

A Comparative Study between Global South and North Countries on the (lack of) Integration among Land use and Transport Planning

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Colophon

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Summary

The world's population has been constantly increasing and since 2007 more than half of it is living in cities. Currently, 56.2% of the world is already urbanised, and a number of negative externalities follow this continuous growth, such as congestion, pollution, discrepancies of access to public transport and services, and social inequality. In order to reverse this scenario and guide urbanisation towards a sustainable direction, building denser and mixed communities is an alternative, since it is expected to have a positive effect on travel behaviour and, consequently on transport energy consumption. However, this is only possible if land use and transport planning are carried side-by-side. Yet, currently, land use and transport planning procedures still exist in separate silos, each with its own institutions, disciplinary and cultural background. As a result, many authors indicate what keeps frustrating land use and transport integration (LUTI), which includes institutional and substantive aspects. Those relate to an institutional incongruence affecting LUTI implementation and the need for shared planning concepts that integrate transport and land use solutions.

The scientific literature not only has been able to provide interesting insights about how formal and informal institutions can negatively affect LUTI implementation, but also has indicated the concept of accessibility as a promising approach to guide spatial and transport planners towards coordinated plans. Nevertheless, a knowledge gap remains about the social problems that can emerge when institutions act in different directions and how accessibility can empirically promote broader social goals. Elaborating on a wide body of literature on justice and equity in transportation as well as accessibility and LUTI, this study set out to provide more in-depth understanding into:

What are the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport?

In order to answer this question, the present research carried a qualitative multiple case study: the RandstadRail project, an interregional plan connecting the cities of The Hague and Rotterdam in the Netherlands, and the BRT project at the city of Rio de Janeiro, Brazil, implemented as the city would host the 2014 World Cup and the 2016 Olympic Games. The research methods consisted of content analysis and semi-structured interviews with transport and spatial planners, who were asked to share their personal point of view about LUTI implementation challenges, how they define and measure accessibility as well as their definition and plans to achieve social justice. The research results indicate that despite the socio-economic and historical differences that exist between the Netherlands and Brazil, in both contexts the institutional incongruence found affects mainly the access of vulnerable groups to public transport and opportunities since public policies and investments are not directly targeted to them.

Preface and acknowledgements

The present Master thesis is part of the conclusion of my Master in Spatial Planning degree and specialization in Planning, Land and Real Estate Management at Radboud University, Nijmegen.

The completion of this research means a lot to me, since it has been a challenging experience of which I learned a lot. Coming to study at the Netherlands, again, was part of my career plans, however, I would never imagine that it would be under difficult circumstances, such as the global pandemic of Covid-19. Most of my studies have been through on-line platforms, making my on-campus experiences very limited. Nevertheless, I could still enjoy and learn greatly with all on-line classes, activities, and orientation meetings. Therefore, I would like to express my special thanks to my supervisor Professor Erwin van der Krabben for his continuous support, feedbacks, and guidance during this study.

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List of abbreviations

Abbreviation	Original Language	English
BNDES	Banco Nacional do Desenvolvimento (Portuguese)	Brazilian Development Bank
BRT	Bus Rapid Transit	
CA	Capabilities Approach	
FIFA	Fédération Internationale de Football Association (French)	International Federation of Association Football
HTM		
IBRD	International Bank for Reconstruction and Development	
IOC	International Olympic Committee	
IPEA	Instituto de Pesquisa Econômica Aplicada	Institute of Applied Economic Research
ITDP	Institute for Transportation & Development Policy	
LUTI	Land use and Transport Integration	
MIRT	Meerjarenprogramma Infrastructuur, Ruimte en Transport (Dutch)	Multi-year Plan for Infrastructure, Space and Transport
MIT	Meerjarenprogramma Infrastructuur en Transport (Dutch)	Multi-year Plan for Infrastructure and Transport
NS	Nederlandse Spoorwegen (Dutch)	Dutch Railways
OD	Origin and Destination	
PPB	Planning Programming and Budgeting	
PNT	People Near Transit	
RET	Rotterdamse Elektrische Tram (Dutch)	Rotterdam Electric Tram
TOD	Transit Oriented Development	
UN	United Nations	

1. Introduction

In this introductory chapter, the need for the analysis of the integration between spatial and transport planners is elaborated. An explanation of the research aim leads to the formulation of the research question, which in turn is followed by the scientific and societal relevance of the present study. Ultimately, at the end of this chapter, the document structure is explained.

1.1 Problem Statement and Research Aim

The world's population has been constantly increasing and since 2007 more than half of it is living in cities. Currently, 56.2% of the world is already urbanised, and this number is expected to keep increasing (UN-Habitat, 2020). With this in mind, several researchers have concluded that in order to guide this growth in a sustainable direction, a denser and more mixed community is an alternative as it has a positive effect on travel behaviour and, consequently on transport energy consumption. Nevertheless, a land use intensification without a proper urban transport policy is capable of worsening side effects, such as congestion and pollution, instead of prevailing the benefits, like protected natural resources, clean air, and better use of social services (Duffhues & Bertolini, 2015).

Thus, if this complexity is to be dealt with in an effective way, transportation and land use planning should be carried side-by-side. As Straatemeier & Bertolini (2020) likewise explain, transport and land use patterns carry an interdependent relationship, where one influences the changes on the other domains. This interdependency nature has attracted the attention of many scientists and practitioners. As a result, many authors have contended to fine-tune transport and land use planning strategies. Yet, the achievement of this integration is in practice easier said than done. Currently, land use and transport planning procedures still exist in separate silos, each with their own institutions, disciplinary and cultural backgrounds, and planning concepts (Straatemeier & Bertolini, 2020; van Geet, et al., 2019).

Moreover, while this dynamic mutual relationship seems to be obvious, it is not always recognized by policy makers, culminating in discrepancies such as high density developments at locations that offer poor accessibility by public transport, or the other way around, low density developments served by several modes of public transport (Straatemeier & Bertolini, 2020). Under these circumstances, potential economic, social, and environmental benefits of Land use and Transport Integration (LUTI) are being missed (van Geet, et al., 2019). To give an example, an efficient and sustainable spatial organisation of activities that are well linked with the transport system, will consequently improve the accessibility and the use of space. In addition, increasing the use of public transport and contributing to non-motorised modes, such as walking and cycling, will decrease problems like congestion, air pollution, noise, among others. Thus, a healthy urban economy can be developed and cultivated, providing social equity and transport opportunities for all individuals despite their age, gender, race, income, and limitations (Wegener & Fürst, 2004).

In light of that, some authors have identified factors hindering the possibilities of more integration between the land use and transport sectors. From an institutional point of view, those can relate to an institutional incongruence, which were attributed by van Geet, et al., (2019) to two main factors, they are: the temporal incongruence and the contextual incongruence. In addition, focusing on the substantive aspect of the identified factors, Straatemeier & Bertolini (2020) argue the need for shared planning concepts that could enable

more integrated solutions for both transport and land use planners. From discussions in scientific literature (Vecchio & Martens, 2021; Duffhues & Bertolini, 2015; Geurs & Wee, 2004), accessibility has been acknowledged as a crucial concept that could lead to more integrated planning. For this reason, the concepts of accessibility and institutional incongruence are relevant for the present study, which later will be addressed in-depth in order to provide the necessary understanding of its meanings and metrics.

Meanwhile, if we want to improve the urban economy so it can provide social equity and transport opportunities for all individuals, a better integration between urban dynamics and transport infrastructure is vital. In the European context we are witnessing the development of light rail, integrating the classic urban and regional public transport systems (Priemus, 2008), more commonly known under the label of 'Transit Oriented Development' (TOD) as in North America and Australia, or as (re)development of and around stations across in Europe, Asia and South America (Straatemeier & Bertolini, 2020; Curtis, Renne, & Bertolini, 2009). On the one hand, South American cities have increased investments around Bus Rapid Transit (BRT) systems, since it appears as an attractive option (in economic and efficiency terms) to solve urban mobility problems (Branco, 2013). On the other hand, although relatively rich countries still deal with highly motorized and congested cities, they can afford rail-based mass transit systems, which is not the case in developing countries. These experience population and urban growth on a faster pace, which makes the development of mass transit less feasible (Gwillian, 2003).

Thus, the aim of this research is to explore the dynamic between Land use and Transport, with a focus on accessibility and social justice in two case studies, being those the RandstadRail project between the cities of The Hague and Rotterdam, in the Netherlands, and the BRT project in the city of Rio de Janeiro, Brazil.

1.2 Research Question

The research aim as previously stated lead to the following research question:

What are the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport in the context of, respectively, a typical Global South and Global North metropolitan region?

In order to help answering the main research question, the following sub questions will be addressed:

- a. What are, on spatial and transport planners' point of view, the factors hindering the integration between land use and transport policies in the Province of South Holland and the state of Rio de Janeiro?*
- b. How spatial and transport planners define and measure accessibility in the Province of South Holland and the state of Rio de Janeiro?*
- c. What is and how spatial and transport planners aim to achieve social justice in the Province of South Holland and the state of Rio de Janeiro?*

1.3 Scientific and Societal Relevance

The overall purpose of the present study relies on both scientific and societal dimensions, aiming at exploring and developing valid knowledge and insights that can later support organisations and stakeholders in the field. Concerning the scientific relevance, this thesis contributes to existing research related to land use and transport integration, as the lack of it seems to be inadequate on a global scale (UN-Habitat, 2013). Besides, it relies on concepts such as accessibility and social justice, that are of ultimate importance on both urban and transportation fields, however, they are not fine-tuned between the academic community and the planning professionals.

When looking at van Geet, et al., (2019) study, a knowledge gap remains about the social problems that can emerge when formal and informal institutions negatively affect LUTI implementation. Besides, Straatemeier & Bertolini (2008; 2020) studies have focused on the use of accessibility as a concept that can be shared between transport and land use planners and, consequently, integrate their solutions. Although they argue that the use of this concept may promote broader economic, social and environmental goals, they still did not investigate it empirically.

In order to address the knowledge gap as previously explained, the present research follows a qualitative methodology (detailed in Chapter 3) unlike most studies addressing LUTI, accessibility and social justice that make use of quantitative methodologies. Adding the perception of planners will contribute to understand how equity and fairness issues may differ between a Global South and a Global North country. In addition, few studies contribute to Global South and North cases' comparisons. As most of them compare cities within the same country or the same continent, this research compares distinct social, urban, and institutional contexts that can learn from each other's experiences.

Last but not least, according to UN-Habitat (2013) many cities across the globe are facing an unprecedented accessibility crisis. Although the level of urban mobility is increasing, people are still encountering difficulty to access places, activities, and services. For this reason, UN-Habitat (2013) urges the need for a focus on access, where urban and transport planners and decision-makers move the attention away from 'transport bias' towards the human right to equitable access to opportunities. Therefore, a focus on accessibility highlights the need for a holistic and integrated approach, establishing a link between urban form and transportation systems (UN-Habitat, 2013). Thus, the present study aims to contribute on discussions about land use and transport integration, connecting it to the concepts of accessibility and social justice.

1.4 Document Structure

The research questions mentioned above are the guiding thread throughout the present study. In Chapter 2 an in-depth literature review of multiple concepts and ideas is presented. Chapter 3 explains the methodology used in this research, with the introduction of the study cases and the operationalization of the research themes. The results of the interviews are reported in Chapter 4, followed by a discussion in Chapter 5. Finally, the main conclusions and recommendations for future research are presented in Chapter 6.

2. Theoretical Framework

This chapter begins with a brief overview of the main justice theories and how they can be applied in the context of transportation. The most prominent one was chosen and followed by a discussion in more details of this approach along with the concept of accessibility and their relationship. Then, two interesting approaches concerning land use and transport planning integration are presented and followed by a comparison among them. In addition, an institutional perspective is considered together with its effects on LUTI. This discussion results in a conceptual framework displayed at the end of this chapter.

