sup> Data from ATLAS (RS)

<sup>4</sup> Data from FEE (FEEDADOS)

<sup>5</sup> <https://www.gov.uk/government/publications/trend-deck-2021-urbanisation/trend-deck-2021-urbanisation>

<sup>32</sup> Official map available at <https://geoportal.statistics.gov.uk/documents/ons::counties-and-unitary-authorities-april-2023-map-in-united-kingdom/explore>



## APPENDIX F – PRELIMINARY VERSION OF THE DEFINITIONS OF THE ATTRIBUTES

Table 40 - Preliminary version of the definitions of the essential attributes of mobility as a Public Function of Common Interest (FPIC)

(continue)

Attribute	Preliminary version of definition	Facility question
Integrated Metropolitan Governance	A strategic approach that combines integrated territorial planning with metropolitan governance practices, aligning land use, intermunicipal coordination, and resource management. This attribute aims to overcome territorial and administrative fragmentation by promoting cohesive policies, functional interconnectivity between areas, and the implementation of strategies that transcend regional and administrative boundaries.	How can the integration of territorial planning and metropolitan governance improve coordination between municipalities and enhance regional cohesion?
Socio-Spatial Structuring	The alignment of urban planning and mobility policies to balance economic flows, administrative boundaries, and socio-spatial equity while fostering regional cohesion.	How can socio-spatial policies address disparities while promoting regional cohesion?
Regional Economy and Equity	Economic planning that prioritizes equitable access to resources, reduces regional inequalities, and supports sustainable practices to improve opportunities and quality of life.	Question: How can economic strategies promote equity while ensuring regional sustainability?
Sustainable and Inclusive Mobility	The design of public transport systems, inclusive infrastructure, and accessible spaces to promote non-motorized, sustainable mobility while addressing environmental and equity challenges.	How can mobility systems be adapted to ensure both sustainability and inclusivity for diverse populations?
Cultural Inclusion and Identity	Strategies that promote cultural integration, diversity, and the preservation of local identities as foundations for social cohesion and balanced urban development.	How can metropolitan planning embrace cultural diversity while preserving local identity?
Rural-Urban Connectivity	Policies and planning that enhance the connection between urban, rural, and peri-urban areas, balancing development and preserving local identity.	What measures can improve the connectivity between urban and rural regions while maintaining local distinctiveness?
Sustainability and Innovation	The integration of sustainable practices with technological advancements in urban mobility and planning to address current and future challenges efficiently.	How can innovation be leveraged to promote sustainability in urban mobility and planning?
Innovative and Resilient Infrastructure	The development of infrastructure that incorporates technological innovation and strategic investments to meet evolving demands for connectivity, efficiency, and long-term sustainability.	How can innovative technologies improve infrastructure to meet future metropolitan needs?

(continuation)

Attribute	Preliminary version of definition	Facility question
Participation and Collaborative Planning	A participatory process that engages stakeholders and civil society in decision-making, aligning collaborative planning with strategic foresight to address metropolitan challenges.	What processes can foster meaningful stakeholder involvement in metropolitan planning?
Future-Oriented Strategies and Visionary Planning	Strategic planning that anticipates future trends, integrating foresight, sustainability, and innovation to address emerging metropolitan challenges effectively.	What planning strategies can prepare metropolitan regions for long-term challenges and opportunities?
Climate Resilience and Risk Management	Integrated policies that mitigate climate risks, enhance urban adaptability, and strengthen infrastructure to address climate-induced vulnerabilities such as floods and heatwaves.	What strategies can cities adopt to prepare for and respond to climate-related risks?
Integrated Transport Networks	A seamless connection of multimodal transport systems that enhance accessibility, reduce regional disparities, and optimize mobility services between urban, rural, and peri-urban areas.	What approaches can ensure the integration of transport networks across diverse metropolitan regions?

Source: Elaborated by the author (2024).

## **APPENDIX G – PROPOSED CHANGES TO THE METROPOLIS STATUTE AND THE NATIONAL URBAN MOBILITY POLICY**

### *JUSTIFICATIVA*

*Esta Lei altera o Estatuto da Metr pole e na Pol tica Nacional de Mobilidade Urbana para:*

- I - Reconhecer a mobilidade sustent vel como uma fun o p blica de interesse comum;*
- II - Permitir que Munic pios integrantes de regi es metropolitanas ou aglomera es urbanas, mediante iniciativa pr pria, instituam autoridades metropolitanas para a governan a de fun es p blicas de interesse comum, desde que atendidos crit rios espec ficos.*

