From peripheral challenges to core solutions: Exploring sustainable mobility in rural tourism

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To my dear departed mama.

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Beatrice Waleghwa

Borlänge, March 2025

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Abstract

This thesis is concerned with the study of sustainable mobility in rural tourism areas. In particular, it aims to: i) contribute to a better understanding of the transport challenges faced by rural tourism areas; and ii) explore how to plan for sustainable mobility in such places. The overarching research question that has guided this investigation is as follows: *How can rural tourism regions promote sustainable mobility?* To achieve the aim of this thesis, two main aspects of sustainable mobility are addressed. Firstly, by incorporating perspectives from various stakeholder groups, including tourists, residents, second-home owners and practitioners involved in transport planning, the study seeks to gain a comprehensive understanding of transportation challenges and the travel practices of the various groups. Secondly, the thesis explores how Public Participation Geographic Information Systems (PPGIS) – a rarely-used participatory land use planning method in tourism studies - can aid in sustainable mobility planning. The thesis draws from several concepts and a theory. The concepts include monomodalism, car dependency, wicked problems, (un)desirable transport futures, automobility and public participation in planning processes. The theory is that of social representation. The thesis is based on a case study approach, focusing on four selected locations in Sweden: Sälen; Malung-Sälen; Älvdalen; and Åre. These locations are prominent rural tourism regions that face significant transport-related challenges for which they seek to implement sustainable solutions. A mixed-methods approach is employed, integrating both qualitative and quantitative techniques to address the objectives outlined in the five papers that make up the thesis. The findings of the thesis collectively show that the main challenge to sustainable mobility in rural tourism regions is one that can be termed

a crisis of uncontested poly-challenges. In other words, these regions simultaneously face a conundrum of transport challenges, including the hegemony of the private car coupled with poor public transport services as well as a shortage of policy frameworks for developing sustainable mobility. In addition, the regions included in this study have historically been marginalised when it comes to transport planning research and policy, a situation which further exacerbates their peripheral position with regard to promoting sustainable mobility. This thesis makes a theoretical contribution to the fields of tourism and transport research. It does so by applying contemporary concepts in sustainability discussions and social representation theory to inform our understanding of transport challenges. Furthermore, by investigating the potential of the PPGIS method as a tool for sustainable rural mobility planning and how to design effective PPGIS studies for such planning, this thesis makes a methodological and practical contribution to the fields.

Summary in Swedish

Denna avhandling handlar om att studera hållbar mobilitet i turismområden på landsbygden. I synnerhet syftar den till att: i) bidra till en bättre förståelse av de transportutmaningar som turismområden på landsbygden står inför; och ii) utforska hur man planerar för hållbar rörlighet på sådana platser. Den övergripande forskningsfrågan som har väglett denna undersökning är följande: *Hur kan turismregioner på landsbygden främja hållbar mobilitet?* För att uppnå syftet med denna avhandling behandlas två huvudaspekter av hållbar mobilitet. För det första, genom att införliva perspektiv från olika intressentgrupper, inklusive turister, fastboende, fritidshusägare och utövare som är involverade i transportplanering, försöker studien ge en omfattande förståelse för transportutmaningar och resvanor hos de olika grupperna. För det andra undersöks hur ”Public Participation Geographic Information Systems (PPGIS)” - en metod för allmänhetens deltagande i planering som sällan använts vid studier av turism och markanvändning - kan bidra till hållbar mobilitetsplanering. Avhandlingen bygger på flera begrepp och en teori. Begreppen omfattar monomodalitet, bilberoende,” wicked problems”, (o)önskvärda transportframtider, automobilitet och allmänhetens deltagande i planeringsprocesser. Teorin om sociala representationer används. Avhandlingen är baserad på fallstudier med fokus på fyra utvalda platser i Sverige: Sälen; Malung-Sälen; Älvdalen; och Åre. Dessa platser är framstående turismdestinationer på landsbygden som står inför betydande transportrelaterade utmaningar där hållbara lösningar efterfrågas. Metodmässigt används mixed-methods används, där både kvalitativa och kvantitativa ansatser integreras för att uppnå avhandlingens mål. Resultaten av avhandlingen visar sammantaget att den största utmaningen för

hållbar mobilitet i turismregioner på landsbygden är en kris som kan beskrivas som *a crisis of uncontested poly-challenges*. Med andra ord står dessa regioner samtidigt inför en rad olika transportutmaningar, bland annat privatbilismens hegemoni i kombination med bristande kollektivtrafik samt otydliga politiska ramverk för att utveckla hållbar mobilitet. Dessutom har de regioner som ingår i denna studie historiskt sett varit marginaliserade när det gäller forskning och politik inom transportplanering, en situation som ytterligare förvärrar deras perifera ställning när det gäller att främja hållbar mobilitet. Denna avhandling ger ett teoretiskt bidrag till turism- och transportforskningen. Det gör den genom att tillämpa samtida koncept inom hållbarhets området och teorin om social representation, för att öka vår förståelse för transportutmaningar. Vidare, genom att undersöka PPGIS-metodens potential som ett verktyg för hållbar mobilitetsplanering på landsbygden och hur man utformar effektiva PPGIS-studier för sådan planering, ger denna avhandling ett metodologiskt och praktiskt bidrag till nämnda forskningsområden.

List of papers

Paper 1: Waleghwa, B., & Heldt, T. (2022). Exploring the use of public participation GIS in transportation planning for tourism at a Nordic destination. *Scandinavian Journal of Hospitality and Tourism*, DOI: 10.1080/15022250.2022.2070541. Published.

Paper 2: Waleghwa, B. (2024). Mixed methods Public Participation GIS (PPGIS) in tourism; a concurrent triangulation approach. In P. Mason, M. Augustyn & A. Seakhoa-King (Eds.), *How to Use Mixed Methods in Tourism* (PP 85-105). Edward Elgar. https://doi.org/10.4337/9781035314096.00014. Published.

Paper 3: Waleghwa, B., & Ioannides, D. (2024). "Everyone wants to drive there"; Challenges to transport sustainability in rural tourism destinations. *International Journal of Tourism Research*, https://doi.org/10.1002/jtr.2810. Published.

Paper 4: Waleghwa, B. (2025). Rethinking car-dependent rural tourism mobility. *Applied Mobilities*, https://doi.org/10.1080/23800127.2025.2477937. Published.

Paper 5: Waleghwa, B., & Heldt, T. (Forthcoming). Mapping transport improvement areas and travel patterns in rural tourism regions; implications for sustainable mobility planning. Manuscript.

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Preface

I love the poem "The Road Not Taken" by Robert Frost. One interpretation of the poem is that it is about life's dilemmas and the choices we make. It tells the story of a traveller who comes to a crossroads and has to decide which way to go. We often find ourselves confronted with questions about life, both grand and trivial: What is my purpose in life? What career should I pursue? What cereal should I have for breakfast? Frost's words in the poem, "Two roads diverged in a wood, and I— I took the one less travelled by, And that has made all the difference," have sometimes reminded me that it is okay to take a plunge and go down the path with the most resistance, because that may be the only way to change one's life, or even the world.

That's what this doctoral thesis is about. It is about sustainable mobility in rural tourism regions and arguing for a low-carbon path - one in which, for example, travellers, whenever possible, make the not-so-popular active choice to travel in a way that has the least impact on the environment. In addition, this thesis is partly a reflection of the academic journey I have taken on my way to a PhD in Tourism Studies. A journey that has proven to be both challenging and rewarding. In the little over 5 years that I have been pursuing my PhD, I have had to push myself out of my comfort zone, including learning a method that I had never heard of before - Public Participation GIS (PPGIS) - and using it in my thesis. I had to deal with so many days of frustration and confusion - days that, looking back, were the ones that really helped me develop the skills of an academic.

This is a compilation thesis, consisting of a cover essay ("kappa" in Swedish) and five individual papers. The cover essay offers a comprehensive summary of the thesis, situates it within theoretical

discourses in the tourism, transport, and sustainability domains, and synthesizes all of its findings into a coherent contribution. Papers I, II, and V concentrate on PPGIS method and its application in sustainable mobility planning for rural tourism regions. Specifically, the first paper focuses on how stakeholders could use PPGIS to understand transport challenges in the early stages of transport planning in rural tourism regions. The second paper provides practical insights into how to design and effectively conduct mixed methods PPGIS studies in rural tourism and transport planning contexts. The fifth paper focuses on the PPGIS method's potential application in planning sustainable mobility for both permanent (e.g., residents) and temporary (e.g., second-home owners) populations in rural tourism areas. The second and fourth papers address the main transport challenges facing rural tourism areas, with the fourth paper delving deeper into the challenge of car-dependency in these areas and how this dependency impedes a transition to low-carbon travel in the countryside.

This thesis is a very important milestone in my lifelong journey of learning and unlearning, one that I hope to share with many people from small villages around the world - like the one in Kenya where I grew up - who dare to take the road less travelled by following their dreams. So, dear reader, I hope this thesis reminds you to take the low-carbon path in your (daily) travel choices. If nothing else, I hope this thesis inspires you to take " The Road Not Taken " - whatever that may be for you.

1 Introduction

It goes without saying that any study of tourism must acknowledge the pivotal role of transportation, given its inherent interrelationships with the tourism sector (Duval, 2017; 2020). This is partly because travel constitutes an integral component of the tourism system (Zillinger, 2007), whether as a functional mode of transportation to, from, and within destinations, or as a recreational experience, such as traversing historic and picturesque routes or embarking on a cruise (Gross & Klemmer, 2014). It is, therefore, unsurprising that even though there are records of wealthy people travelling for leisure purposes throughout history (e.g., Roman or Medieval times), tourism did not really begin to take off as an activity until the latter part of the 19th century because of rapid developments in transportation technologies that emerged after the industrial revolution (Rodrigue, 2020). Indeed, the global growth of tourism only began following World War II and especially the advent of jet passenger aircraft in the late 1950s (Ioannides & Timothy, 2010).