2.1 Justice and equity in transportation

According to Pereira, Schwanen, & Banister (2017), studies concerned with justice and equity in transportation have been increasing over the past decades. Current studies usually addresses questions such as: what kind of neighbourhoods within a city benefit from transport infrastructure projects, service supply and public transport subsidies; how policies influence the cost of transport goods and services for different income groups; and, what are the social groups that are impacted by transport-related externalities, like air pollution and traffic accidents (Pereira R. H., 2018). Despite the relevance of justice, there is a lack of clarity about what it means in the transport context (Pereira, Schwanen, & Banister, 2017). For this reason, this section introduces key theories of justice (Utilitarianism, Libertarianism, Intuitionism, Egalitarianism and Capability Approaches), and the most prominent one will be framed and discussed within the transport context.

Firstly, introduced by Jeremy Bentham and John Stuart Mill, utilitarianism is one of the most outstanding justice theories since it supports the ethical foundation of cost-benefit analysis. This theory bases itself on three main assumptions, that are, (1) human well-being (utility) is the core value; (2) everyone's welfare and interests have equal weight regardless their personal differences; and (3) human well-being should be maximised. Because everyone's welfare is equally important, utilitarian philosophers do not give particular attention on how accessibility varies per individual members of society, as they focus on cumulative measures of transport performance. So, if a transport policy violates the right of the minorities but increases the overall benefits for a large group of people, it will not be seen as a moral problem (Pereira, Schwanen, & Banister, 2017).

The second theory, libertarianism, follows the main concept of self-ownership. Presented by Robert Nozick, it postulates that every individual should share fundamental rights, such as to life and to property, and freedom to pursue life according to one's values and goals. An important point is that the state or others should not interfere on people's lives and the free market is seen as a natural tool to promote justice and maximise social wealth. Nevertheless, free market transactions and its price system overlook possible conflicts among the market goals for increasing efficiency and distributing fairness. To illustrate, private companies will not provide transport services to less profitable areas, such as remote and poor neighbourhoods (Pereira, Schwanen, & Banister, 2017).

The third theory, intuitionism, contrasts with utilitarianism and libertarianism, as it "argues for a more context-dependent and pluralistic approach" (Pereira, Schwanen, & Banister, 2017, p. 174). It claims that real-life moral problems are complex and vary, meaning that only multi conceptions of justice will be able to correctly deal with them. Some risks from this approach

lie in evaluations becoming too context sensitive, providing little guidance to policy decisions, as it will take on an ad hoc basis. Also, opportunistic claims can take advantages on particular moments, like during election processes (Pereira, Schwanen, & Banister, 2017).

Moreover, the following theory is egalitarianism from John Rawls, which encompasses two principles in order of priority. The first concerns basic rights and liberties being equally applied to everyone. Yet individuals are free unless they do not infringe the freedom of others. The second involves the proper distribution of primary goods, such as social conditions and means that are crucial so citizens can pursue their life aims (Pereira, Schwanen, & Banister, 2017). This second principle, the difference principle, “contends that social and economic inequalities can only be considered fair if they simultaneously (a) derive from a situation of fair equality of opportunity, and (b) work to the benefit of the least advantaged members of society” (Pereira, Schwanen, & Banister, 2017, p. 174). However, it is important to acknowledge the downsides of the difference principle. As the principle does not make distinction among inequalities that result from individuals’ choices and the ones that result from morally unpredictable situations, it not only mitigates unfairness from the latter, but also from the former case (Pereira, Schwanen, & Banister, 2017).

The last theory, conceptualised by Amartya Sen and further developed by Martha Nussbaum, proposes a shift on the focus of Rawls’ difference principle from primary goods to human capabilities. Even though Capabilities Approaches (CA’s) cannot be taken as a full theory of justice, it deals with the heart of justice concerns that is human capabilities. One’s capability to convert a particular resource into useful purpose, i.e., the range of freedoms and opportunities available, depends on the social, political, and economical context, preferences, skills, etc. Hence, the influence that an environment can have in increasing or decreasing the set of opportunities available to a person is recognized by the CA. In essence, the assessments of social justice using the CA aim to understand the possibilities of what a person can do (the set of capabilities) and what he or she actually ends up doing (functionings) (Pereira, Schwanen, & Banister, 2017). Table 1 summarizes all the theories briefly discussed in this section.

Table 1: Summary of key theories of justice.

Theories of justice	Distribution of what?	Guiding principle of distribution	The fairest distribution pattern	Key Authors
Utilitarianism	Welfare, well-being, utility	The greatest good for the greatest number	Whatever distribution that maximizes aggregate welfare	Jeremy Bentham and John Stuart Mill
Libertarianism	Basic rights and liberties	Self-ownership	Absolute equality	Robert Nozick
Intuitionism	Different 'whats', e.g., resources (food, money etc.), services (health, education etc.)	Particular distributive problems demand different principles be applied to particular cases (e.g., rights, deserts, needs, expectations, procedural justice, etc.)	No clear distribution pattern	Brian Barry and David Miller
Rawls' Egalitarianism	Basic Liberties	First principle (deontological justification)	Equal distribution	John Rawls
	Opportunities		Equal distribution	
	Primary goods (rights and prerogatives of authority, income and wealth)	Difference Principle	Maximin criterion: The distribution that maximizes, subject to constraints, the prospects of the least advantaged groups	
Capabilities approach	Opportunities	Human dignity and equal respect	Equal distribution	Amartya Sen and Martha Nussbaum
	Central/basic capabilities		All should get above a minimum basic level	

Note. Reprinted from "Distributive justice and equity in transportation", by Pereira, R. H., Schwanen, T., & Banister, D., 2017, *Transport Reviews*, 170-191.

Comparing all those approaches that focus on fairness in transport, CA's is especially appropriated "to account for the wide diversity of individuals, considering not only how mobility resources are distributed, but also how these differently affect people's opportunities depending on personal features, aspirations and choices" (Vecchio & Martens, 2021, p. 2).

Hence, the present research takes CA's as the most appropriate concept when transport policies aim to decrease levels of inequality. The following section discusses into more details this approach.

2.2 Capabilities Approach and Accessibility

2.2.1 Capabilities Approach

A starting point to understand the CA is realizing that having the freedom to choose to lead one kind of life, or another is the most important dimension that a person can have. Despite some divergence on conceptualisations about the Capabilities Approach, Vecchio & Martens (2021) argue that this perspective converges on five main features to acknowledge an individual's level of freedom, they are:

1. *Resources*: the means that people have to achieve their purpose, e.g., commodities and intangible goods, that will depend on socio-spatial context in which the individual lives.
2. *Conversion factors*: those are the personal, social, and environmental conditions that will result on the individual life experience.
3. *Capabilities*: the available set of freedoms or choices (i.e., what people are able to do and be) available so a person can lead one type of life or another.
4. *Choice*: indicates the decisions individuals have over a particular "state" or another according to their capability set.
5. *Functionings*: refers to what people can actually achieve according to their set of capabilities, i.e., "while capabilities are the "beings" and "doings" available to a person, functionings are what this person "is" and "does"" (Vecchio & Martens, 2021, p. 3).

To complement, it is important to understand that the person's capabilities are not a static characteristic, but probabilities and robustness. In fact, instead of thinking that capabilities are simply available or not, it is actually something that can imply a person's evolution in time that often is not considered by capabilities-related theories (Vecchio & Martens, 2021).

2.2.2 Accessibility

In order to take part of society, accessing opportunities is fundamental. Once opportunities are dispersed among the urban context, being "mobile" is necessary to pursue essential needs (Vecchio & Martens, 2021). Thus, accessibility plays an important role in policy making, especially in the fields of transport planning, urban planning and geography. Nevertheless, it is a difficult and complex concept to be operationalized and theoretically defined. Some of its meanings are: 'the potential of opportunities for interaction' (Hansen, 1959, as cited in Geurs & Wee, 2004); 'the ease with which any land use activity can be reached from a location using a particular transport system' (Dalvi and Martin, 1976, as cited in Geurs & Wee, 2004); 'the freedom of individuals to decide whether or not to participate in different activities' (Burns, 1979, as cited in Geurs & Wee, 2004); and, 'the benefits provided by a transportation/land use system' (Ben-Akiva and Lerman, 1979, as cited in Geurs & Wee, 2004).

Differently from the previous definitions, the present study follows the interpretation of accessibility as the potential for reaching spatially distributed opportunities (Vecchio & Martens, 2021) and the relationship between land use, transport developments and policy plans on the functioning of the society in general. Therefore, it will allow or not (groups of)

individuals to have the opportunity to participate in activities in different locations (Geurs & Wee, 2004). From an inequality in transport accessibility point of view, accessibility is treated as a fundamental condition, although not solely enough, to expand people's power to choose and to promote equal opportunities to public amenities and housing (Pereira, Schwanen, & Banister, 2017). Ryan & Pereira (2021) state that 'real' accessibility can vary greatly according to individual characteristics like age, gender, income, or physical and cognitive functioning. In addition, accessibility differs on a number of components from the definitions and practical measures found in the literature, which are the land use, transportation, temporal, individual, and cognitive components.

According to Geurs & Wee (2004), the *land use component* consists of (1) the amount, quality and spatial distribution opportunities delivered at each destination (employment, health, social and leisure facilities, etc); (2) the need of these opportunities at origin locations (e.g., where people live); and, (3) the conflict of supply and demand for opportunities, that may result in competition for activities. The *transportation component* is expressed by the disadvantage for an individual to travel across an origin and a destination using one type of transport mode, that includes the amount of time, costs, and effort. The *temporal component* indicates the temporal restrictions, such as individuals having the possibility to participate in different activities at various times of the day. Following, the *individual component* demonstrates the needs, abilities, and opportunities of individuals, depending on their age, income, educational level, physical condition, availability of travel modes, among other aspects (Geurs & Wee, 2004). Lastly, as suggested by Lucas, van Wee, & Maat (2016), the *cognitive component* aims to include "*people ability to interact with the transport system*" (p. 479) on evaluations of transport-related social exclusion. Those interactions involve individuals' confidence while travelling, their experience with the transport network and cultural factors, such as certain social groups' needs (people with physical or mental restrictions and low educated or ethnic minority groups) (Lucas, van Wee, & Maat, 2016).

Ideally speaking, accessibility measure should take into consideration all the five components. However, in practice, the accessibility measure focus component will depend on the taken perspective, that Geurs & Wee (2004) identified as: (1) Infrastructure-based; (2) Location-based; (3) Person-based; and (4) Utility-based. The first is typically used by transport planners, aiming at analysing the performance of transport infrastructure, including the degree of traffic congestion and the speed average of travel on road systems. The second perspective is commonly used in the fields of urban planning and geographical studies. These measures analyse accessibility at locations, usually on a macro-level, describing the degree of accessibility given the spatially distributed activities, for example "*the number of jobs within 30 min travel time from origin locations*" (Geurs & Wee, 2004, p. 129). The third viewpoint is interested in analysing the accessibility according to the individuals' limitations to participate on activities at a given time (space-time geography). The last point of view concerns an economist perspective that aims to analyse the (economic) advantages that people can extract from access to the spatially dispersed activities (Geurs & Wee, 2004). Table 2 summarizes all four perspectives on accessibility together with four components introduced by Geurs & Wee (2004). Although the fifth component, the *cognitive*, introduced by Lucas, van Wee, & Maat (2016) has not been added to the table, it is still an useful summary.

Table 2: Perspectives on accessibility and components.