### *PROJETO DE LEI*

*Reconhece a Mobilidade Sustent vel como Fun o P blica de Interesse Comum; Cria as Autoridades Metropolitanas de Iniciativa Municipal; Altera o Estatuto da Metr pole e a Pol tica Nacional de Mobilidade Urbana.*

*Art. 1  Acresce inciso X ao art. 2  da Lei n  13.089, de 2015, com a seguinte altera o:*

*“X - Mobilidade sustent vel como Fun o P blica de Interesse Comum: conjunto de pol ticas, a es e instrumentos voltados para garantir a acessibilidade universal, a efici ncia no deslocamento de pessoas e bens, a redu o de emiss es de gases de efeito estufa e a prioriza o de modos de transporte ambientalmente sustent veis e coletivos, cuja implementa o isolada por um  nico Munic pio seja invi vel ou gere impactos em Munic pios lim trofes.”*

*Art. 2  Acresce o inciso VIII ao Art. 5  da Lei n  13.089, de 2015, com a seguinte reda o:*

*“VIII - as diretrizes espec ficas para a promo o da mobilidade sustent vel, incluindo a prioriza o de transporte p blico, transporte ativo e o planejamento integrado dos sistemas vi rios em regi es metropolitanas e aglomera es urbanas.”*

*Art. 3  Acresce os art. 8 -A e 8 -B na Lei n  13.089, de 2015, com a seguinte reda o*

*“Art. 8 -A. ~~Mediante autoriza o legislativa federal,~~ Os Munic pios integrantes de uma mesma regi o metropolitana ou aglomera o urbana poder o, por iniciativa pr pria, instituir*

*autoridade metropolitana para a governança interfederativa de funções públicas de interesse comum, observados os seguintes critérios:*

*I - A criação da autoridade metropolitana deverá ser precedida de:*

*a) Estudos técnicos que comprovem a viabilidade institucional, financeira e operacional da entidade;*

*b) Realização de audiências públicas em todos os Municípios integrantes da unidade territorial urbana, com ampla divulgação e participação da sociedade civil;*

*c) Aprovação de leis complementares municipais específicas por, no mínimo, dois terços dos Municípios da região metropolitana ou aglomeração urbana, representando a maioria absoluta da população da unidade territorial;*

*d) Reconhecimento da mobilidade sustentável como uma função pública de interesse comum e sua inclusão como prioridade no plano de desenvolvimento urbano integrado.*

*II - A autoridade metropolitana prevista neste artigo deverá contar com:*

*a) Estrutura de governança colegiada, integrada por representantes do Poder Executivo dos Municípios participantes e do Estado, além de membros da sociedade civil;*

*b) Sistema integrado de alocação de recursos e prestação de contas, com transparência e controle social;*

*c) Plano de desenvolvimento urbano integrado, nos termos do Art. 10 desta Lei, compatibilizado com os planos diretores municipais e demais instrumentos de planejamento urbano.*

*III - Os Municípios participantes deverão assegurar a sustentabilidade financeira da autoridade metropolitana, mediante:*

*a) Rateio proporcional de custos, pactuado previamente entre os entes participantes;*

*b) Captação de recursos adicionais junto à União, Estados, organismos internacionais ou entidades privadas, respeitada a legislação vigente.*

*IV - A autoridade metropolitana somente poderá exercer funções de planejamento, coordenação, execução ou regulação relativas às funções públicas de interesse comum, conforme definido em leis complementares estaduais e municipais.*

*Art. 8º-B. A criação de autoridades metropolitanas por iniciativa dos Municípios deverá ser monitorada pela União, por meio de:*

*I - Relatórios periódicos sobre a eficácia da governança interfederativa e a execução de políticas públicas metropolitanas;*

*II - Promoção de mecanismos de apoio técnico, capacitação e financiamento para a consolidação das autoridades metropolitanas;*

*III - Inclusão das autoridades metropolitanas no Sistema Nacional de Desenvolvimento Urbano Integrado.*

*Art. 4º Acresce art. 18-A a Lei nº 12.587, de 2012, com a seguinte redação:*

*“Art. 18-A. Nos termos do Estatuto da Metrópole, s Municípios integrantes de uma mesma região metropolitana ou aglomeração urbana que instituíram autoridade metropolitana para a governança interfederativa de funções públicas de interesse comum de mobilidade sustentável, deverão compatibilizar as competências locais do art. 18, as regras e diretrizes de interesse comum.”*

*Art. 5º Esta Lei entra em vigor na data de sua publicação.*

*Brasília, 27 de novembro de 2024.*

*[Presidente da República]*