The expansion of tourism on a global scale supported by the development of transportation systems to meet this demand has caused several environmental impacts (e.g., air and noise pollution) on destination areas and their inhabitants (Hopkins, 2020; Page, 2009). In many localities worldwide, transportation's adverse environmental impacts have become particularly problematic especially since most vehicles are powered by gasoline-fuelled engines, which account for high rates of carbon dioxide emissions (CO_2). Indeed, motorized transportation ranks among the highest air polluters in many places throughout the world (Peeters & Dubois, 2010; Peeters et al., 2019).

In this vein, the European Commission first introduced the term "sustainable mobility" in 1992 in their Green Paper on *the "impact of Transport on the Environment - A Community strategy for "sustainable mobility""* (Holden et al., 2019; Høyer, 1999). The Green Paper was a clear declaration of European Union (EU) transport policy, focusing on the rapidly growing environmental impact of transport (European Commission, 1992). Sustainable mobility is an integral part of sustainable development, which focuses on meeting current needs without compromising the ability of future generations to meet theirs (World Commission on Environment and Development, 1987). At its core, sustainable mobility is an approach to transport, which ensures that its social and economic role is fulfilled with the lowest possible environmental impact (Banister, 2008; Hickman et al., 2013).

Related to this, over the last two decades or so, there has been a growing concern about sustainability and climate change (Becken, 2006; Gössling, 2017; Peeters & Dubois, 2010; Peeters et al., 2019), leading to calls for innovative approaches and models for planning (Hall, 2008). As Broaddus and Cervero, (2019) argue, "…there is an increased need for inter-disciplinary approaches, planning for multiple modes of transportation, integration with land use planning, and public engagement skills" (p. 1). Indeed, it is necessary to ensure that public and private stakeholders collaborate more actively and engage in the process of sustainable mobility planning (Graci, 2013; Czepkiewicz et al., 2016).

Furthermore, research in recent time has highlighted the importance of adapting transport policies to local contexts (Berger et al., 2014; Tønnesen et al., 2022). This step is regarded as crucial in ensuring the efficiency of such policies (Berger et al., 2014). Still, the existing

literature on sustainable mobility and related planning actions concentrates overwhelmingly on urban settings (Tønnesen et al., 2022; Zhao & Yu, 2020). To illustrate this gap, Tomej and Liburd (2020) lament the rarity of sustainable planning tools when it comes to non-urban tourism contexts. As the authors further point out, available sustainable planning tools (e.g., spatial network analysis for multimodal urban transport systems) have been developed and operationalised to assess urban transport systems rather than those in the countryside. This is despite the fact that the current transport system in rural areas is highly carbon-intensive due to the heavy reliance on private cars for everyday use (e.g., commuting, residential travel) and leisure mobility (e.g., tourist travel) (Dickinson & Robbins, 2007; Tomej & Liburd, 2020). The heavy dependence on the private car is mainly due to, among others, the longer distances involved and the limited sustainable transport alternatives, such as public transport modes (e.g., rail and bus connections), in rural localities (Tomej & Liburd, 2020). Nevertheless, cars are still widely accepted as "the rural transport solution" (Shergold et al., 2012, p.69), a factor that complicates the transition to more sustainable transport systems in rural areas (Waleghwa, 2025).

Additionally, existing studies in rural areas on transport and related sustainability challenges mostly focus on the perspectives of either residents or visitors (Poltimäe et al., 2022). Meanwhile, there is a shortage of studies focusing on the viewpoints of government officials, transport planners, businesses and service providers (hereafter practitioners) on transport challenges in rural tourism areas (Waleghwa & Ioannides, 2024) despite their important role in the planning and provision of transport services (Kiryluk et al., 2021).

Moreover, in many countries, including Sweden, government information relating to rural communities, such as population-related statistics do not account for temporary residents, which include tourists in general and second-home tourists in particular (Back & Marjavaara, 2017). Thus, the funding of public services (e.g., roads, sewerage treatment) in such rural areas, which experience seasonal variations in visitor numbers is based solely on their number of permanent residents, meaning that these communities often lack the resources to effectively cover their infrastructural needs (ibid). This is despite the popularity of second-home tourism in numerous rural regions, especially in the Nordic countries (Müller, 2021). Focusing only on permanent rural residents leads to a mismatch between the public services provided and the available demand for these services (Back & Marjavaara, 2017). Indeed, absence of a planning approach for public services that also considers temporary residents, including second-home owners, poses a challenge in terms of how to manage the variable levels of transport demand in rural tourism communities, especially during peak periods when the population in these places is significantly higher (Waleghwa & Heldt, 2022). Accordingly, a focus on how to promote sustainable mobility for permanent and temporary residents in rural tourism contexts is inevitable if a transition to a low-carbon tourism future is to be achieved.

Considering the aforementioned background, the present thesis draws from and contributes to a number of interrelated research domains. In the domain of tourism studies, the thesis addresses a basic yet fundamental aspect of the tourism system, namely transportation (Duval, 2017; 2020; Zillinger, 2007), linking it to ongoing scholarly debates regarding contemporary environmental sustainability

challenges (Becken, 2006; Gössling, 2017; Peeters & Dubois, 2010; Peeters et al., 2019). Moreover, within the disciplines of transport and planning studies, this thesis contributes to a comprehensive understanding of travel behaviour and transport challenges faced not only by permanent but also temporary (e.g., second homeowners) residents in rural settings. This understanding is crucial in order to more effectively plan for transportation for these groups throughout the year. Furthermore, insights are provided into the hitherto neglected perspectives of practitioners on transport challenges (Waleghwa & Ioannides, 2024; Kiryluk et al., 2021), which are pivotal in fostering a comprehensive understanding of the supply-side conditions pertaining to transport provision. This thesis also contributes knowledge regarding the Public Participation Geographic Information Systems (PPGIS) method in regard to how it could be employed in the realm of sustainable mobility planning and stakeholder engagement in the aforementioned planning process (Banister, 2008; Hickman et al., 2013).

1.1Aim, research questions and thesis structure

This thesis aims to: i) contribute to a better understanding of the transport challenges faced by rural tourism areas; and ii) explore how to plan for sustainable mobility in such places. To achieve the aim of the thesis, I focus on the following overarching research question: *How can rural tourism regions promote sustainable mobility?* I divide the overall question into two sub-questions:

1) What are the main transport challenges facing rural tourism regions as perceived by different stakeholders?

2) How can the PPGIS method contribute to sustainable mobility planning in rural tourism regions?

I address the sub-questions through five interrelated papers, which are outlined in Table 1.

Table 1: Research question(s) addressed in the five papers

Paper	**Sub-questions**	**Focus and link to Sub-questions**
1	2	i) The first paper focuses on the use of PPGIS method for transportation planning. In particular, it explores how stakeholders could use PPGIS to understand transport challenges in the early stages of transport planning in rural tourism regions. ii) The paper is also a pilot as it introduces PPGIS methodology for transport planning in tourism contexts. Additionally, the paper provides valuable insights that I used in the development of the second and fifth papers.
2	2	Based on the lessons learned from the first paper, the second paper, which is a book chapter on methods, provides practical insights into how to design and effectively conduct mixed methods PPGIS studies in rural tourism and transport planning contexts.
3	1	i) The third paper provides a comprehensive overview of the main

		transport challenges facing rural tourism regions as perceived by practitioners and the steps they are taking to address them. ii) The practitioners' perspectives shed light on the problem of car dependency and the challenges they face in providing sustainable mobility alternatives.
4	1	Building on the third paper, this fourth paper delves deeper into the challenge of car dependency by unravelling the extent of this dependency and arguing for the urgency of rethinking car-based travel in rural tourism regions, something that has so far gone unchallenged in sustainable mobility research and practice.
5	1& 2	The fifth paper builds on the first one and identifies the travel patterns and perceived mobility improvements of both permanent (local residents) and temporary residents (tourists, second homeowners). It also demonstrates how sustainable mobility planning for these groups can be undertaken using the PPGIS methodology.
Nb: The numbering of the papers is based on how the studies build on each other, not on the date of publication.		

The five papers are premised on two fundamental principles of the sustainable mobility paradigm: firstly, that a change in user practices (for instance, in the selection of transport modes) and secondly, the

implementation of land use policies that facilitate the adoption of sustainable travel options (Banister, 2008; Holden et al., 2019) , are crucial elements in the transition towards a sustainable, low-carbon transport future (Peeters & Dubois, 2010; Peeters et al., 2019). While these topics have long been the subject of considerable research attention in the field of urban and transportation planning (e.g., Hickman et al., 2013; Czepkiewicz et al., 2016), but also the pursuit of sustainable tourism, in the case of rural tourism regions, the implementation of sustainable alternatives continues to meet several obstacles. As highlighted earlier, these include, at least partly, the normative acceptance of private vehicles as "the" default transport mode for rural mobility (Shergold et al., 2012), the seasonal nature of transport demand in rural areas with a high level of tourism (Waleghwa & Heldt, 2022), and the limited understanding of mobility issues due to the dearth of empirical studies in such locations (Tønnesen et al., 2022; Zhao & Yu, 2020).

The empirical material in this thesis comes from four selected locations -Sälen, Malung-Sälen, Älvdalen, and Åre- within two rural regions in Sweden - Dalarna and Jämtland Härjedalen. These regions provide highly relevant contexts for studying transport issues and sustainable mobility planning for permanent and temporary residents. This is because Sälen, Åre and Idre are characterized as prominent tourism regions (Visit Sweden, 2024), which respectively count as the first, second and fourth largest ski tourism destinations (measured in skier days) in Sweden (Swedish Ski Areas Industry Association- SLAO, 2024).