Measure	Component			
	Transport	Land use	Temporal	Individual
Infrastructure-based	Travelling speed; vehicle-hours lost in congestion		Peak-hour period; 24-h period	Trip-based stratification, (e.g., home-to-work, business, etc.)
Location-based	Travel time and or costs between locations and activities	Amount of spatial distribution of the demand for and/or supply of opportunities	Travel time and costs may differ, e.g., between hours of the day, between days of the week, or season	Stratification of the population (e.g., by income, educational level, etc.)
Person-based	Travel time between locations of activities	Amount and spatial distribution of supplied opportunities	Temporal constraints for activities and time available for activities	Accessibility is analysed at individual level
Utility-based	Travel costs between locations of activities	Amount and spatial distribution of supplied opportunities	Travel time and costs may differ, e.g., between hours of the day, between days of the week, or season	Utility is derived at the individual or homogeneous population group level

Note. Reprinted from “Accessibility evaluation of land-use and transport strategies: review and research directions”, by Geurs, K. T., & Wee, B. v., 2004, *Journal of Transport Geography*, 127-140.

2.2.3 Accessibility as a human capability

Vecchio & Martens (2021) present an extensive discussion on how to conceptualise capability in the context of mobility and movement. Essentially, they present three possible approaches, being those, *mobility as a capability*, *accessibility as a capability* and *transport policy as a social conversion factor* (Vecchio & Martens, 2021). From those three approaches, the second has been taken as the most suitable one to transport planning and policy. Some of the reasons are that when the focus is on mobility as a capability, the capability here is conceptualised as an individual’s ability to be mobile, since mobility can be vaguely defined as “*the ability to move freely from place to place*” (Nussbaum, 2000, p.78, as cited in Vecchio & Martens, 2021). Therefore, this approach gives little attention on how being mobile can actually conduce an individual to fulfilling diverse needs and wants (Vecchio & Martens, 2021).

Also, if the focus is on transport policy as a social conversion factor, an approach proposed by Randal, et al. (2020), it can underscore transport policy's role as a promoter of capabilities such as employment, education, health, access, etc. At the same time, it highlights the potential negative effects on people's health and wellbeing. Vecchio & Martens (2021) explain that transport has an important role in shaping each individual's accessibility, meaning that the attention should be on accessibility itself. Additionally, merging many concerns and dimensions into one sole concept, such as conversion factors does not give the necessary guidance "*on how to balance or prioritise transport's diverging impacts on the wide range of related capabilities*" (Vecchio & Martens, 2021, p. 9).

Given these points, Vecchio & Martens (2021) understand that accessibility as a human capability is the most effective way forward. It can capture the dominant concerns among CA with people's power of being and doing what they consider valuable. In other words, accessibility seizes the possibilities available to each person to actively participate in valued activities, while mobility is the means to access it. Furthermore, there are two possible approaches when considering accessibility as a capability, although they still struggle to interact, a common tendency in the wider capabilities' literature. Those are the top-down approach and the bottom-up approach.

The top-down approach aims "*to assess to what extent transport infrastructures and services provide accessibility to valued opportunities*" (Vecchio & Martens, 2021, p. 5). Studies using this approach usually use people's place of residence as the origin point for accessibility measurement, ignoring other possible spatial points. Also, they frequently focus on specific opportunities (e.g., education and employment) or specific modes of transport (e.g., walking and bus services). On the other hand, the bottom-up approach aims to assess how different individuals value distinct activities and how mobility can enable or hinder participation on those. This is an interesting study direction, since it selects specific groups, particularly the unprivileged ones, to understand how well the accessibility provided by transport and land use systems enable those individuals to participate in different activities. The groups are usually differentiated on features such as: age, income, and impairments, although these can sometimes overlap each other (Vecchio & Martens, 2021).

A positive aspect when following the bottom-up approach is that it is possible to assess people's perceived accessibility, giving more complete interpretations than using the top-down approach. This can be done by focusing on how capabilities are formed and used or by examining the difference among expected accessibility and realised mobility (Vecchio & Martens, 2021). All in all, the challenge here remains on integrating the two approaches as it can deliver accessibility values and experiences, which are crucial for transport planning and policies' progress.

2.3 Land use and transport integration (LUTI)

2.3.1 The land use and transport feedback cycle

According to Wegener & Fürst (2004), it is common wisdom between planners and the public in general that urban land use and transport are strictly inter-linked. While there is much understanding that human activities dispersed among the urban environment create the necessity for travel and transport of goods, the reverse impact, that is, from transport to land

use, is less acknowledged (Wegener & Fürst, 2004). In addition, Straatemeier & Bertolini (2020) argue that despite the strong influence that land use and transport systems have on each other, both seem to work as separate entities, each having their own institutions, disciplinary and cultural backgrounds, planning procedures and concepts (Straatemeier & Bertolini, 2020).

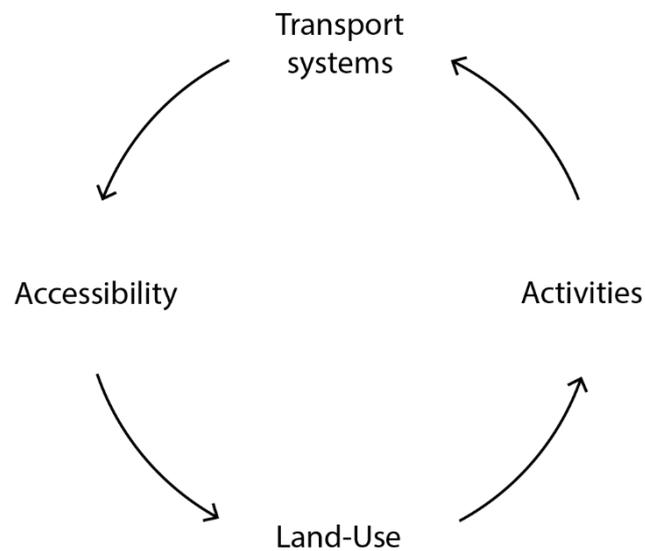


Figure 1: The 'land-use transport feedback cycle' (Wegener & Fürst, 2004).

The 'land-use and transport feedback cycle' displayed in Figure 1 helps to recognise that decisions based on travel and location co-determine each other, leading to the urgency of coordinating transport and land use planning (Wegener & Fürst, 2004). To briefly explain this coordination, Wegener & Fürst (2004) argue that the location of *activities* such as living, working, shopping, education and leisure will be co-determined by the different *land uses* distribution (residential, industrial, or commercial). These human activities over the urban area will require *transport infrastructure* so people can overcome the distance between their activities' location. Moreover, the spatial interaction enabled by the transport systems can be measured as *accessibility*. Then, the quality of accessibility (i.e., how well transport and land use systems are jointly planned) in space co-determines where different types of activities are located, resulting in changes of the land use system and the cycle starts anew (Wegener & Fürst, 2004; Straatemeier & Bertolini, 2020). Having said that, accessibility is seen as a crucial concept that could help transport and land use planners to identify more integrated solutions. Nevertheless, it is important to note that the cycle is a highly simplified representation of reality, being excluded from this external factor, such as broader socio-economic processes, and internal complexities (Straatemeier & Bertolini, 2020). Lastly, Straatemeier & Bertolini (2020) characterize an integrated strategy as a combination of transport strategies and land use measures that supports each other, equally advocated in Transit-Oriented Developments (TOD's). TOD's basic philosophy appears the same in all contexts: "*concentrating urban development around stations in order to support transit use and developing transit systems to connect existing and planned concentrations of development*" (Curtis, Renne, & Bertolini, 2009, p. 3).

2.3.2 The node-place model

Build upon elaborations of the land use and transport feedback cycle, the node-place model introduced by Bertolini (2008) aims to provide an analytical framework to gain insight into the dynamics of station area development (Bertolini, 2008). The model distinguishes station areas between node value, the transportation network, and place value, the functional value (Vale, 2015; Priemus, 2008). Its basic idea is that by improving transportation supply (its *node-value*) in a specific station area it will create conditions favourable to advance its intensity and diversity of land uses (its *place-value*), as accessibility will have been increased (Bertolini, 2008; Vale, 2015). On the other hand, by increasing land uses intensification and diversity it will create conditions favourable to advance development of infrastructure in the same area, once (transport) connections will have grown. In addition, the model helps to identify if conditions for development of both land use and/or transport are actually realized or are mere potential for development, which will depend on factors that go beyond land use and transport (Bertolini, 2008).

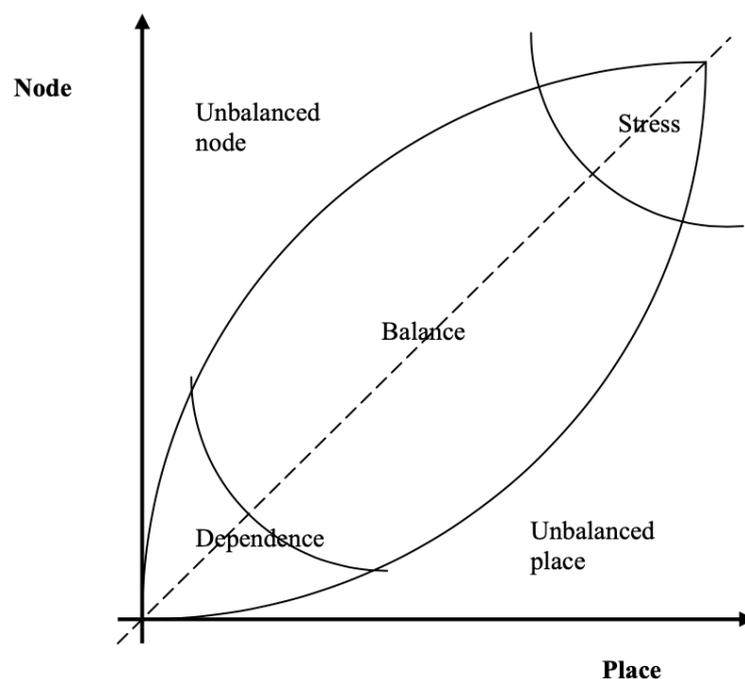


Figure 2: The node-place model (Bertolini, 2008).

From the model displayed by Figure 2 it is possible to distinguish five archetypal situations. The first ideal typical situation, along the middle line, are the '*balanced*' locations, where node and place indexes are equals. These are the places where the land use and transport driven conditions for, respectively, improving transport supply and for intensifying and diversifying land use have been both realised. The second, at the top end of the middle line are the '*under stress*' areas, indicating that the potential for land use and transport development are the highest and have been realised. Even though these are balanced places, there is high chance of competition for space, once it is limited, and conflicts may occur. The third, on the bottom end of the middle line, are the '*dependent*' areas characterised by low transportation supply and low land use intensity and diversity. Consequently, competition for space is very small on those areas (Bertolini, 2008; Vale, 2015).

The last two archetypal situations are two ‘unbalanced’ circumstances. Those are the ‘*unbalanced nodes*’, at the top end of the diagram, and the ‘*unbalanced places*’, at the bottom end of the diagram. The first corresponds to a significantly higher transportation supply than urban activities happening at the station areas. The second is the opposite case, where land use intensity and diversity being higher than transportation supply. It is expected that the last two interesting location-types will, following the transport land use feedback cycle, evolve into a more balanced state, that might happen in three different ways. An ‘unbalanced node’ might increase its place value, for instance by attracting urban developments. It might also decrease its node value, for instance by reducing the amount of transportation services, or pursue both approaches at the same time. The ‘unbalanced place’ can either increase its node value, decrease its place value, which is more difficult and unlikely, or pursue both approached simultaneously (Bertolini, 2008; Vale, 2015). Regardless the approach taken, the node-place model is a useful tool to guide urban and transportation planning to further balanced, integrated, and transit-oriented locations (Vale, 2015).

2.3.3 Comparison between LUTI feedback cycle and Node-place model

The ‘land-use and transport feedback cycle’ and the node-place model were especially selected as both acknowledge the path-dependency that urban planning and infrastructure development have with each other. On the one hand, the ‘land-use and transport feedback cycle’ helps to explain the two-way interaction of land use and transport in urban areas, combining technical theories (urban mobility systems), economic theories (cities and markets), and social theories (society and urban space) (Wegener & Fürst, 2004). From the LUTI feedback cycle, some predictions about the impact of integrated land use transport policies, although difficult to measure, can still be done. Wegener & Fürst (2004) explain that there are, in general, three possible approaches to measure those impacts. The first concerns the ‘stated preference’, which is asking people about their anticipated reaction on changes, e.g., increased transport costs or land use restrictions. The second refers to ‘revealed preference’, that is to come up with conclusions from empirically observed behaviour of people. And the third possibility consist of mathematical models to simulate human decision making and its consequences. From the three mentioned methods, the third method is the only one that can predict unknown situations, which makes it the most used method, despite variations among the existing ones (structure, theoretical foundations, data requirements, etc.) (Wegener & Fürst, 2004).

On the other hand, the node-place model can be used as a tool to understand what and where is favourable to invest. It works as a strategic framework that once applied to a specific case study has two main utilities, which are to classify and identify categories of stations. The classification of overall node and place equilibrium of a region should be based on the interpretation of the mean value of the node and place indexes of all station areas, so that comparisons can guide decisions afterwards (Vale, 2015). To illustrate, the first application of Bertolini’s model was at the stations of Amsterdam and Utrecht. It was discovered that most of the places were in ‘balanced’ areas, where ‘dependent’ node-places were predominant. Another example of the model application, developed by Gonçalves and Portugal (2008), was on a new train line with 14 station areas at the city of Rio de Janeiro. The researchers were able to classify the new stations in Bertolini’s five original categories that resulted in the majority being in ‘balanced’ and ‘dependent’ categories. Altogether, the model is useful when

distinguishing among station areas, indicating the situations of unbalance among the land use and transport aspects of those station areas (Vale, 2015).

2.3.4 Institutional effects on LUTI

A recent study conducted by van Geet, et al., (2019) has detailed the institutional factors that prevent transport and land use planning from getting integrated. The context of their research was the Dutch Planning Programming and Budgeting (PPB) system called Multi-year plan for Infrastructure, Transport and Space (*Meerjarenprogramma Infrastructuur, Ruimte en Transport* in Dutch or MIRT). Although their context matches with one of the case studies of the present research, this section concerns to their analytical framework.

First of all, van Geet, et al., (2019) differentiate LUTI between *strategic* and *operational* levels. The former relates to the integration of land use policies and transport policies with the aim to properly organise activities among the urban space together with a well balanced transport system, where accessibility is the integrative objective. The latter proposes integrating infrastructure development with alongside land use development where area development projects are intended. Apart from this distinction, LUTI can also be differentiated between its dimension of integration, i.e., horizontal, and vertical. The horizontal dimension refers to inter-sectorial, intra-sectoral and cross-territorial integrations. As to the vertical dimension, it is associated to the many distinct layers of government. In addition, the authors argue that LUTI, “*whether at the strategic or the operational level, comprises both the horizontal and the vertical dimensions simultaneously*” (van Geet, et al., 2019, p. 85).

Secondly, van Geet, et al., (2019) address how institutions may affect land use and transport integration. Considering that integration is the result of social interaction processes and institutions (i.e., ‘rules of the game’) are characterised as any form of human rules that aim to structure social interactions. Thus, institutions structuring interaction will impact the extent to which integration is achieved. Correspondingly, institutions have a direct impact on actor behaviour, especially in the processes of designing, negotiating, and funding policies, since actors will play according to what is permitted, obliged, or forbidden (van Geet, et al., 2019). Besides, institutions may be formal, where rules are “*created, communicated and enforced through governmental channels such as courts, legislatures and bureaucracies*” (van Geet, et al., 2019, p. 85) or informal, i.e., “*socially shared rules that may be unwritten and are created, communicated and enforced outside formally sanctioned channels*” (van Geet, et al., 2019, p. 85).

Lastly, the authors present the concept of institutional congruence, which is crucial to have a full understanding on the effects that institutions may have on LUTI. Before delving into this concept, it is important to acknowledge that institutions are not static organisations, but actually, they are constantly changing to adapt themselves and fit in the unstable demands of society. Hence, institutions follow a path-dependency process into their specific context that will have intended and unintended results on future decision-making processes (van Geet, et al., 2019). Given these points, the concept of institutional congruence can be used to assess the relationship among institutions, once they can reinforce each other, have no impact at all on each other, or diminish each other’s effect. And, if institutions take opposite directions that in the end negatively affects each other, then it is characterised as an institutional incongruence. The latter can be attributed to two main factors, which are the temporal

incongruence and the contextual incongruence. Temporal incongruence aims to explain a misfit between institutions that followed a similar path of development, however in different period of times. The contextual incongruence concerns to a misfit between institutions that were developed in independent paths but interrelate in multi-actor action situations. Both situations may happen between only formal, formal and informal or only informal institutions (van Geet, et al., 2019).

2.4 The conceptual model

Figure 3 displays the conceptual model, which hypothesizes that institutional factors regarding LUTI implementation, such as incongruence, affect the access of different groups to public transport.



Figure 3: The conceptual model.

3. Methodology and operationalisation

3.1 The Research Onion

Choosing the correct research strategy can be a hard task. With the help of a research onion, the possible approaches from the research philosophy to data collection techniques and analysis procedures are displayed in Figure 4. This will guide us, layer by layer, in order to determine the most coherent research strategy for the present study.

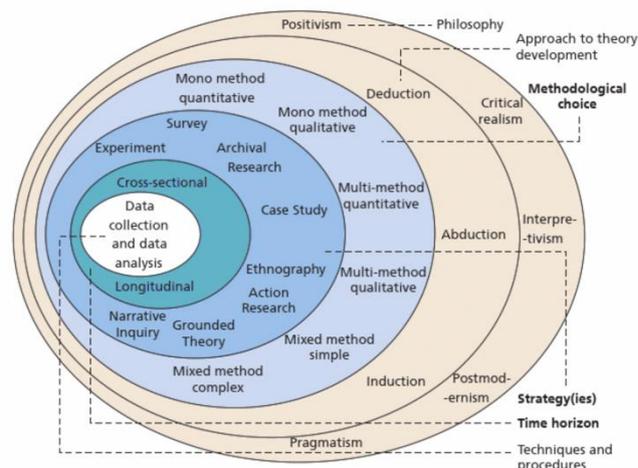


Figure 4: The "research onion" (Saunders, Tornhill, & Lewis, 2019).

Having said that, the present chapter discusses the methodological framework of the thesis, following the research onion layer-by-layer. Afterwards, the reliability and validity to be conducted at this thesis is presented, followed by ethical considerations. Then, the study cases are introduced with a comparison afterwards. Finally, the present chapter ends with the operationalisation of the main conceptual elements under study.

3.1.1 Research elements

According to Crotty (1998), the starting point in developing a research is to answer two main questions, they are: (1) "what methodologies and methods will we be employing in the research we propose to do?"; and, (2) "how do we justify this choice and use of methodologies and methods?" (Crotty, 1998, p. 2). In addition, Crotty (1998) expands the two previous questions into four, which are:

- "What methods do we propose to use?"
- "What methodology governs our choice and use of methods?"
- "What theoretical perspective lies behind the methodology in question?"
- "What epistemology informs this theoretical perspective?"

Thus, before answering those questions, it is essential to understand what each of the underlined terms really means.

- *Methods* refers to research "techniques or technical procedures used to gather and analyse data related to some research question or hypothesis" (Crotty, 1998, p. 3).
- *Methodology* denotes an investigation of the concepts, theories, and basic principles of reasoning on a subject, i.e., the strategy, plan of action, process and design lying behind the choice and use of methods to the desired outcomes (Crotty, 1998, p. 3; Moses & Knutsen, 2012).

- *Theoretical perspective* is “the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria” (Crotty, 1998, p. 3).
- *Epistemology* is “the theory of knowledge embedded in the theoretical perspective and thereby in the methodology” (Crotty, 1998, p. 3).

Figure 5 displays the four research elements that inform one another.



Figure 5: The four research elements (Crotty, 1998).

The first layer of the research onion refers to philosophies of science. It consists of what science is, what is the ideal way to conduct scientific research and what are the contributions that science can make to society. However, it is important to point out that a researcher’s view on these subjects is influenced by his/her personal beliefs to a certain degree. Besides, other aspects that can also influence are the scientific schooling and the prevailing set of ideas and thought patterns, commonly known as paradigm. This refers to “a theoretical tradition or accepted method in a certain discipline, which guides a coherent research agenda and is coupled to a certain scientific approach” (van Thiel, 2014, p. 31). It also symbolizes a worldview, defining the nature of the “world”, the individual’s place in it and the possible relationships to that world and its parts (Guba & Lincoln, 1994). Once the research philosophy is chosen, it will influence how the research is conducted (van Thiel, 2014), as better described in the next section.

3.1.2 Research Strategy

Research philosophy

According to Saunders, Thornhil, & Lewis (2019), research philosophy refers to a system of beliefs and assumptions about the development of knowledge, based on ontological (nature of reality), epistemological (the relation between the researcher and ‘what can be known’) and methodological assumptions (how the researcher can go about finding this reality) (Guba & Lincoln, 1994). In this case, the present research makes use of the constructivist human knowledge. The constructivism thought, also called ‘interpretivism’, aims at people’s perception of the world, which differs according to individual (e.g., age or gender) or social (e.g., culture or language) characteristics (Moses & Knutsen, 2012). Concerning its ontology, reality can be apprehended as mental constructions depending on each individual. The epistemology of this paradigm is transactional and subjectivist, which means that both the investigator and the object of investigation are linked, where the findings are created through the process (Guba & Lincoln, 1994). The challenge of this paradigm remains on the researcher adopting an empathetic stance when entering the social world of the research participants and understanding this world from their viewpoint (Saunders, Thornhil, & Lewis, 2019).

In this study, spatial and transport planners' point of view concerning the (lack of) integration between Land use and Transport is of crucial importance, since through their experiences it will be possible to acknowledge what is allowing or hindering this unification.

Research approach

There are two main reasoning approaches in scientific research, namely deduction and induction. The deductive approach aims at confirming the explanations given by already existing theories, which according to van Thiel (2014), can be achieved by testing the validity of hypotheses. In addition, the conclusions in the deduction are logically derived from the propositions, which mean that if these propositions are true, the conclusions must also be true (Saunders, Thornhil, & Lewis, 2019). According to Saunders, Thornhil, & Lewis (2019), an important characteristic of this approach is that it commonly makes use of quantitative data to measure the facts when testing the premises. On the other hand, the inductive approach is based on empirical observations so that theory follows the data (van Thiel, 2014; Saunders, Thornhil, & Lewis, 2019). Therefore, a model is constructed according to the empirical information gathered in order to identify possible explanations and solutions for the problem. According to Saunders, Thornhil, & Lewis (2019), smaller data sample are more appropriate for induction than deduction, and qualitative data is more frequently used by researchers. Finally, the inductive approach is connected to the constructivist philosophy used in this study due to the subjectivism of its interpretations, considering the human way of seeing the world (Saunders, Thornhil, & Lewis, 2019). Therefore, the present research uses the inductive reasoning approach of the exploratory type.

Methodological choice

The methodological choice of a research can be either quantitative, qualitative, or mixed methods. The differences between quantitative and qualitative research rely on the type of data used or generated by the study. Quantitative studies comprise of numerical information, which can often come from a questionnaire or containing graphs or statistics. On the other hand, qualitative research contains non-numeric data such as information obtained from interviews or categorised data (Saunders, Thornhil, & Lewis, 2019). Moreover, the mixed methods research design refers to a research that is not exclusively quantitative or qualitative. It is used to studies where both numeric and non-numeric data are used jointly. For instance, a questionnaire that includes open-ended questions, or qualitative information analysed numerically (Saunders, Thornhil, & Lewis, 2019). Furthermore, quantitative, and qualitative research can be further divided into mono- and multi-methods. Mono-methods use only one technique to collect and analyse the data, such as a questionnaire for a quantitative study, or an interview in a mono-method qualitative research. In contrast, multi-methods include more than one technique. For example, multi-method quantitative study using questionnaires and observations (Saunders, Thornhil, & Lewis, 2019).