Moreover, the regions in this thesis demonstrate seasonal variations in population throughout the year, as they have low numbers of

permanent residents and receive high numbers of temporary residents, including visitors such as second-home owners (Statistics Sweden, 2024a). In addition, the areas studied here provide a unique context for an in-depth exploration of the complexities of transitioning to a low-carbon future in rural tourism settings, as these places face transportation challenges for which they are seeking sustainable solutions (Waleghwa & Ioannides, 2024). Indeed, transportation, sustainability, and seasonality are highlighted as some of the key challenges facing tourism in Sweden (The Organization for Economic Co-operation and Development- OECD, 2020).

To understand transport challenges in my study areas, I use the concepts of monomodalism, car dependency, wicked problems, (un)desirable transport futures, automobility and the theory of social representation (discussed in Chapter 2). I also use the concept of public participation (also discussed in Chapter 2) in planning processes, with a particular focus on PPGIS - a land use planning and public engagement methodology - in sustainable mobility planning.

At this juncture, I must clarify four things. Firstly, in the literature on transport and sustainable development, the terms "sustainable mobility" and "sustainable transport" (also sustainable transport systems and sustainable transportation, etc.) are used interchangeably (Holden et al., 2019). In Europe, it seems that the term "sustainable mobility" is preferable while "sustainable transport" appears to dominate in North America (ibid). I argue that both terms represent the concept of mobility (Sager, 2006), which relates to manifest mobility (actual, physical movement) and potential mobility (the ability to be mobile). Moreover, since the terms convey identical ideas and policy implications, I have chosen to use them simultaneously.

Secondly, I focus on the mobility of people in rural tourism regions in the Global North (particularly Sweden - a Nordic country). Thirdly, the definitions of “rural” (Sharpley & Roberts, 2004) and “tourism” (McKercher & Prideaux, 2020) continue to be widely debated in the literature. Similarly, the definition of rural tourism is not settled. Such a debate is beyond the scope of this research. In this thesis I use the term rural tourism to refer to tourism that occurs in remote rural areas. Remote rural areas in this thesis mean places located more than 45 minutes' drive from their nearest urban area with more than 3,000 inhabitants (Glesbygdsverket, 2007).

I should also mention that within the context of this thesis, I use the term "periphery" to denote the remote geographical location of rural regions in relation to their nearest urban agglomerations, as well as metaphorically to refer to these regions being "forgotten" (Christaller, 1964) in (sustainable) transport policy development and research (Tønnesen et al., 2022; Zhao & Yu, 2020). Fourthly, my research is primarily concerned with the environmental dimension of sustainable mobility, with a specific focus on pathways to a low-carbon transport future (Peeters et al., 2019). This is a pivotal challenge for countries in the Global North in their quest to achieve greater sustainable mobility (Holden et al., 2017).

The remainder of my thesis begins with the theoretical framework. This is followed by a section describing the case areas before turning to the methods. Subsequently, I present the main findings of my study before focusing on the discussion and conclusion.

2 Theoretical background

2.1 Transport, tourism and sustainability

This initial section (2.1) of the theoretical framework identifies and evaluates key academic contributions on the definition and relevance of tourism transport. It also examines the interlinkages between transport, tourism, mobility, and sustainability. This section aims to elucidate the concept of tourism transport as it pertains to this thesis, to situate the thesis within the broader field of tourism mobility scholarship, and to justify my emphasis on the environmental dimensions of transportation in the context of contemporary sustainability challenges, with a particular focus on rural areas. I explain the concept of tourism transport as it relates to this thesis in the next two paragraphs.

In many cases, the distinction between tourism-related transport and more general (i.e., for everyday purposes) transport can be quite blurred (Hall, 1999). For example, metro systems in urban areas may be used by tourists, but their primary purpose is to serve local transport needs (Page, 2009). Nevertheless, scholars such as Lumsdon and Page (2004) and Prideaux (2000) have made notable contributions to our understanding of tourism transport. Lumsdon and Page (2004) argue that the utility of a tourist trip and/or what makes tourist trips different from other trips is a principal factor to consider in tourism transportation. The authors present a transportation and tourism continuum with *transportation for* tourism on one end and *transportation as tourism* on the other end. Transportation for tourism is utilitarian by being a means to an end and the level of satisfaction is associated with the cost and speed of travel. Essentially, transportation

for tourism has no intrinsic value, and it is viewed as a cost rather than a benefit for example the cost of hiring a taxi. Transportation as tourism is where the transportation is an end in itself, for example, taking a cruise, luxury (heritage) train travels, and cycling holidays to name but a few. In this case, transportation has an intrinsic value, and it is viewed to be beneficial (ibid).

Additionally, Prideaux (2000) suggests a tourism transport system (TTS) as a model to understand tourism transportation. According to Prideaux, the TTS is "the operation of, and interaction between, transport modes, ways and terminals that support tourism resorts in terms of passenger and freight flows into and out of a destination, and the provision of connecting transport modes in the tourism generating region" (p.56). In this thesis I employ the definition of tourism transport as proposed by Prideaux (2000), which essentially regards transport as an integral component of the broader tourism system. After clarifying the definition of tourism transport used in the thesis, in the next subsection I provide an overview of the environmental impacts of tourism transport and the sustainability challenges associated with these impacts, as well as strategies for achieving sustainable mobility.

2.1.1 Transportation's impact on the environment and sustainability issues

Advancements in transportation technology (e.g., invention of the jet-engine airplane) have been credited as one of the key factors that have contributed to the rapid development of tourism over the last century or so both domestically and internationally (Chew, 1987; Gierczak, 2011). Transportation is arguably a fundamental aspect underpinning economic and social development, not only for facilitating mobility but

also to meet humanity's needs for movement across space and time for various reasons including travel for tourism (Duval, 2020; Cooper, 2008).

Research highlights the impact of (tourism) transportation on the climate in terms of CO_2 emissions (Peeters et al., 2019; Peeters & Dubois; Kamb et al., 2021). This has led some observers to argue that having a *desirable tourism transportation future* is critical to mitigating climate change (Peeters et al., 2019). As Peeters et al. (2019 p. 175) highlight, a desirable tourism transportation future is one in which there is a commitment to reduce CO_2 emissions. These authors maintain that:

> The Paris Agreement (UNFCCC, 2015), signed by all countries in the world (notwithstanding the recent decision by the US to withdraw from the accord) offers a collective commitment to limit CO_2 emissions at a level that will keep global temperature rise below 2 °C. This commitment forms a commonly accepted base for CO_2 emission reduction pathways in accordance with a desirable future.

However, achieving a desirable future for tourism transport is inextricably linked to a comprehensive transformation of the transport sector in line with sustainability principles. Researchers have identified several key implementation strategies to improve the sustainability of the transport sector (Banister, 2008; Hall et al., 2017; Le-Klähn & Hall, 2015; Tomej & Liburd, 2020). Some of the strategies identified by researchers include reducing the number of trips, transiting to renewable fuels (e.g., Banister, 2008) and using sustainable mobility options such as public transport (e.g., Le-Klähn & Hall, 2015). Alternative modes of transport such as trains, bicycles and

buses are perceived to have a lower environmental impact than private cars. This can be explained by the fact that some collective transport (e.g., public transportation) has a lower carbon footprint, with lower cumulative carbon emissions per capita (Peeters et al., 2019; Ritchie & Roser, 2024). In addition, some of the aforementioned travel modes offer additional health benefits, such as the exercise provided by cycling, and are more affordable, making them accessible to economically marginalised groups (Lucas, 2012).

2.1.2 Tourism mobilities and rural travel challenges

This subsection locates the thesis within the broader field of tourism mobility scholarship and discusses the challenges of automobile dependency, monomodalism, and wicked problems inherent in rural environments.

Hannam et al. (2014) present a framework delineating three interrelated dimensions of the tourism mobilities literature. These dimensions encompass materiality, the influence of new technologies, and the phenomenon of automobility. A study of the materiality of tourism mobilities seeks to understand the movement of tangible and/or intangible objects through time, and how tourism is entwined with the temporal movement of things. As Hannam et al. (2014) observe, an illustrative example is the examination of the role of images and artefacts in the formation of memories and practices, particularly in the context of landscape transformation through artistic expression. Furthermore, scholars engaged in the study of tourism mobility have endeavoured to comprehend how novel technologies (such as smartphones) are reconfiguring the conceptualisation of space and time as a consequence of their pervasive integration into

contemporary society. This phenomenon has the effect of blurring the boundaries between the domains of everyday life and leisure practices (den Hoed & Russo, 2017). Urry (2004) defines automobility as a complex socio-technical system that has become the dominant form of travel in the modern era. This is characterised as "quasi-private" mobility, which subordinates other forms of mobility. The work of Urry (2004) draws attention to the ways in which a system of private motorised modes of transport, including petroleum-fuelled cars, together with the infrastructures, practices, policies, technologies and regulations associated with it, have become self-reinforcing as a result of a process of path dependence and lock-in.

Urry (2004) illustrates the path-dependency of the automobile by arguing that a system of privately owned gasoline-powered automobiles was established and locked-in as early as the late 19th century. Gasoline-powered vehicles gained popularity for several reasons, including the success of a car powered by gasoline in a horseless carriage competition in Chicago in 1896 (Urry, 2004). A series of events, including the 1910 opening of the Ford assembly line in Highland Park, Michigan, led to the fast and cost-effective production of vehicles (Flink, 1972), an event that sowed the seeds of the automobile's dominance for the rest of the 20th century and beyond (Flink, 1972; Urry, 2004).