According to Saunders, Thornhil, & Lewis (2019), qualitative research is associated with interpretivist (constructivist) philosophy, as well as makes use of an inductive reasoning approach. Therefore, this research comprises of a mono-method qualitative study as the methodological choice. Semi-structured interviews are used for this matter, which is discussed in more details in section 3.1.3.

Strategy

As stated by Van Thiel (2014), choosing which strategy to follow along with what methods and techniques to apply play a major role to the research design. Depending on the chosen strategy, there will be different methods to gather data and techniques to analyse them (van Thiel, 2014). Therefore, the strategy can be understood as a plan of action to achieve a goal and a methodological link between the research philosophy and the choice of methods. The possible strategies in qualitative research are action research, case study research, ethnography, grounded theory and narrative inquiry (Saunders, Thornhil, & Lewis, 2019).

The present study conducts multiple case studies, as the aim is to conduct an in-depth inquiry into the topic of land use and transport integration, accessibility, and social justice within two real-life settings, that are the RandstadRail project between The Hague and Rotterdam and the BRT project in Rio de Janeiro. This is linked to the interpretative philosophical approach used in this research motivated by discovering meaning and understanding of experiences in context (Harrison, et al., 2017). Simultaneously, this study makes use of content analysis in the form of desk research, another qualitative research method, which helps to gain more understanding of the existing literature about the subjects under study and the cases per se (van Thiel, 2014).

Time horizon

The time horizon options available for a research are cross-sectional or longitudinal. A cross-sectional study focuses on a particular phenomenon at a particular time, while a longitudinal study is capable of providing the changes and developments upon the subject under research (Saunders, Thornhil, & Lewis, 2019). Following Saunders, Thornhil, & Lewis (2019), the present study will be cross-sectional since it is an academic research with time constraints. In addition, cross-sectional studies may employ qualitative or quantitative methodologies, such as case studies that are based on interviews conducted over a short period of time (Saunders, Thornhil, & Lewis, 2019), as it is the present case.

3.1.3 Research Method

Technics and procedures

Within the chosen strategies, different methods and techniques can be applied. Regarding desk research strategy, the available methods are content analysis, secondary analysis, or meta-analysis. This research uses content analysis, which is basically the study of the content of data sources such as written material or documents (van Thiel, 2014). Here the data analysed are literature related to both cases studies and the topics (e.g., accessibility and social inequality) addressed in this research. When it comes to case study, the possible methods are observation, questionnaire, interview and/or content analysis. Interviews are considered to be a flexible way of collecting data. They can be flexible in its structure as well as during the conversation, as the researcher may ask additional questions that will help him or her to gain a better understanding of the answers already given (van Thiel, 2014). Moreover, research interviews may be classified into three different types: structured, semi-structured and unstructured (Saunders, Thornhil, & Lewis, 2019). This thesis gathered the necessary information through semi-structured interviews, which reflect the questions formulated in the research problem (van Thiel, 2014).

Since the themes under study are derived from theory, interviewees were asked for their personal point of view. This helps to gain insight into the interviewees own experiences and understand what, from their perspective, is hindering the integration between spatial and transport planners. These interviews were conducted on-line, since the Covid-19 pandemic is still an ongoing circumstance, and it was held in English with the participants from the Dutch case and in Portuguese with those from the Brazilian case. During every interview, a similar list of themes and questions was used (see Appendix II and Appendix III) and the questions' order may have changed according to the progress of the interview.

Spatial and transport planners were interviewed for both cases, all being involved or influenced by the RandstadRail or the BRT project (see Table 3). The selection of the interviewees took place by (1) looking at their involvement in the planning, implementation, or post-analysis; and (2) their work-related background. Also, multiple stakeholders with different backgrounds were involved; therefore, both employees of governmental and private organisations were interviewed.

Table 3: Interviewees' organisations.

RandstadRail project – Rotterdam and The Hague, The Netherlands	Bus Rapid Transit project – Rio de Janeiro, Brazil
Province of South Holland	Municipality of Rio de Janeiro
Province of South Holland	Private company – Rio de Janeiro
Municipality of Rotterdam	Public institution – Rio de Janeiro
Municipality of Rotterdam	Municipality of Rio de Janeiro
	Municipality of Rio de Janeiro
	Private company - Rio de Janeiro
	NGO for public policies – Rio de Janeiro
	State of Rio de Janeiro Government

3.2 Reliability and Validity

Reliability and validity, as referred by Van Thiel (2014), are important criteria for sound scientific research. Reliability refers to accuracy, meaning that the variable to be measured should be correctly captured, and consistency, which objective is to make the same measurement repeatable and leading to similar results (van Thiel, 2014). Equally important, validity concerns of two basic types, internal and external. While internal validity relates to the coherence of the study itself, external validity considers to which extent the study can be generalized (van Thiel, 2014). Once this thesis is making use of multiple case studies, where the research aims for depth instead of breadth, with richly detailed and extensive descriptions of the subject under study within its contexts, the generalization of findings to other situations is difficult, if not impossible. Thus, the external validity is limited, while the internal validity is high, as the information collected tends to be abundant (van Thiel, 2014). In contrast, collecting existing data through desk research will reduce threats to the reliability and validity of the study.

Finally, the interviews were recorded and transcribed, so that relevant information for the cases could be selected. Moreover, from the records, a qualitative exploration is performed investigating whether the theoretical findings and planners' experiences match or differ from each other. Regarding ethical considerations, the interviewee's privacy needs to be dealt with care, thus they were informed since the beginning about their identity being kept in anonymity and the possibility to withdraw any information when desired.

3.3 Case Selection

3.3.1 RandstadRail project – Rotterdam and The Hague, The Netherlands

The RandstadRail is located at the Zuidvleugel, southwestern part of the Randstad area, and it is completely within the Province of South Holland. The Zuidvleugel area has 3.5 million inhabitants, and its main cities are Rotterdam, commonly known by having one of the largest harbours in the world, and The Hague, the political capital of the Netherlands (OMEGA Centre, 2014). Since 1908, the cities of Rotterdam and The Hague have been connected by a heavy rail line, the Hofpleinlijn, a route exploited by the Dutch railway company Nederlandse Spoorwegen (NS). In 1998 a transition from heavy rail between the two cities was proposed, in which the original plans aimed at linking two important urban transport networks through a light rail system in latest 2010 (OMEGA Centre, 2014). Thus, since 2007 the Dutch "RandstadRail project" has been operating with the intention to provide an attractive form of public transport combining high quality and high frequency as well as an alternative mode of transport to the motorcar directly connecting important zones, like residential, employment, and services in the region with competitive travelling times (Dimitriou, et al., 2014).

The interregional project consists of four lines and a reconstruction of the existing rail systems from heavy rail to light rail (Koppenjan, et al., 2011). So, three of those lines are rail-based systems and the fourth is a bus service with a dedicated lane. The link in The Hague has been made with the tram network, connecting the city centre to Zoetermeer, while in Rotterdam the link has been made with the metro network, connecting the South of Rotterdam with The Hague Central Station (Movares adviseurs & ingenieurs, 2021). The bus system with the dedicated lane operates between Zoetermeer and Rotterdam (OMEGA Centre, 2014).

Since this project is located in the most urbanized area of the Netherlands (Randstad area), it helps to provide more understanding on how integrated urban and transport developments are and what barriers this process faces. Figure 6 displays the RandstadRail lines, where lines 3 (red) and 4 (blue) connect The Hague with Zoetermeer. The green line connects The Hague with the metro network of Rotterdam. And the dotted line represents the bus route connecting the rail lines of The Hague and Rotterdam (OMEGA Centre, 2014).



Figure 6: Map of the RandstadRail system (Railway Technology, 2007).

Those lines have many stations and stops, and some of them are related to (re)development projects which occurred in the vicinity. To name a few, the Beatrixkwartier development comprehends an area of 18ha¹, of which 400,000m² is for office space and 20,000 people are expected to live and work there. Another prominent station is the Meijersplein located near the planned neighbourhood of Polder Zestienhoven, with 1,700 new dwellings from different income backgrounds (OMEGA Centre, 2014).

To what concerns the stakeholders involved in the project process, because of its interregional aspect, a multitude of administrative bodies were part of its planning and delivery. The administrative agreement in the present case was between the national Ministry of Transport and the city regions of Haaglanden and Rotterdam, being these the owners of the project as well. The operators, RET and HTM, Rotterdam and The Hague's municipal companies at that time respectively, were the project's developers while NS transferred its lines (Hofpleinlijn and Zoetermeerlijn) that formed the basis of the project (OMEGA Centre, 2014).

¹ 1ha equals 10,000m².

A crucial factor of the RandstadRail project, like in all infrastructure project, was the funding. Since municipalities had limited funds of their own, the national government provided the biggest part of it for the RandstadRail. The mechanism for this type of funding in the Netherlands was through the MIT (Multi-year plan for Infrastructure and Transport), which since 2007 has been called MIRT in which spatial development projects have been incorporated. The MIT was controlled by the Ministry of Transport, consequently, the project's negotiations and coordination remained between the latter and the municipalities. The Dutch parliament in this case had little involvement, being limited to concerns over delays, accidents, and later approving and transferring the control of the project to the regions. Additionally, within this context, public debate was minimal (OMEGA Centre, 2014).

3.3.2 The Bus Rapid Transit project – Rio de Janeiro, Brazil

Rio de Janeiro, located in the southeast region of Brazil, is the second largest city in the country, housing more than half of the metropolitan area population, which comprises over 12 million inhabitants. The latest data, from 2010, shows an average population density of approximately 5.5 thousand inhabitants per km², which is similar to that of Great London. Between the Global South cities, Rio is one of the richest as well as one of the most unequal cities in the world, with a Gini coefficient² of 0.62 (Pereira R. H., 2018).

This inequality can be spatially observed when housing policies and housing costs near the city centre have pushed low-income groups towards regions with poor urban infrastructure conditions. In contrast, higher income groups have been historically benefited from easy access to transport services, urban amenities, and economic opportunities, located in the coastal area and the city centre (Pereira R. H., 2018).



Figure 7: Municipality of Rio de Janeiro (dashed line), Brazil, with medium and large capacity corridors (Pereira, 2018).

² The Gini coefficient is a measure of income distribution across a population. It ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality (OECD, 2021).

Pereira (2018) adds that a distinguish characteristic of the urban arrangement in Rio is the presence of slums, not only in the periphery, but also across the city in general. When it comes to the transport conditions, the city of Rio de Janeiro offers a poor service with high congestion levels and one of the highest average commute times compared to global cities, especially for those who live in the periphery (Pereira & Schwanen, 2013). Also, according to UN-Habitat (2013), it stands as one of the most expensive transport systems in the world. Another peculiar characteristic is Rio's landscape, which has a strong influence over where the urban infrastructure can develop or not, including large-capacity transport corridors (Pereira R. H., 2018).

In order to host mega-events such as the FIFA World Cup in 2014 and the Olympic Games in 2016, great urban transformations were realized in Rio. These events fast-tracked the implementation of important public transport projects in the city. According to Pereira (2018) between 2012 and 2017 approximately U\$5.5 billion were invested to extend the metro lines, to build a new light rail system and four new BRT corridors, of which one is still under construction, being this the TransBrasil corridor (red line in Figure 7). BRT' systems are operated with exclusive lanes, where the boarding of the passengers happens at the station level and the ticket payment occurs when entering the station, which makes it similar to a metro system (ITDP, 2015). Moreover, to build a BRT system can cost 4 to 20 times less than a light rail system or 10 to 100 times less than a metro system (Wright & Hook, 2008).