In this thesis within the field of tourism mobilities scholarship my research is primarily concerned with the phenomenon of automobility, particularly *automobile dependency* in rural tourism areas. I must acknowledge that this approach may only partially interrogate the intricacies of rural tourism mobilities. Even so, in response to one of the research questions posed in this thesis, namely, *"What are the main*

transport challenges facing rural tourism regions as perceived by different stakeholders?", my third and fourth papers present a detailed illustration and a compelling challenge to the pervasiveness of automobiles in contemporary rural travel. Furthermore, the papers illustrate how this phenomenon impedes the transition to more sustainable transport systems. This insight is of value in the broader context of the transition from dominant automobile transport systems to more sustainable ones, as it provides a deeper understanding of the challenges and complexities involved in this process in a rural tourism context.

The study of rural tourism regions is particularly pertinent in the context of sustainable mobility, given the multitude of transport-related challenges they face. In addition to the issues of car dependency and poor public transportation services previously outlined, rural locations are also confronted with the challenges of *monomodalism* and *wicked transport problems*. As observed by Shergold et al. (2012), the sustained dependence on personal vehicles for transportation in rural regions has resulted in monomodalism. This term refers to the tendency to prioritise a single mode of transportation, in this case, the automobile, to fulfil most if not all mobility needs. As a result, those engaged in the formulation of rural policy have not sufficiently considered the development of transport policies that encourage the use of alternative modes of transportation to the private automobile.

Nevertheless, the finding of alternatives to the car and addressing transport challenges in rural settings is further complicated by the existence of the so-called wicked transport problems in such places. The concept of a wicked problem has been defined in literature as a

problem for which attempting to find a solution results in the emergence of a new problem (Rittel & Webber, 1974; Noto & Bianchi, 2015). To illustrate such a problem, consider a rural tourism destination which may seek to encourage the utilisation of electric vehicles as opposed to those dependent on gasoline. Although this solution might be considered positive from an environmental standpoint, since it focuses on private, albeit electric, vehicles it does nothing to relieve congestion in such places (Ioannides & Wall-Reinius, 2015).

2.2 Planning, public participation and GIS tools

In this section, I review the literature on planning in general, with a particular focus on tourism and sustainable mobility planning. Furthermore, this section considers the role of public participation in the planning process. Specifically, it examines the potential of GIS as a facilitating tool for public participation by focusing on the PPGIS method as a means of engaging stakeholders in the planning process. This is of particular importance given the necessity to engage a variety of stakeholders, including local inhabitants, in the planning of sustainable mobility in diverse geographical contexts, including rural areas (Banister, 2008; Czepkiewicz et al., 2016; Graci, 2013).

Planning is a critical aspect both in tourism theory and practice. However, before moving further, some definitions are necessary. Hall (2008) notes the complexity of planning, citing that this process is an ambiguous and difficult term to define, partly because of the many actors involved making interdependent decisions. Nevertheless, Hall (2008) views planning as "[…] *the process of preparing a set of decisions for action in the future, directed at achieving goals by preferable means*" (p.8). In the same light Chadwick, (1971) in his seminal work *A Systems view on*

Planning defines planning as: "*a process of human thought and action based upon that thought- in point of fact, forethought, thought for the future* […]" (p,24). Similarly, Forsberg (2005) defines planning as future-oriented public decision-making that targets specific goals. I focus on tourism planning in the subsequent paragraphs in this section.

Tourism planning is unique compared to other types of planning for several reasons. Firstly, we must consider that tourism is a multifaceted and hard-to-define sector that is impacted by many issues like seasonality, politics, crises, and the economy among others (Dredge & Jenkins, 2011). Secondly, the very rapid and often loosely regulated speed of tourism growth and development makes planning for tourism complicated as contingency plans need to always be in place (Inkinen et al., 2021). Thirdly, there is the absence of a single organization, which is accountable for tourism-related development. The lack of such an organisation has often meant that the public sector responds in an ad hoc manner rather than having pre-determined strategies for addressing the development (Hall, 2008).

The intervention of government and private stakeholders in the tourism planning and development process usually occurs retroactively in response to the negative impacts of that development. To a large extent, the adverse consequences of tourism lead various stakeholders to realize that they must intervene to retain or even enhance a destination's attractiveness and competitiveness (Saarinen et al., 2017), but also to protect natural and cultural resources. In many cases it also leads to the understanding that there is a need to involve the local community in the tourism development process (Gunn & Var, 2020). Although planning for tourism does not correct all the negative impacts of tourism growth and development, it can potentially

minimise some of the negative impacts, such as environmental degradation (Hall, 2008).

Gunn and Var (2020) also argue that there is an over-emphasis in tourism research and policy that "greater planning and care must be exercised to avoid negative social, environmental, and economic impacts and reach the positive objectives desired" (p.121). Relatedly, the authors propose a practical approach to tourism planning, one that focuses on using a planning model that best suits the needs and contingencies of a particular region and/or local area. To illustrate this, Gunn and Var provide nine different case studies of tourism planning (including those of Scotland, Michigan, Mozambique, Nepal, and Lithuania). Each case is different in terms of the content and process of tourism planning, but there are common threads running through all. These include the strong role of regional tourism at the destination level, the awareness of greater public-private cooperation in tourism planning and the fact that the main obstacle in the tourism planning process is implementation. The next subsection will address sustainable mobility planning and how it differs from conventional transportation planning.

2.2.1 Sustainable mobility planning

Traditional transportation planning is "concerned with developing and organizing transportation infrastructure, networks, and services" (Broaddus & Cervero, 2019 p.1). As Broaddus and Cervero further indicate, transportation planning seeks to prepare for future growth in terms of the flows of people and goods and the modes of transportation used. Traditional transport planning is divided into four main general phases. These are: a) estimation of future transport demand and assessment of the capacity of the current transport supply

to meet this demand; b) design of a range of alternative transport plans (at local, regional and national levels) in line with community objectives to meet the future flow of people and goods; c) evaluation of the alternative transport plans in terms of their economic and social viability and selection of the best alternative; d) and funding and implementation of the selected alternative transport plan (Bruton, 2021; Litman, 2013; Nijkamp et al.,1998).

This approach in traditional transport planning focuses mainly on efficiency and cost as evidenced by most transport studies (i.e., transport geography research) within social sciences (Hopkins, 2020). As Dickinson and Dickinson (2006) argue, most transport studies are deterministic and focus mainly on quantifying the characteristics of users and the logistics of transport provision. However, as the authors go on to argue, quantitative studies cannot be used in their entirety to address transport issues in tourism destinations. This is because, in a tourism context, there are different stakeholders including local residents, tourists, tourism entrepreneurs and government representatives (Kiryluk et al., 2021) with various perceptions about transportation that should be considered when planning and managing transport. It should be noted that this thesis encompasses both classic transport geography research and qualitative aspects. The former includes the quantification of modal split among different travellers, while the latter encompasses, among other things, the subjective experiences of practitioners regarding transport challenges.

The objective of sustainable mobility planning is to meet the transport needs of travellers so that they are consistent with the principles of sustainable development (Holden et al., 2019; Høyer, 1999). Consequently, in contrast to the conventional approach to transport

planning, which is primarily concerned with meeting current transport demand, sustainable mobility planning emphasises the necessity for stakeholders not only to plan for existing transport demand, but also to proactively seek to influence the structure and level of that demand in alignment with sustainable development objectives (Banister, 2008; Czepkiewicz et al., 2016).

Transport planners could amend their approach by shifting their focus from planning primarily for car travel to incorporating measures that encourage the use of alternative modes of transport, such as walking (ibid). Achieving this objective would be feasible, for instance, through the implementation of a Transit-Oriented Development (TOD) approach to planning (Ibraeva et al., 2020; Transit Oriented Development Institute, 2024). A TOD is a North American strategy that fosters the development of compact, walkable, pedestrian-friendly, mixed-use environments (e.g., commercial, entertainment, residential) in close proximity to railway systems or bus routes (Transit Oriented Development Institute, 2024; Ibraeva et al., 2020).

A TOD approach to transportation planning provides an ideal illustration of how to integrate sustainable mobility into the urban form, (Banister, 2008) broadly defined as the built environment and physical characteristics of the city (Tønnesen et al., 2022; Banister, 2008). The goal of the integration of sustainable mobility into the urban form is to reduce trip lengths by addressing the physical separation of activities and service points and, thus, encourage the adoption of environmentally friendly modes of transportation (Tønnesen et al., 2022; Banister, 2008).

Moreover, as Banister (2008) asserts, transport planners can influence a modal shift towards sustainable mobility by developing the so-called transport planning hierarchy. Such a hierarchy, unlike conventional transportation planning methodologies that prioritize motorised transport like the car and air travel, integrates all transportation modes, with cyclists and pedestrians at the top and motor vehicle users at the bottom. As Banister (2008) further explains, successful implementation of the transport hierarchy depends on stakeholders like transport planners reallocating space to public transportation, facilitating its use, applying parking controls, and instituting road pricing.

Essentially, sustainable mobility planning closely aligns with key tenets within the sustainable mobility paradigm (Banister, 2008; Holden et al., 2019; Hopkins, 2020). The fundamental principles of the paradigm indicate that an efficiency-based approach to transport, which relies heavily on technological advancement, is inadequate. Instead, it proposes that new configurations of users' travel practices and the built environment are considered a fundamental part of a sustainable mobility transition. Indeed, as Banister (2008) highlights, "the sustainable mobility approach requires actions to reduce the need to travel (less trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency in the transport system" (p.3). This quote and the previous discussion of the sustainable mobility planning approach show that a mix of supply (transportation system configurations) and demand (changes in travel behaviour) considerations are necessary to advance sustainable mobility. Accordingly, successful implementation of sustainable mobility policies requires public involvement so that policy changes are

understood, and behavioural changes follow (Banister, 2008; Czepkiewicz et al., 2016). The next subsection elaborates on the role of public participation in planning processes.