Rio's BRT project was firstly thought in 2007 so the city could host the 2016 Olympic Games. Also in 2007, the city had hosted the Pan-American Games, a successful experience, although some constructions suffered deliver delays. In order to host the Olympic Games, the competition's infrastructure needed to be dispersed trough the city combined with a good and fast transport support. Thus, the BRT system was chosen for its relatively cheap and time-wise characteristics. The project was funded by federal, state, and municipal institutions (i.e., Ministry of City, Ministry of Transports, and State and Municipal Governments) as well as the Brazilian National Bank of Development (BNDES) (RJ, 2019). Lastly, international organizations, like the International Bank for Reconstruction and Development (IBRD), the World Bank, the International Federation of Association Football (FIFA) and the International Olympic Committee (IOC) set the standard required for all new developments, including the new BRT corridors (Dametto & de Mattos, 2013).

3.3.3 Comparison of cases

Since the RandstadRail and Rio's BRT cases have been introduced, it is important to compare one with the other in order to clarify the reasons for the selection of these projects. Above all, as previously mentioned, each case comes from completely different urban, social, political, and economic backgrounds. However, this section not only discusses their differences, but also the similarities between them.

Differences

As already mentioned, each case comes from a contrasting background that differ on their urban, social, political, and economic process. One of the main differences is that the RandstadRail makes use of existing transport infrastructure and involves three different types of transport (i.e., tram, metro, and heavy rail), while the BRTs in Rio de Janeiro were built from scratch and comprises of only one transport mode. First, Kasraian, Maat, & van Wee (2016)

conducted a study analysing how the railway network evolved in the Randstad area, from the time of its introduction, which dates from 1850, to the present day and its impact on urbanisation. Their long-term study was able to identify that the railway length and the total number of stations followed the same tendency in general. They kept growing until 1920, achieving its climax around that decade. Between the 1930s and 1950s they suffered a deteriorating process until stabilizing around the 1960s. Subsequently, from 1970s to the present moment a course of expansion restarted, although at a slower pace (Kasraian, Maat, & van Wee, 2016).

A key point is that the station numbers demonstrated more variation than railway length, and as predicted the railway development has been highly associated with the urban growth pattern in the beginning. Later, urbanisation developed and intensified closely to the stations. However, this scenario changed with the introduction of the car and other transport modes, making urban development possible to happen far away from stations. Finally, at the turn of the 21st century, urban development partially returned to the vicinity of stations, a process that can be illustrated by the RandstadRail project itself (Kasraian, Maat, & van Wee, 2016).

In order to understand the current TOD situation in Brazil, it is important to be aware of how Brazilian cities have developed in the last decades. The urban population in the country grew from 31% to almost 85% between 1940 and 2010 (Evers, et al., 2018). This growth was not properly accompanied by the urban planning in most of the Brazilian cities, which led to a dispersed, distant, and disconnected urban forms, where residential areas are far from opportunities such as employment, services, and leisure (Evers, et al., 2018). Besides that, the investments made in those years prioritized private vehicles. To illustrate, there was an increase of 30% in the number of trips by car in Brazil from 2003 to 2014, whereas for public transport this number grew 23%. In addition, for the same time span, the vehicle fleet increased by 116%, while the Brazilian population increased 21.3% (ANTP 2016 as cited in Evers, et al., 2018). To summarize, the biggest Brazilian cities are extremely car-oriented, thus using the infrastructure inefficiently, with a lot of congestion, high pollution, and accident rates.

As a consequence of the Brazilian urban planning, low-income population is the most impaired group, which spends more time travelling, with less access to opportunities, and hindered by the public transport inefficiency, since they are the ones who mostly use collective transport. Moreover, the prioritization of active modes of transport was only addressed in Brazilians' laws in 2012, with the National Mobility Plan. However, TOD started to be introduced in the cities' policies as of 2014, by means of municipal strategic plans, which are revised every 10 years (Evers, et al., 2018). Therefore, TOD is recent in Brazil, and little progress can be found so far, which makes the results obtained in practice are not sufficient to draw general conclusions.

Focusing on the case of Rio de Janeiro, as of the 1980s the city went through an economic stagnation, losing its economic importance, especially in its regional context. Social aspects such as income, housing, and essential urban services access, including passenger's transport, became worse. However, by the end of the 1990s signs of economic improvements started to appear and the years of 2008 and 2009 were of crucial recovery (despite the financial crisis that ravaged the world at the time). Moreover, the city was target of numerous investments in the areas of steel, ports, shipbuilding, and petrochemicals simultaneously to the

announcement of hosting two mega-events, the 2014 FIFA World Cup and the 2016 Olympic Games reinforcing the opportunity that Rio had to reverse the trend of economic decay (Rodrigues, 2013).

However, in order to host those mega-events, the city had to comply with a series of requirements to support the number of visitors entering the city, keeping everything inside the given budget and the period of time available. One of those requirements was to expand the transport infrastructure and the service, which resulted in the BRT. Even though this was the first BRT system in Rio, the city of Curitiba (capital of the state of Paraná, south region of Brazil) is responsible for the first BRT experience in Brazil, since 1974 (Christino, 2017).

Similarities

To begin with, both cases represent a transport innovation in their context. The RandstadRail case not only consists of a combination of existing transport systems, but also comprises of three other interesting innovations. First, from a technical point of view, despite the existing know-how of tram, metro and heavy-rail systems, their couplings demanded an expertise not known at the time. This concerned two different types of vehicles running on the same infrastructure (i.e., rail track) and two safety systems along the railway, being part of it controlled by traffic lights and the other part dependent on the conductor's sight. Secondly, from an institutional perspective, the division of roles between the involved stakeholders was also new, as the central government gave the project autonomy (see section 3.3.1). Additionally, the Municipality of The Hague had to build infrastructure outside its municipal limits, a new fact in the Netherlands. Thirdly, the legal context of the project was also new (see section 3.3.1). The safety regulations to be applied to the RandstadRail were unclear since the existing railway safety regulations were not enforced to light-rail. Besides, the Ministry of Transportation issued a policy guideline containing procedures and roles to support the safety management and delegated this responsibility to Haaglanden, an urban district responsible for interconnecting 'Hofplein line' from the border of the region to The Hague Central station. Thus, the RandsatdRail was the first case wherein safety was managed according to these policy guidelines (van Der Voort et al, 2011).

Regarding Rio's BRT project, the lanes implemented to fulfil the mobility commitment established with the IOC, were the first experience of this type of transport system at the city of Rio de Janeiro, which brings an originality and pioneering degree to the project. Also, one of the lanes, the Transoeste corridor (blue line in Figure 7), was the first initiative aimed at the implementation of a structuring system for passenger transport in a region (Barra da Tijuca and Recreio dos Bandeirantes neighbourhoods) that, since the 1970s, has had great real estate dynamism (Moura, 2014).

Besides their innovative aspect, both projects were implemented on consolidated urban environments. However, part of each project is also placed around greenfield areas. So, not only they were conceptualised to satisfy a transport demand, but also to orient the urban (re)development around their new stations and stops.

3.4 Operationalization

The operationalization process concerns the transition from theory to empirical research. In other words, *"theoretical concepts are translated into entities that can be observed or*

measured in the real world” (van Thiel, 2014, p. 43). The aim of this step is to give a definition of the theoretical concepts that are of crucial importance to the present study, which are accessibility, person’s capability, social justice, land use, and transport system and to use their definition to compare with the interviewees’ responses. In Table 4, the research themes, indicators, and values are summarized.

Table 4: Operationalisation of research themes.

Research theme	Indicator	Value
Accessibility	Definition	The potential for reaching spatially distributed opportunities, such as housing, jobs, health care, etc.
	Function	To enhance land use, transport developments and policy plans on the functioning of the society in general.
	Measures	Infrastructure-, location-, person- or utility-based. Components influencing 'real' accessibility are land use, transportation, temporal, individual, and cognitive components.
Person’s capability	Definition	Person's level of freedom of being and doing what they consider valuable.
	Function	Assess if the transport infrastructure and services provide accessibility and assess people's perceived accessibility.
	Measures	Top-down and bottom-up approaches.
Social Justice in transportation	Definition	Fair distribution of opportunities and resources among society.
	Function	To reduce inequalities.
Land use and transport integration	Definition	Combination of transport strategies and land use measures that support each other.
	Function	To acknowledge the path-dependency that urban planning and infrastructure development have with each other.

4. Research results

In the present chapter, the research results are presented with an introduction, where the research question and sub questions are stated once again, followed by the interviews' results of each case study. These are divided according to the conceptual themes.

4.1 Introduction

This exploratory research on spatial and transport planners' point of view concerning Land use and Transport (lack of) integration, focusing on the research themes of accessibility and social justice, has produced qualitative results that were gathered through on-line interviews. These are further presented in this chapter with their distinction per case study. The results described below indicate consistency with the already mentioned factors that are frustrating the Land use and Transport integration (see section 1.1), but also new insights were generated. When it comes to the concepts of accessibility and social justice, there are still disagreements that will be later discussed in Chapter 5. The interviews served as empirical data to answer the main research question and its sub questions.

Respectively for the RandstadRail and Rio's BRT project, the research results presented are set out to answer the following questions:

What are the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport in the context of, respectively, a typical Global South and Global North metropolitan region?

- a. *What are, on spatial and transport planners' point of view, the factors hindering the integration between land use and transport policies in the Province of South Holland and the state of Rio de Janeiro?*
- b. *How spatial and transport planners define and measure accessibility in the Province of South Holland and the state of Rio de Janeiro?*
- c. *What is and how spatial and transport planners aim to achieve social justice in the Province of South Holland and the state of Rio de Janeiro?*

4.2 Province of South Holland - RandstadRail project

LUTI

When asked about the integration between spatial and transport planners, the respondents mentioned several factors that restrain those roles from naturally coming together. Firstly, the government organisation makes a evident separation of roles and responsibilities. On the one hand, most of the spatial planners work at the municipal level (the minority work at the regional level), being in charge of housing plans and new working areas, for example. On the other hand, transport planners working with public transport and infrastructure are at the regional and national level, while most of the ones working at the municipal level work with individual modes related issues, such as bicycle and automobile (Interviewee 3, personal communication, July 19, 2021 & Interviewee 11, personal communication, August 17, 2021).

“The responsibilities for part of that integrated approach are with different parties, and they have sometimes different goals, different ambitions and that is a risk for finding the best solution.” (Interviewee 11, personal communication, August 17, 2021)

One of the respondents argued that combining spatial and transport planning is much easier when the project is placed on greenfield areas than if placed on the inner city. In the case of the RanstadRail project, some parts of it were indeed in undeveloped land, being considered as a crucial factor for its success (Interviewee 2, personal communication, July 19, 2021). At the same time, some claim that although the mobility plans were on the regional level and the housing plans on the municipal level, both ‘accidentally’ fit together. The boards were communicating with each other since the regional investment on public transport was only considered knowing about the municipal housing plans. Yet, there was no master or integral plan (Interviewee 3, personal communication, July 19, 2021).

Furthermore, the challenges remain on the institutional as well as the decision-making aspects on trying to bridge the different levels and to make the decision-making process more integral, especially when the national government is involved. According to Interviewee 11 (personal communication, August 17, 2021), the reason relies on the national government still using cost-benefit analysis in order to know how faster and how many people can travel, underestimating the overall benefits from a new line as, for example, how many more jobs a new line can reach.

An interesting insight is that people working within the different government levels should keep a mind-set to always pursue communication with other departments besides the transport and spatial planning, such as the sustainability, social and economic areas. But, above all, the boards have a responsibility to make this communication flow regularly. On the whole, respondents expressed that municipal and regional levels have been working with one integrated vision and approach, finding more resistance only when the national government is part of the process (Interviewee 3, personal communication, July 19, 2021; Interviewee 11, personal communication, August 17, 2021; Interviewee 12, personal communication, August 18, 2021).

Accessibility

All interviewees demonstrated to acknowledge the concept and the metrics of accessibility that are applied in their daily work. Besides recognising the importance of the concept, all of them pointed out that measuring it is already part of the transport product. Thus, questions such as *how many jobs can be reached within 30/45min by public transport combined with walking or cycling; how many people will use a determined line from point A to point B; how many potential working places people can reach from one neighbourhood within 30/45min by public transport* are very common to determine the accessibility indicators.

“Accessibility is about facilitating that people can take part in society... bringing people to work, school and helping them to develop, to create a good life. And then

mobility is one of the solutions.” (Interviewee 11, personal communication, August 17, 2021)

When further asked about measuring accessibility from an individual point of view, selecting groups of people, for instance, per income, Interviewee 11 (personal communication, August 17, 2021) explained that it is still difficult to make these kinds of selections. On the one hand, they are working on more datasets that can give the information needed and, consequently, a detailed conclusion about job and/or school opportunities, for example. Nevertheless, he argues that the transportation model has its limitations. On the other hand, Interviewee 12 (personal communication, August 18, 2021) stated that dividing society into different groups is always a bit sensitive, even though he demonstrated curiosity regarding what the results would be when making those selections.

Social Justice

When it comes to the theme of social justice, interviewees acknowledge that this topic needs constant attention, even though they argue that there are already important measures to decrease social inequities in the context of land use and transport. Albeit transport can be considered expensive for some groups in the Netherlands, the respondents stated that around 40% of social housing is located in the inner city, next to amenities and transport stations (Interviewee 2, personal communication, July 19, 2021). Moreover, the interviewees acknowledge that different social groups have their own mobility culture and looking at these differences is a common strategy to advance on social issues related to transport access.

One of the respondents stated that there is also an injustice regarding investments, of which 90% goes to urban areas, while there are more than 700 rural villages in the country lacking public transport options. According to Interviewee 2 (personal communication, July 19, 2021), a good approach would be to decrease investments on highways and transfer part of it to public transport and bike infrastructure, and systems (Interviewee 2, personal communication, July 19, 2021).

All in all, the respondents believe that a stronger integration between spatial and transport planners can have positive impacts on inequalities of access to transport and opportunities, especially to avoid negative impacts such as gentrification. According to interviewee 12 (personal communication, August 18, 2021), making space for more social housing in areas that are going through a (re)development is one way towards social justice. At the same time, Interviewee 12 (personal communication, August 18, 2021) acknowledges that money is a factor that still leads many decisions particularly when building a new station.

“When you build a new station, the prices around it rises. And building a station can be quite expensive, so maybe making more expensive houses can help to finance the station we just built...that effect is quite difficult to avoid.” (Interviewee 12, personal communication, August 18, 2021)

Given the previously discussed points, the respondents agree that LUTI and accessibility can help to create more social and equitable cities, albeit there is still room to grow on those

themes and more research needs to be done to understand factors that underline the topic of social justice.

4.3 State of Rio de Janeiro - BRT project

In the context of the mega-events, the 2014 FIFA World Cup and the 2016 Olympic Games, the city of Rio de Janeiro received the largest amount of investment in urban mobility projects of all its history. Those were indeed important transport contributions. However, a recent study developed by Pereira (2018) has concluded that the accessibility benefits from the transport policies enforced in Rio were in their majority over middle- and higher-income classes, which reinforced existing urban inequality conditions. Similarly, a study conducted by Moura (2014) concluded that the integration between land use and transport planning on the BRT projects should be improved in some respects. For instance, the low population coverage of the system in its area of direct influence together with bad infrastructure conditions of non-motorized modes, such as walking and cycling.

Having said that, the spatial and transport planners' point of view concerning the research themes under study are presented in the following paragraphs.

LUTI

From all undertaken interviews, most of the spatial and transport planners share similar opinions when asked about their own judgement on the integration between both actors. That is, the proximity between those two roles is still very modest, although they see changes towards a greater integration.

“So, I think this issue of the interaction between land use and transport is getting better these days... public managers are starting to understand that these two matters are fundamental, and the population is starting to realize that too.” (Interviewee 1, personal communication, July 09, 2021)

However, when asked about the case of the BRT project, the interviewees believe that the integration could have been better on the planning and decision-making process. According to the respondents, some of the reasons rely on the time span available to implement the corridors, since there was a pressure for on-time delivery for the mega-events. Besides, some factors have been presented by a few interviewees that go beyond the present case study situation. Those relate to an institutional barrier, since inside the Municipality of Rio de Janeiro there is a clear division of departments, one that involves only transport planning matters and another involving urban planning issues alone. In addition, within each department there are distinct interests and agendas. However, some interviewees working at Rio's municipal government have noticed progress on this topic, arguing that there exists flexibility for employees to change their working department, then experiencing different roles and expanding their know-how. To illustrate, some respondents claim that currently there are spatial planners working in the transport and mobility department whereas there are transport planners working in the land use department.

Accessibility

According to some of the interviewees, when it comes to the concept and the metrics of accessibility, there are still lack of use of it, while for other interviewees there is acknowledgment and use of it. It is common sense among the respondents who work at Rio's municipal government of what accessibility means. In addition, most of them share the same knowledge about the metrics in use, with the predominance of location-based measure together with the land use component.

In Brazil, the interviewees made a distinction of accessibility on their scales of analysis. They distinguished between the macro accessibility and the micro accessibility. The former, which is the one relevant for the present study, means the opportunity to access essential activities, such as living, education, health care and employment. While the latter relates to the conditions of use of urban vehicles and equipment by people with disabilities or reduced mobility, i.e., if an individual is able to easily reach the public transport (first/last mile), mainly through non-motorized modes (e.g., walking and cycling). Also, one of the respondents argued that the planning process for the BRT project followed all features necessary to improve the macro accessibility. Nevertheless, no attention was paid to the micro accessibility. Thus, the upgrading of streets near the stations, investments on parking facilities or bicycle lanes and stand to facilitate connections with other transport modes were not prioritized on the agenda.

The accessibility metrics in use at Rio reflect the dominance of location-based measures with the focus on transport and land use components (see Table 2). In other words, it involves origin and destination (OD) studies taking into consideration, mainly, residential, educational, employment, health care and income indicators. Nevertheless, under the BRT circumstances, those studies have been simplified in order to fit it within the budget and the time-span available at the time of the project (Interviewee 8, personal communication, August 06, 2021). In contrast to what has been just presented, a few respondents claim that accessibility metrics are still under explored among Rio's municipal government. Macro data such as the percentage of people using a determined transport mode is their main source combined with in loco studies.

“We still do not have this culture of using evidence data to propose projects in Rio. When I have to develop a project, my team and I go into the field making surveys, collecting data and using it almost in a timely manner.”
(Interviewee 6, personal communication, July 26, 2021)

Last but not least, according to Interviewee 9 (personal communication, August 10, 2021), the municipality of Rio has associated to their work some indicators developed by the Institute for Transportation & Development Policy (ITDP). One of them includes the PNT (People Near Transit) that measures the number of residents in a city that live within a short walking distance of high-quality rapid transit (ITDP, 2016). This and other similar indicators have been incorporated by the municipality in order to scientifically support and track the planning process.

Social Justice

All interviewees expressed their understanding of what social justice means in the context of urban and transport planning and gave different reasons why and how social justice could be improved in the city of Rio de Janeiro, generally speaking. Some of the definitions include that transport should be a universal right, just as education and health care (Interviewee 1, personal communication, July 09, 2021); to guarantee that all social groups have access to all parts of the city (Interviewee 10, personal communication, August 11, 2021); to favour transport modes that are inclusive and sustainable, such as non-motorised approaches (walking, cycling and public transport) (Interviewee 9, personal communication, August 10, 2021); and, provide dignity of access and security/comfort while travelling (Interviewee 6, personal communication, July 26, 2021).

After explaining their definition of social justice, the interviewees were asked about how equity can be improved in the transport context. Interesting responses were gathered and some of them were very similar. The main one relies on the ticket fare, which is taken as extremely expensive disfavours vulnerable groups, which are the ones that count the most on public transport. For this issue, many spatial and transport planners mentioned the relevance of transport infrastructure and operation if it was subsidized by the government and an assistance that low-income groups could receive as well. A few other interviewees argue that if the transport network was better disseminated on the urban territory, together with a proper supply of modes (that are comfortable and safe) and the allocation of opportunities that were well connected, then social justice would be achieved. Last but not least, a crucial factor is the institutional recognition that transport should be considered essential just as health care and education are.

5. Discussion

This section elaborates on the findings of this study through a discussion using the empirical data collected through the interviews that were presented in the previous chapter along with the literature referenced in the theoretical framework (see Chapter 2). This will help to answer the research questions.

5.1 LUTI

This section provides answers to sub question A, that is:

What are, on spatial and transport planners' point of view, the factors hindering the integration between land use and transport policies in the Province of South Holland and the state of Rio de Janeiro?

As previously indicated in the results, the Dutch as well as the Brazilian institutions make an evident separation of roles and responsibilities. While this division is mainly between the levels of government in the Netherlands (i.e., national, regional, and local), in Brazil this happens within the national, the state, and the local government, each having different departments for land use and transport concerns. Under those circumstances, positive and negative aspects can be drawn up.

Firstly, even though the Dutch institutions have this division, planners recognised a good integration between the regional and local governments (here the Province of South Holland and the Municipality of Rotterdam) since they work from an integrated vision and approach. Therefore, this interrelation can be framed as an institutional congruence, where one reinforces the other. Secondly, when the national government is also involved, planners find more difficulties to coordinate the existing methods of the decision-making process. One of their claims suggests a mismatch of tools to assess public transport benefits since the goals are sometimes also different. Thus, in this case an institutional contextual incongruence is what best defines this lack of integration since institutions are taking opposite directions that in the end can negatively affect each other, as already defined. Thirdly, the RandstadRail project is considered to be a successful case in the Netherlands. As explained in section 3.3.1, the national government had little involvement with the project, giving the responsibility to the regional and local governments. And, from the interviews, respondents demonstrated that LUTI is hard to be achieved when the national government is involved. Having said that, the success of the RandstadRail may have as one of its reasons the limited involvement of the national government.

In the case of Brazil, the development of the BRT project remained mainly at the municipal scale. Yet, respondents were not satisfied with how spatial and transport planners interact with each other. Besides the clear division of departments, these usually have distinct goals and decision-making processes, which again takes one institution to act in different direction from the other. Although this contextual institutional incongruence still exists, some respondents argued that this scenario might be changing towards a greater integration. This concerns the flexibility that public servants have in order to change their working department and be in contact with different occupations, which may lead to an acknowledgment of shared planning procedures and concepts.

5.2 Accessibility

This section provides answers to sub question B, that is:

How spatial and transport planners define and measure accessibility in the Province of South Holland and the state of Rio de Janeiro?

The definitions of accessibility presented by interviewees from the RandstadRail project follow what has been discussed in section 2.2.1 and later operationalised (see Table 4) as the potential for reaching spatially distributed opportunities such as housing, jobs, health care, etc. As for the respondents from the BRT project, they provided similar definitions, albeit most of them still confuse it with the concept of micro accessibility. Altogether, all interviewees acknowledge the concept and believe that it works as an important indicator to guide spatial and transport policies and developments.

The main differences between both cases rely on the metrics of accessibility in use. According to spatial and transport planners from the Netherlands, the national government makes use of infrastructure-based metrics since it is concerned with travel speed values. However, the regional and local government make use of location-based metrics since it aims to analyse accessibility given the spatially distributed activities. In addition, some planners at the local level are starting to use person-based measures in order to understand which groups of people are accessing a specific employment location, for example. This goes in line with the top-down approach when accessibility is recognised as a capability. Nonetheless, planners are still finding difficulties to measure accessibility under this approach.

In the case of Brazil, accessibility is mainly measured through location-based metrics just as in the Netherlands. However, other possible metrics, such as the person-based, are still little explored among the municipal government. Yet, an important policy institute, the ITDP (Institute for Transportation and Development Policy), that keeps an open dialog with Rio's government, together with the Institute of Applied Economic Research (IPEA), has been developing interesting studies concerning accessibility of different social groups to opportunities (e.g., employment, health care and education) in the 20 largest cities in Brazil, including Rio de Janeiro. Those studies resulted in open data available with the purpose of guiding researchers and public managers in the elaboration and assessment of urban policies.