2.2.2 Public interest and engagement in planning

Planning occurs in both private and public spheres. The definition of public planning is problematic, as the definition of "public" is unclear in the literature. Drawing on Dewey (1954), Maidment (2016) argues that the decision made in planning is the threshold by which the public is defined. The decision becomes public when it affects more people than the decision-makers themselves. Indeed, in the context of public participation GIS (PPGIS) approach to planning – which I discuss in greater detail in subsequent sections – the term "public" encompasses a diverse range of stakeholders, including residents or visitors to a particular area, experts or non-experts, and those who influence decision-making processes (Brown & Kyttä, 2014). Moreover, Brown and Kyttä (2014) highlight that the definition of the term "public" in PPGIS is not fixed and can vary depending on the context. For instance, the term may encompass decision-makers, individuals who are directly or indirectly affected by a decision, or even the general public.

Additional theoretical discussions support the complexity of public planning given the existence of diverse stakeholders with varied levels of influence. Two key approaches, among others, exist when it comes to the planning process. Firstly, there is the more traditional rational planning approach where experts with operational knowledge undertake planning tasks (e.g., Campbell & Marshall, 2002; Christensen, 2015; Burns, 1999). The problem with the rational approach is that it excludes the views of the wider public by relying almost entirely on expert information (Burns, 1999). Secondly, there is

a democratic approach to planning, which largely stems from the criticism of the rational approach (Campbell & Marshall, 2002). The main view in the democratic approach is to balance the general and special interests of the various stakeholders who are directly or indirectly affected by the planning process (ibid).

In addition, the public interest in planning has witnessed a paradigm shift. Specifically, there has been a change in how the public interest is considered in planning from utilitarianism to liberalism (Alexander, 2002; Campbell & Marshall, 2002). On the one hand, utilitarianism is based on the hedonic view of individual interests in "pleasure" or "happiness". Liberalism, on the other hand, advocates individual freedom and rights, and subsequently the "aggregated collective good: the public interest" (Alexander, 2002, p.230). Conceptually, the link between the public interest and planning has traditionally had three distinct functions, namely, as a founding principle of the planning profession, as a check to legitimise spatial and land use planning, and as an ethical norm for planners (Campbell & Marshall, 2002).

Moreover, incorporating the public interest in planning processes by engaging and involving a diverse set of stakeholders is beneficial for several reasons. For example, it can enhance the decision-making process due to the involvement of experts and community members, lead to a better understanding of the situation at the local level, and result in better policies if effective engagement is undertaken (Le Pira et al., 2016). The process of engaging stakeholders can be effective when several critical factors are considered. These factors include, among others, transparency in the planning process, aiming to incorporate stakeholder concerns as much as possible, having a two-way communication mechanism that promotes interaction and

information-sharing between stakeholders, and considering stakeholder engagement as early as possible and throughout the planning process (Cascetta & Pagliara, 2013).

Indeed, as Tang and Waters (2005) highlight in their study on public participation in transport planning, the involvement of the public in the planning process allows the transportation planner to gain insight into, among others, the positive and negative effects of a transportation plan on a community. The public is typically aware of the changes and developments they would like to see within their community. Consequently, if the public is involved in the planning process from the outset, the planner is able to take these public concerns into account when developing the transportation plan, thus ensuring that the plan is responsive to the needs and concerns of the community.

It is, however, common for the general public to be excluded from certain planning processes such as those associated with the development of transport infrastructure. This is particularly the case in the planning of national transport systems, which are, in some cases, designed with security and defence in mind (Tang & Waters, 2005). Examples include the Interstate Highway System in the United States (https://shorturl.at/tZElT). In the next subsection I examine the potential of GIS as a tool for facilitating public participation in planning processes that involve public input.

2.2.3 Public participation GIS (PPGIS)

A geographic information system (GIS) is a combination of personnel, computer software, hardware, and spatial data designed for, among other things, the capture, analysis, and presentation of different types

of information with a geographical component (National Geographic Organisation, 2024). As ESRI (2024) elucidates:

> GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication, efficiency, management, and decision-making

The use of GIS in planning practice and processes that include public participation has grown considerably in recent times (Obermeyer,1998; Sieber, 2006). Indeed, PPGIS is an outcome of the endeavour to render GIS more accessible to the general public. PPGIS is broadly defined as an approach that is used to generate spatially explicit place-based information, which can inform land-use planning and management alternatives (Brown, 2017; McCreary et al., 2020).

The establishment of PPGIS was formally announced at a meeting held in Friday Harbor in the state of Washington in 1993, which was sponsored by the National Center for Geographic Information and Analysis (NCGIA). At that time, there was a growing intellectual divide between those who supported and those who opposed the use of GIS (Schuurman, 2000). The meeting was convened with the aim of challenging this divide (Obermeyer, 1998; Weiner et al., 2002). The conference saw the convergence of scholars from both camps, resulting in a series of deliberations on GIS. A pivotal outcome was a consensus to examine the social ramifications of GIS (Obermeyer, 1998; Sieber, 2006). Consequently, the so-called "GIS and Society research agenda"

was constituted, its objective being to investigate the social consequences of the ways in which the environment, space and people are represented in GIS (Mukherjee, 2015, p. 386).

PPGIS is closely associated with the field of participatory geography (Pánek, 2016), which is also known as participatory mapping (Brown, 2017). The objective of participatory mapping is to utilise the technological capabilities of GIS with the ultimate goal of enhancing the quality of life for community members by including them in local planning processes (Shannon et al., 2021; Tulloch, 2008). Other terms used to describe participatory approaches in geography include "volunteered geographic information" (VGI) and "participatory GIS" (PGIS) (Elwood, 2008). A principal objective of PPGIS, VGI and PGI is to incorporate the perspectives of the general public, who would otherwise be marginalised in land use planning and decision-making processes (Munro et al., 2019; Mukherjee, 2015).

Furthermore, it is proposed that mental maps are the foundation for participatory approaches such as PPGIS (Pánek, 2016). In fact, mental maps have been used for a long time as a way of collecting people's cognitive depiction of space (Gould & White, 2012). As Lynch (1960) asserts, one's association with a place is the mental image of the external physical world that an individual holds. Consequently, to create an accurate map of any place, it is essential to gather local knowledge from the people in the area, in order to represent the human geography of the place in the most effective way possible (Norris, 2017).

Since its inception, the application of PPGIS has increased and improved markedly, especially over the past two decades, driven by

the advent of mobile phones and the concomitant growth in computer processing power (Waleghwa & Heldt, 2022). PPGIS has been employed to examine a range of subjects, including utilisation of urban green spaces (e.g., Heikinheimo et al., 2020), urban planning (e.g., Kahila-Tani et al., 2019; Jankowski et al., 2019) and transportation planning (Tang & Waters, 2005; Griffin & Jiao, 2019). It is noteworthy that Brown and Kyttä (2014) conducted a comprehensive review of over 40 PPGIS studies, identifying a predominant focus on environmental and urban-related topics.

While PPGIS has been employed to examine a range of issues pertaining to land-use planning and development preferences, its utilisation in tourism contexts remains relatively limited (Brown & Weber, 2013). Nevertheless, there are examples of PPGIS studies in the context of tourism (see, for instance, Brown & Weber, 2011; Munro et al., 2019; Nikula et al., 2020; Kantola et al., 2018; Wolf et al., 2018). In a study conducted by Wolf et al. (2018), PPGIS mapping was employed to identify and delineate place-based conflicts among mountain bikers, horse riders, and other groups who frequently utilized trails within national parks in Sydney, Australia. With regard to PPGIS, my focus in this thesis is on how it could be used in sustainable mobility planning in rural tourism contexts.

My exploration of how PPGIS method can be used for sustainable mobility planning in rural tourism areas includes, among others, an examination of the potential benefits of the method (discussed in later sections) and some of the inherent challenges associated with the method, including low response rates and sampling bias (Brown & Kyttä, 2014; Brown, 2017). The tendency for such surveys to be quite extensive, often including standard survey questions (e.g., socio-

demographic queries) and mapping tasks (Fagerholm et al., 2021), can make it problematic to motivate participants to complete PPGIS surveys. In addition, sampling biases can occur in PPGIS surveys, especially given that respondents who successfully complete such surveys often have technical expertise in basic GIS skills (Dunn, 2007). As a result, careful planning and design of PPGIS studies is essential and often requires a significant investment of resources (e.g., time, money). This includes implementing measures such as randomly sampling the target population as much as possible to minimise sampling bias (Fagerholm et al., 2021). To illustrate this, for my fifth paper I sampled participants from the population register via a text message to reduce sampling bias.

In the next section, I review the literature on social representation theory. I have applied this theory in the thesis to study tourism and transport practitioners' perceptions of transport challenges in rural destinations and the steps they are taking to overcome these problems.

2.3 Social representation theory

Traditional psychological theories, such as the theory of reasoned action, which enhance our understanding of the factors that influence behaviour and actions related to transport (Dickinson & Dickinson, 2006), do not provide a detailed knowledge of the multiple perspectives on transport held by social actors, such as practitioners (Atzori et al., 2019). To understand practitioners' perspectives on rural transport challenges, I turn to the theory of social representations (Moscovici, 1988). This particular theory suggests that we construct shared perceptions and ideas that shape our attitudes and behaviours (Dickinson et al., 2009; Lahlou, 2015).

Moscovici suggests there are three ways in which representation becomes social. These are hegemonic, emancipatory and polemical. Hegemonic representations arise from powerful groups that dominate social reality (Moscovici, 1988; 2001). All members of a structured grouping (for example, a political party or a nation) share these representations (Sarr, 2021). Unlike hegemonic representations, emancipated representations are not widespread. However, they are popular within certain groups, such as lobby groups (Moscardo, 2011) and exist when subgroups have "their own versions of reality with a certain degree of autonomy with respect to the interacting segments of society" (Moscovici, 2001, p. 221). Polemical representations are often associated with social struggles and controversies. As Moscovici (2001) adds, polemical representations denote opposing relationships with antagonistic ideas such as rich and poor, married and unmarried, educated and uneducated.

Tourism scholars have used the theory of social representation to study several topics including, but not limited to, evaluating host-guest relationships and residents' attitudes towards tourism (Pearce et al., 1997; Moscardo, 2011; Sarr et al., 2021), rural tourism travel (Dickinson & Robbins, 2006; 2007; Dickinson et al., 2009), space travel (Tasci et al., 2021), and low-carbon tourism (Becken, 2017). Moscardo (2011), for example, found hegemonic representations in which residents were excluded or played a minor role in planning, in her assessment of tourism planning and development models. While there are examples of studies that have applied social representation theory in a rural tourism context (e.g., Dickinson et al., 2009), none have examined practitioners' perceptions of transport challenges. Thus, in my third paper, I have chosen to focus on this issue.

2.4 Summary, key concepts and theory

My theoretical background chapter comprised three main parts: "Transport, Tourism and Sustainability", "Planning, Public Participation and GIS Tools" and "Social Representation Theory". The first part laid the foundation for the remaining sections by evaluating key academic contributions on the definition and relevance of tourism transport. It also examined the links between transport, tourism, mobility and sustainability. The second section reviewed literature on planning, focusing on tourism and sustainable mobility. It also considered public participation in planning and the potential of GIS as a facilitating tool, focusing on PPGIS method. The third part included a review of the literature on social representations theory and its application in the field of tourism studies.

The key concepts and the theory of social representation outlined in the theoretical background, which I have used in four out of five of my research papers are: *monomodalism*, *car dependency*, *wicked problems*, *undesirable transport futures*, *automobility* and *public participation* in planning processes. For the remaining paper (i.e. the second), I draw on and contribute to contemporary discussions on mixed methods research design, in particular mixed methods PPGIS for transport planning in rural tourism contexts, which I discuss in more detail in the methods section.

I have chosen the aforementioned concepts and theory for my papers because I believe that together they provide a useful theoretical framework for my study of sustainable mobility in rural tourism regions. My thesis is based on the premise, within the sustainable mobility paradigm (Banister, 2008), that a change in user practices (e.g., mode choice) and the implementation of land use policies that facilitate

the uptake of sustainable travel options are crucial elements in the transition to a sustainable, low-carbon transport future. I, therefore, apply the key concepts and theory outlined above to understand the travel practices of different travellers, the associated challenges in rural areas and how to engage different stakeholders in sustainable mobility planning using the participatory land use planning methodology of PPGIS. Such an approach is important as it allows for: (i) a comprehensive understanding of current travel behaviour; and (ii) how to encourage a shift to more sustainable modes of travel, given that stakeholder engagement often leads them to support sustainable mobility initiatives (Czepkiewicz et al., 2016).

In addition, the theoretical background chapter and the introduction have identified specific gaps in the literature that I aim to fill with the five papers that make up the thesis. These gaps stem from: 1) the limited in-depth studies of transport and sustainability studies in rural areas (Tønnesen et al., 2022; Zhao & Yu, 2020); 2) the rarity of PPGIS studies in tourism contexts (Brown & Weber, 2013); 3) the shortage of studies that focus on practitioners' perspectives (Kiryluk et al, 2021) on transport challenges; 4) limited research, which challenges the normative acceptance of the car as the "rural transport solution" (Shergold et al., 2012, p.69) the rare investigations accounting for the opinions of both temporary and permanent rural residents (Poltimäe et al., 2022) in sustainable mobility planning; and 6) the paucity of sustainable planning tools for non-urban tourism contexts (Tomej & Liburd, 2020). I address the first gap in all my papers and the remaining gaps in each of my five papers, as shown in Table 2. The table also shows the specific concept or theory I have used in each of my five papers.

Table 2: Research gaps, theoretical framework and study areas

Paper	Research gap addressed	Concepts/theory applied	Study area
1	The scarcity of PPGIS studies in tourism contexts	Public participation in planning processes	Sälen
2	The shortage of PPGIS studies in tourism contexts	Mixed methods research (discussed in the methodology chapter)	Sälen
3	The paucity of studies that focus on practitioners' perspectives on transport challenges	Undesirable transport futures, wicked transport problems, social representation theory, car dependency	Sälen & Åre
4	The rarity of studies contesting the acceptance of the car as the default travel option in rural areas	Automobility, car dependence, monomodalism	Sälen
5	The need for studies involving both temporary and permanent rural residents in sustainable mobility planning and the rarity of sustainable planning tools for non-urban tourism contexts.	Public participation in planning processes	Malung-Sälen & Älvdalen

3 Contextual background

This thesis focuses on four rural tourism areas (discussed in section 3.2) in Sweden, a country where transportation and sustainability are highlighted as some of the key challenges in relation to tourism (OECD, 2020). Indeed, sustainability, especially with regard to transportation, is a prominent challenge in Sweden, as a significant proportion of the population lives in sparsely populated rural areas where the car is indispensable for social and cultural life (Pyddoke & Creutzer, 2014). This assertion is supported by the observation that people living in these areas own more cars than those living in urban areas in Sweden (ibid). In addition, land use planning in Sweden is delegated to the local municipal level by law (The National Board of Housing, Building and Planning - "Boverket" in Swedish, 2025a; Alfredsson & Wiman, 2017). This makes the selected Swedish case areas in this study relevant contexts for examining the transport challenges faced by rural tourism regions and how sustainable mobility development can be adapted to local land-use planning, as the adaptation of transport policies to local contexts is crucial for the success of sustainable mobility initiatives (Berger et al., 2014; Tønnesen et al., 2022). The next section addresses transport planning in Sweden. This is followed by a section that introduces the four rural tourism areas that form the empirical point of departure of my study.

3.1 Transport planning in Sweden

In the Swedish context, municipalities can influence local transport policy due to their primary authority in land-use planning (Boverket, 2025a; Tornberg & Odhage, 2018). This authority is stipulated in the Planning and Building Act, which establishes, among other things, the framework for local planning by municipal entities in Sweden

(Boverket, 2025a). Within this regulatory framework, municipalities are required to adhere to a set of key planning instruments, which are fundamental components of the Swedish planning system. Boverket (2025a) highlights that the Swedish planning system consists of the comprehensive plan, the detailed development plan, the area regulations and the regional plan.

In the field of transportation planning, comprehensive plans are relevant to highlight. A comprehensive plan, albeit not legally binding, serves as a guideline for future sustainable development and long-term strategic initiatives within Swedish municipalities (Alfredsson & Wiman, 2017). With regard to transportation, the comprehensive plan delineates, among other things, specific locations for public transportation routes and provides guidelines for the planning of public transportation in the respective municipality (Boverket, 2025b). However, it is important to clarify that, whilst municipalities in Sweden do plan for some aspects of public transportation, public transportation planning is generally the purview of regional entities, which produce regional transport plans. The regional transport plans I analysed in my third paper, as I discuss later, are a case in point. In this regard, the aspects of public transportation stipulated in the comprehensive plans primarily concern local transport within the specific municipalities.

With the decision-making process for land use entrusted to the local municipal level, the success of sustainability objectives in Sweden hinges on the execution of localized strategies. In this thesis, I have focused on how the land-use participatory PPGIS method could contribute to sustainable mobility planning cognizant of local rural contexts. The potential application of PPGIS in the Swedish transport

planning process includes, for example, the elicitation of public views regarding aspects of comprehensive plans that include transportation in various contexts. Public engagement in transport planning is a legal requirement for municipalities in Sweden (Tornberg & Odhage, 2018), including the study areas in this thesis.

3.2 Study areas

This thesis is based on a case study approach, focusing on four selected locations in Sweden: Sälen; Malung-Sälen municipality; Älvdalen municipality; and Åre (Figure 1). Sälen is located in Malung-Sälen municipality, and the three study areas of Sälen, Malung-Sälen municipality and Älvdalen municipality are part of Dalarna region, while Åre is part of Jämtland Härjedalen region (see Figure 1). The multiple case study areas provide rich empirical starting points for an in-depth examination (Yin, 2014) of the transportation-related challenges facing rural communities and how to plan for sustainable mobility. However, it is important to clarify that, as the distribution of cases shows (Table 2), the main geographical focus of this thesis is the region of Dalarna, especially the area of Sälen, followed by the municipalities of Malung-Sälen and Älvdalen. I describe these areas in the next subsection.

3.2.1 Sälen, Malung-Sälen and Älvdalen in Dalarna region

As shown in Figure 1, Sälen, Malung-Sälen and Älvdalen are located in Dalarna region, which has an area of 28,030 km^2 and a population of 288,310 (Statistics Sweden, 2024 b). Dalarna county is located at a considerable distance from large urban centres (Kauppila et al., 2009) such as Stockholm and Gothenburg, which are Sweden's largest metropolitan regions (Vilhelmson, 2005). In particular, Sälen, Malung-Sälen and Älvdalen are respectively located 440, 330 and 350 km from

Stockholm. Their respective distances from Gothenburg are 460, 420 and 500 km.