5.3 Social Justice

This section provides answers to sub question C, that is:

What is and how spatial and transport planners aim to achieve social justice in the Province of South Holland and the state of Rio de Janeiro?

The topic of social justice is very broad even though the focus of the present study remained in the transport context. With this in mind, some interviewees gave their definition that is closer to what has been operationalised as social justice in transportation (Table 4), while others were too specific on their explanation. However, there is no right or wrong answer when defining it and it is possible to see a correlation between some definitions with a specific justice theory. To illustrate, one of the definitions was about looking and understanding that each social group has its own cultural mobility, which is something that the CA's takes into account,

i.e., the set of capabilities available to an individual or a group of people and what this individual or people end up doing. Another example is the definition of favouring transport modes that are inclusive and sustainable. A correlation with the CA's is also possible in this case, since being inclusive means equally respecting people, one of the CA's guiding principles of distribution. One last example concerns the definition that understands social justice as a diversity of problems, meaning that solutions will also be diverse. Differently from the other examples, the latter correlates to the theory of Intuitionism, which has no clear distribution pattern, arguing for context-dependent and pluralistic approach to distributive problems. All things considered, all respondents acknowledge it as one of the most important topics in transportation and urban planning.

Furthermore, respondents were able to express how equity in transportation can advance. In both contexts interviewees expressed the need to subsidize or develop social inclusion products in the tariff ticketing system targeting vulnerable groups who rely the most on public transport. These solutions interact with Rawls' distributive rule that is based on the *maximin* criterion, which suggests policies alternatives that maximises the prospects of the least advantaged groups.

5.4 Answering the research question

During this study, multiple questions have been raised. The answers to the sub questions have been extensively discussed in the previous sections acknowledging the research results from Chapter 4 and the theoretical framework stated in Chapter 2. Following this discussion, this section provides the answers to the main question, that is:

What are the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport in the context of, respectively, a typical Global South and Global North metropolitan region?

The cases under study have demonstrated some similarities, especially to what concerns the institutional challenges to implement LUTI. Both share problems such as roles and responsibilities separation and distinct goals and decision-making processes within levels of government and departments. Nevertheless, the cases contrast when it comes to the understanding and applicability of concepts like accessibility, which has consequences over inequalities of access to opportunities.

Before delving into the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport in each of the present study cases, it is important to emphasize that in order to achieve LUTI institutions should share the same goal and carry a common decision-making process. Regarding the impacts of institutional incongruence in the case of the Netherlands, all governmental levels, from national to local, make use of accessibility metrics in both urban and transport planning. However, since the national government makes use of different metrics than the ones that are being used by the regional and local levels, their studies will possibly produce distinct understandings and outcomes. Consequently, it may lead to a conflict of where and/or whom should investments take as priority. In other words, while some metrics may indicate where to invest in order to decrease the travel time of a specific line, it will still not expose the inequality of access to public transport. Thus, keeping the demands of vulnerable groups unnoticed and unaddressed.

As to the case of Brazil, when it comes to the concept of accessibility, there is still misunderstanding of what it means and lack of use, for some planners, when it comes to the concept of accessibility, which results in inefficient public policies and debates. Thus, before expanding the use of accessibility metrics and incorporating the use of data to guide policies and planning procedures, it is important that planners understand the difference between the topics of macro accessibility, micro accessibility, mobility, and transportation, which are commonly mistaken as meaning the same thing. As long as public managers and planners do not integrate the use of accessibility and its metrics to their work, especially the person-based one, vulnerable groups will keep lacking access to public transport and opportunities that are essential to everyone (i.e., health care, education and employment next to their housing).

All things considered, the accessibility analyses on both contexts have the potential to expose inequalities, guide investments, refine the decision-making process of urban projects and create fairer and more sustainable cities. Considering accessibility as a central concept result in spatial and transport public policies that are not only more efficient, but also allows a wider range of more inclusive actions. Thus, the more accessibility, the better, since it means that a larger amount of people is being able to access the opportunities and services they value (ITDP Brasil , 2020).

6. Conclusion and Recommendations

In this chapter, the final conclusions are presented together with an overview of what this research has produced followed by recommendations for future research.

6.1 Conclusion

The world has become increasingly urbanised over the past decades and several issues have emerged as a consequence to the ongoing urban population growth along with uncontrolled urban development. Those concerns relate to unorganised spatial distribution of activities demanding more transport systems to link one place to the other. Thus, generating a number of negative externalities such as congestions, air pollution, discrepancies of access to public transport and services, and social inequality. In order to reverse this scenario and guide this growth in a sustainable direction, researchers have concluded that the leading solution is to build denser and more mixed communities. However, this is only possible if transportation and land use planning are carried side-by-side. Although Land Use and Transport Integration (LUTI) benefits are well recognised, its implementation has faced substantive challenges, mainly institutional.

Therefore, elaborating on a wide body of literature on justice and equity in transportation as well as accessibility and LUTI, this study has set out to provide more in-depth understanding into what are the impacts of institutional incongruence regarding LUTI implementation on individuals' access to public transport. For this reason, the present research carried out a qualitative study using two real life cases with contrasting backgrounds. Being those the RandstadRail project in the Netherlands, an interregional plan connecting the cities of The Hague and Rotterdam with other surrounding areas by means of three light rail-based lines and one bus system with dedicated lane; and the BRT project at the city of Rio de Janeiro, Brazil, consisting of four new bus systems with dedicated lanes (of which one is still under construction) that were faster implemented as the city would host two important mega-events, the 2014 World Cup and the 2016 Olympic Games.

The research methods consisted of content analysis in the form of desk research to gain more understanding of the existing literature about the subjects under study and the cases, and semi-structured interviews. The interviews had the purpose to gather empirical data about transport and spatial planners' experiences on their integration of roles and responsibilities in the two case studies. Additionally, planners were asked to share their point of view about the factors hindering LUTI implementation, how they define and measure accessibility, and what is and how they aim to achieve social justice. Combining the interviews' results presented in Chapter 4 with the literature referenced in the theoretical framework in Chapter 2 enabled the elaboration and discussion of the answers to the research sub questions and the main question in Chapter 5.

It was observed that the cases shared similarities and differences. Both projects are characterized by having an evident separation of roles and responsibilities between spatial and transport planners within the different levels of the government or even within the local level. Also, both demonstrated a lack of integral goal and decision-making processes within institutions. Nonetheless, the interviewees have manifested contrasting results to the understanding and applicability of the concept of accessibility. While the Dutch planners

present a coherent understanding of accessibility, they still encounter divergence of the metrics in use and are facing difficulties to add person-based metrics to the transport model. As to the Brazilian planners, a need for clarification of meanings between the concepts of macro accessibility, micro accessibility, mobility, and transportation is crucial. In addition, planners, especially the ones working within the government are limited to the use of one accessibility metric and make little use of research and data in order to develop consistent policy plans and debates.

In either case, the institutional incongruence regarding LUTI implementation on individuals' access to public transport is very similar for both contexts. Being these an inadequacy of understanding of where and/or whom the investments should prioritise and keeping groups that rely the most on public transport without proper access to opportunities and services that are essential to individuals' development. In essence, the research results indicate that LUTI implementation still needs improvements, reinforcing existing literature that concerns LUTI. Also, despite the socio-economic and historical differences that exist between the Netherlands and Brazil, in both contexts the existing institutional incongruence affects the access of vulnerable groups to public transport and opportunities since public policies and investments are not directly targeted to those groups.

6.2 Research limitations and recommendations

As any other study, the present research also has its own limitations. Firstly, the case study as strategy has provided the opportunity to make an in-depth analysis in two diverging contexts. However, the empirical data has highly location-related results, then generalizations are almost impossible to be made. An alternative could be choosing for a survey-strategy instead, which would enable looking at additional cases, this way increasing the generalizability of the research outcomes.

Secondly, the number of interviews obtained for each case study is very different, which might have affected the research results in the end. Four interviews were conducted in the case of the RandstadRail project in contrast to the eight conducted for the case of Rio's BRT project. One of the reasons why these numbers differ may rely on the fact that all the interviews were made in the months of July and August, when most people in the Netherlands are on summer vacation. Thus, some potential interviewees could not be reached on time. Also, it would be interesting to conduct some interviews with planners working at the Dutch national government in order to debate points raised by the interviewees from the regional and local level who expressed the lack of integration coming mainly from the national level.

Thirdly, some of the research themes such as capability approach, accessibility and land use and transport integration (specifically the node-place model) could have been analysed by a quantitative method as well. A mix method approach would be interesting to combine the empirical data gathered through the interviews with the quantitative outcomes, which later could allow comparisons between both results. However, this was out of the scope of this research.

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Appendix I: Interviewees

Brazil		The Netherlands	
Interviewee 1	Transport Engineer of the Municipality of Rio de Janeiro – 09.07.2021	Interviewee 2	Economic Geographer and Regional Urban Planner of the province – 14.07.2021
Interviewee 4	Transport Engineer at Sinergia Estudos company – 19.07.2021	Interviewee 3	Program Manager for Public Transport – 19.07.2021
Interviewee 5	Architect and Urban Planner at IAB-RJ – 26.07.2021	Interviewee 11	Strategic Advisor of the Municipality of Rotterdam – 17.08.2021
Interviewee 6	Architect and Urban Planner of the Municipality of Rio de Janeiro – 26.07.2021	Interviewee 12	Urban Planner of the Municipality of Rotterdam – 18.08.2021
Interviewee 7	Architect and Urban Planner of the Municipality of Rio de Janeiro – 26.07.2021		
Interviewee 8	Architect and Urban Planner at ZK architecture office – 06.08.2021		
Interviewee 9	Human Development Manager of ITDP Brazil – 10.08.2021		
Interviewee 10	Transport Engineer of the State of Rio de Janeiro – 11.08.2021		

Appendix II: Questionnaire for the Province of South Holland

1. What is in your opinion the role of the Spatial Planners/Transport Planners?
2. What was your role as Spatial/Transport Planner in the Randstad Rail project?

LUTI

3. What do you think about the integration between Spatial Planners and Transport Planners in the development of projects in the city?
4. How was that integration on the Randstad Rail project?

Accessibility

5. Are you familiar with the concept of accessibility?
6. What is accessibility for you?
7. Are you familiar with the metrics of accessibility?
8. Do you use the concept of accessibility on your work? And for the Randstad Rail project, was it used?
9. Do you use the metrics of accessibility on your work? And for the Randstad Rail project, was it used?
10. Do you think it is important to measure accessibility as an indicator?

Social/transport justice

11. Are you familiar with the concept of social/transport justice?
12. How can equity be improved?
13. Do you think that the integration between Spatial and Transport Planners could improve social/transport justice? Why and how?
14. Do you think that the concept and metrics of accessibility could be used to improve social/transport justice? Why and how?

Appendix III: Questionnaire for the Municipality of Rio de Janeiro

1. What is in your opinion the role of the Spatial Planners/Transport Planners?
2. What was your role as Spatial/Transport Planner in the BRT project?

LUTI

3. What do you think about the integration between Spatial Planners and Transport Planners in the development of projects in the city?
4. How was that integration on the BRT project?

Accessibility

5. Are you familiar with the concept of accessibility?
6. What is accessibility for you?
7. Are you familiar with the metrics of accessibility?
8. Do you use the concept of accessibility on your work? And for the BRT project, was it used?
9. Do you use the metrics of accessibility on your work? And for the BRT project, was it used?
10. Do you think it is important to measure accessibility as an indicator?

Social/transport justice

11. Are you familiar with the concept of social/transport justice?
12. How can equity be improved?
13. Do you think that the integration between Spatial and Transport Planners could improve social/transport justice? Why and how?
14. Do you think that the concept and metrics of accessibility could be used to improve social/transport justice? Why and how?