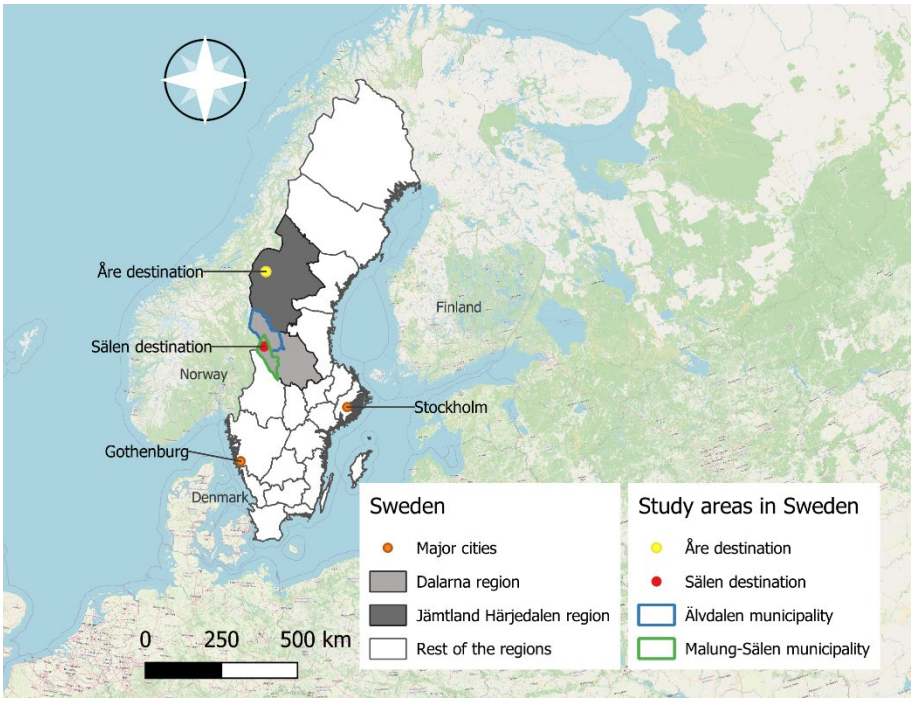

Figure 1: Study areas

Despite its considerable distances from Sweden's main urban areas, Dalarna continues to be a popular destination for tourists, particularly those seeking to immerse themselves in what is marketed as a genuinely Swedish experience (Visit Dalarna, 2024; Visit Sweden, 2024). As visit Dalarna (2024) highlights:

> Travelling in Dalarna is like experiencing Sweden in a miniature. The mountains and the Sami culture, the lakes, the red cottages, the craft tradition and the exciting industrial history. Everything gathered up close.

Thus, the tourism industry is a significant contributor to Dalarna's economy, with the region offering a range of attractions, including Fulufjällets National Park, a World Heritage Site mine (Falu Gruva) and two popular ski destinations (Sälenfjällen and Idre). Sälenfjällen (hereafter referred to as Sälen) and Idre are located in the municipalities of Malung-Sälen and Älvdalen, respectively. Sälen is the largest ski destination in Sweden hosting five independent ski resorts (Kläppen, Lindvallen, Hundfjället, Tandådalen and Stöten) with the famous Högfjällshotellet in between (International Report on Snow and Mountain Tourism, 2022; SLAO, 2024; Destination Sälenfjällen, 2024). Idre is also a well-known ski destination hosting three resorts, Himmelfjäll, Fjätervålen and Idre Fjäll. The latter according to information on the destination's website, "was *the first in Europe to build a four-chair lift*" (Destination Idrefjäll, 2024). Furthermore, the region of Dalarna is a popular destination for those seeking to engage in second-home tourism, with a total of 45,526 second homes located within its boundaries. Of these, 7,608 and 5,366 respectively are situated within the municipalities of Malung-Sälen and Älvdalen (Statistics Sweden, 2024 a).

Reaching Sälen, Malung-Sälen and Älvdalen from major tourist areas such as Stockholm can be a challenge. Although Malung-Sälen municipality has a train service, the railway does not reach Sälen itself. Travelling by train in Älvdalen is also problematic as there is no train service to the municipality. Consequently, to get to Sälen or Älvdalen, one must take a bus from the town of Mora, where the train currently stops. However, it is also possible to fly to these areas. Sälen opened an airport in recent years that mainly serves this particular destination as well as other places in its vicinity such as Trysil ski resort in Norway

and the municipalities of Malung-Sälen and Älvdalen. The airport known as Scandinavian Mountains Airport is 10 km from the destination. From the airport it is possible to reach Sälen by rental car, bus or dog sled. The other parts of Malung-Sälen and Älvdalen can be reached by bus or rental car.

3.2.2 Åre in Jämtland Härjedalen region

As shown in Figure 1, Åre is in Jämtland Härjedalen region, which covers 48,935 km2 with a total of 132,054 inhabitants (Statistics Sweden, 2024 b). Jämtland Härjedalen is also a long way from Sweden's main urban centres (Vilhelmson, 2005). In particular, Åre is 630 km from Stockholm and 890 km from Gothenburg.

Similar to Dalarna, tourism is an important sector in Jämtland Härjedalen region. The region offers a plethora of activities, including mountain biking, hiking, kayaking, fishing, and skiing (Visit Sweden, 2024). Åre, which is a prominent ski destination in Jämtland Härjedalen, is the second largest ski resort in Sweden and the most internationally visited (International Report on Snow and Mountain Tourism, 2022). Jämtland Härjedalen has a longstanding tradition of tourism, having served as a destination for pilgrims travelling along the renowned St Olavsleden trail, which spans the region leading to Nidaros Cathedral in Trondheim, Norway (Jämtland Härjedalen Tourism, 2024). Furthermore, Jämtland Härjedalen is a popular destination for second-home tourism, with a total of 32,247 second homes. Of these, 5,692 are located in Åre municipality (Statistics Sweden, 2024 a), which is where the tourist resort of Åre is situated.

Although Åre is served by both regional and national train companies, most visitors to the destination choose to travel by car. This could be

partly due to the limited capacity on the trains for tourists to bring equipment such as skis for their intended activities at the destination (Waleghwa & Ioannides, 2024). It is also possible to reach Åre via Östersund Airport. However, once at that airport, the tourist must still travel a further 88 km by renting a car of taking a bus transfer.

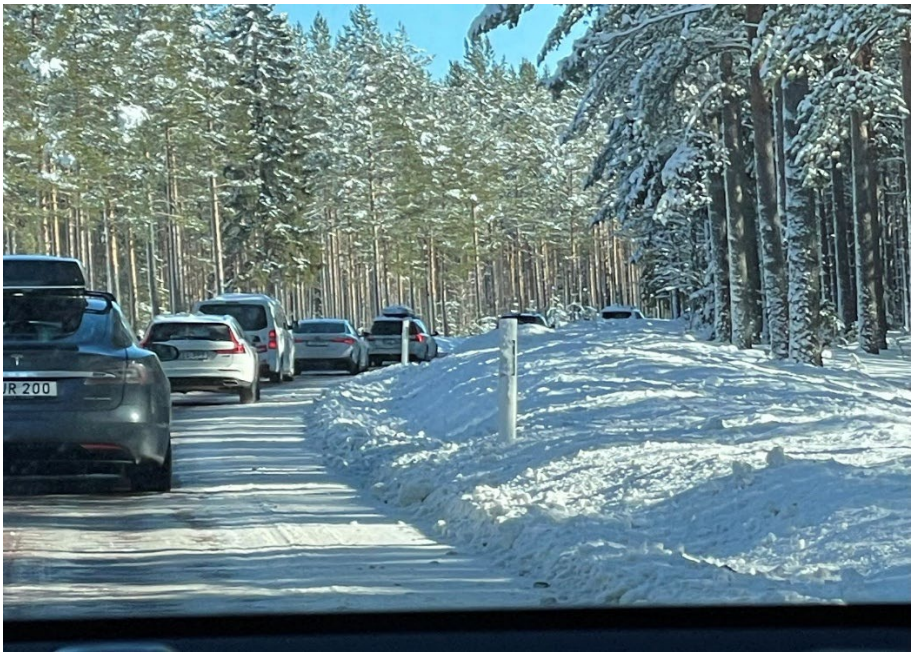

Figure 2: A section of a congested road in Sälen during the winter season.

Photo by Beatrice Waleghwa (2024).

It is important to note that transportation challenges such as congestion (See Figure 2 for an example from Sälen) in all the study areas are most visible during the peak season, which in all cases coincides with winter. During the peak season, the number of people in these communities and their surrounding areas increases

dramatically. For example, in Sälen and the surrounding community (Malung-Sälen municipality), the number of people increases from about 10,000 (of which 2,000 live in Sälen year-round) to 50,000 weekly visitors during the peak winter weeks (Waleghwa & Heldt, 2022). Following this contextual background, the next part presents the methods employed in this thesis.

4 Methodology

The similarities and differences between scientific disciplines are contingent upon their ontology (the manner in which the world is perceived), epistemology (the criteria by which knowledge is deemed true), methodology (the research toolkit employed), and axiology (the values and ethics that shape the practice of research) (Tracy, 2020). As I argued earlier in this thesis, the majority of classical transport studies in the social sciences discipline, also known as transport geography research, are deterministic in nature. They are also informed by economic perspectives and aim to quantify the characteristics of users and the logistics of transport provision (Hopkins, 2020; Dickinson & Dickinson, 2006). Two main reasons can be attributed for the deterministic and quantitatively inclined nature of mainstream transport geography research. Specifically, the field has historically focused on research related to the infrastructural boom and economic expansions that followed the Second World War (Hopkins, 2020). Additionally, the field has remained within a spatial-analytical quantitative research framework that revolutionised the field of geography in the 1960s by introducing the so-called systematic scientific approach to the field (Goetz et al., 2009).

However, as Dickinson and Dickinson (2006) argue, quantitative studies cannot be used in isolation to address transport issues, especially in tourism destinations, as there are different stakeholders (Kiryluk et al., 2021) whose perspectives ought to be considered in transport research. In addition, transport is not only important to all travellers but is also a social and emotional issue. This means, for example, that the subjective perspectives of stakeholders such as practitioners can influence how they plan and manage transport (Waleghwa & Ioannides, 2024). In order to gain a comprehensive overview of the transport challenges and how to plan for sustainable mobility in rural tourism areas, I used a mixed methods research design that included qualitative and quantitative methods. In the next section I discuss pragmatism, as this is the philosophy most associated with mixed methods research. This is followed by a section on mixed methods research. The subsequent part explains the process of data collection and analysis, as well as the specific qualitative and quantitative methods used in my five papers.

4.1 Pragmatism

Pragmatism has been described as America's most notable contribution to Western philosophy (Menand, 1997). This term was first used as a philosophical position in an 1878 article by Charles Sanders Pierce. Etymologically, the word pragmatism comes from a Greek word meaning action (James & Sheffield, 2019; James, 2020). Charles Sanders Peirce, William James, Clarence Irving Lewis, George Herbert Mead and John Dewey have been identified as the founding classical pragmatists (Thayer, 1982). In essence, pragmatism challenges the implicit assumption that our practices are inherently flawed and in

need of justification through reference to a higher, external standard (James & Sheffield, 2019; James, 2020).

Epistemologically, pragmatists seek to expand the nature of inquiry itself (how the inquiry functions). This pragmatic epistemology has been described as one in which "ways of knowing are demonstrated in the everyday lifeworld" (Reybold, 2002 p.1). Moreover, pragmatists believe that knowledge does not have a direct relationship with understanding. Instead, a pragmatist focuses on why it is beneficial to implement a view (exploring inquiries that will prove useful). In other words, pragmatists emphasise instrumentalism as a way of navigating inquiry, arguing that the accepted truth is the best and the one they can be sure of (James, 2020).

Additionally, pragmatists argue that the principles that guide empirical inquiry could be accepted even if the principles cannot be proven with certainty (James, 2020). When it comes to values and ethics, pragmatism holds that moral inquiry ought to be useful, meaning it should focus on problems that lead to useful answers. As such, pragmatists argue that judgments should be made based on improvements and not perfection. In this regard, ethical principles are only meaningful if they can be applied to problematic situations. Accordingly, for pragmatists, values, statements of facts, and ethical principles are human constructs and ought to be studied as such (James & Sheffield, 2019).

The problem-centric focus and emphasis on the practical applications of the research tenets of pragmatist philosophy are particularly pertinent to my doctoral research, which relates to applied projects focusing on transport problems in the rural tourism areas included in

this study. These projects have been executed in close collaboration with tourism and transport stakeholders in the study areas, which underscores the practical relevance of the research. Still, pragmatism philosophy is often criticized as being pessimistic and instrumentalist (James, 2020). Notwithstanding, the pragmatic philosophy has continued to gain traction in social science research, partly due to its existing interlinkages and usability in mixed method research (Morgan, 2007). Related to this, according to Teddlie and Tashakkori (2009), pragmatists reject ideas such as "truth" and instead focus on using the methodological tools necessary to answer the research question/problem under investigation. This means that for pragmatists, the research question/problem is what takes precedence, and qualitative and/or quantitative methods can be used to answer it, as long as they are appropriate (Tashakkori & Teddlie, 2010). The next section includes a discussion on mixed methods followed by a section outlining the specific qualitative and quantitative methods I have used in my research.

4.2 Mixed method research

Tashakkori and Creswell (2007 p.3) define mixed methods as:

> Research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry.

The simultaneous use of both quantitative and qualitative methods has been a tradition in academia for over three decades (Seakhoa-King et al., 2021). However, despite the fact that researchers like Heimtun and Morgan (2012) and Pansiri (2006) have called for using mixed methods

to study tourism, the employment of this approach in tourism studies is a comparatively recent phenomenon (Khoo-Lattimore et al., 2019). This situation has been rectified somewhat in the last few years as seen in studies that employ both qualitative and quantitative approaches (see Singh et al., 2012; Seakhoa-King et al., 2021; Tutenges, 2012; Li et al., 2009). These studies have focused on issues such as sustainable tourism in small island states (Singh et al., 2012), destination quality (Seakhoa-King et al., 2021) and holiday risk-taking among young tourists (Tutenges, 2012).

The limited use of mixed methods in tourism research can be attributed, in part, to the dominance of quantitative approaches within the positivist research paradigm in academia until the 1960s (Mason et al., 2021). In such quantitative studies, the primary research technique was to use close-ended surveys. The survey questions were designed in a way that allowed for the collection of numerical data, with the objective of deriving statistically significant and generalisable results (Creswell & Creswell, 2018). Nevertheless, in the 1970s, scholars such as Cohen (1972) and MacCannell (1973) advanced the argument for the integration of qualitative methodologies within an interpretivist paradigm in the field of tourism studies. The scholars put forth the use of qualitative methods, arguing that they could serve as a means of understanding tourism from the emerging subjective perspectives of participants in research (Lincoln & Guba, 1985). Qualitative scholars commonly employ focus group discussions and in-depth interviews as research techniques. This is because such methods have been argued to enable respondents to express their opinions in detail, thus making it possible to develop a better understanding of the phenomenon under consideration (Denzin & Lincoln, 2011).

In contrast to the established standards for the traditional qualitative and quantitative approaches, the research procedures for the relatively new mixed methods approach remain a topic of ongoing academic debate (Tashakkori & Teddlie, 2010). For instance, scholars have emphasised the importance of differentiating between studies that employ two data types without significant integration and those that integrate the findings of qualitative and quantitative research strands (Johnson & Onwuegbuzie, 2004). Furthermore, some researchers have proposed differentiating between the integration of data within a specific phase of a study and the integration across multiple phases of a single study (e.g., Patton, 1990; Creswell, 2009). Creswell (2009) made a significant contribution to the field by identifying six distinct types of mixed methods research designs, which are classified according to whether the qualitative and quantitative methods are employed in a sequential or concurrent manner.

Creswell (2009) identifies three sequential design approaches, which are presented in the following sequence: The initial approach, designated as "sequential exploratory", commences with qualitative methods and culminates in quantitative techniques. The second approach, "sequential explanatory", entails a quantitative phase that is followed by a qualitative phase. The third approach, defined by Creswell as "sequential transformative", is characterised by the utilisation of a specific theoretical framework that guides the study, with qualitative or quantitative methods being employed initially. Conversely, Creswell (2009) identified three main mixed-method types within the category of concurrent approaches. The initial approach is "concurrent triangulation", whereby both quantitative and qualitative data are collected concurrently and given equal weighting. The second

category is that of "concurrent embedded" approaches, in which either the qualitative or quantitative method is dominant. The third approach is "concurrent transformation", whereby a theory informs the research process and data is collected using both methods.

Another ongoing academic debate concerns the merits of mixed methods approaches. Some scholars have proposed that the use of multiple data collection methods can help to mitigate the inherent challenges associated with relying on a single method (Seakhoa-King et al., 2021; Tashakkori & Teddlie, 2010). Indeed, as asserted by Creswell and Creswell (2018), the underlying tenet of employing mixed methods is that the integration of qualitative and quantitative data facilitates the generation of insights that extend beyond the information yielded by either the quantitative or qualitative data in isolation. Mixed methods may also represent a pivotal approach to enhancing the validity of the data collected (Johnson & Onwuegbuzie, 2004).

Nevertheless, there are some issues associated with mixed methods research (Tashakkori & Teddlie, 2010). These issues pertain to the necessity of establishing a unified lexicon for mixed methods research and matters pertaining to design, data collection procedures, and analytical frameworks (ibid). A further issue is the debate surrounding the paradigm-method fit in mixed methods. This discussion concerns the manner and the extent to which the main paradigms associated with quantitative (i.e., positivism and post-positivism) and qualitative (i.e., interpretivism) approaches within mixed methods are to be considered in a single study (Greene, 2007). Some researchers maintain that the paradigms are incompatible, and that combining methods is only permissible within the framework of a single paradigm, in

accordance with the established guidelines (ibid). Nonetheless, the majority of scholars maintain that pragmatism is the most appropriate paradigm for mixed method studies (Denscombe, 2008; Johnson & Onwuegbuzie, 2004). As previously stated, the research question or problem is of paramount importance in pragmatism. Qualitative and/or quantitative methods are employed to address this question if they are deemed appropriate.

To answer the research questions in this thesis I used a combination of qualitative (paper 3) and mixed methods (papers 1, 2, 4 and 5) as shown in Table 3. As Table 3 also shows, this research began with a concurrent mixed methods approach in the first study. This was then followed sequentially by the remaining studies. Therefore, the overall methods of this thesis can be considered as concurrent sequential, which combines Creswell's (2009) main typologies for mixed methods research. In the following section, I describe the specific quantitative and qualitative methods used in this thesis and explain why, how and in which of my papers I have used them.

Table 3: Sampling and study methods

Papers	Data	Sampling	Sample	Method
1	Primary data (162 surveys)	Concurrent	Tourists	Mixed: Closed and open-ended survey questions and mapping tasks
2	*Secondary data (162 surveys)	Convenience	Tourists	Mixed: Closed and open-ended

				survey questions and mapping tasks
3	Primary data (12 interviews)	Snowball	Tourism & transport practitioners	Qualitative: Semi-structured interviews, document analysis and participant observation
4	*Secondary data (8 interviews and 132 surveys)	Convenience	Tourists, Tourism & transport practitioners	Mixed: Closed and open-ended survey questions, mapping tasks, and semi-structured interviews
5	Primary data (995 surveys)	Concurrent	Permanent residents, second-home owners, tourists	Mixed: Closed and open-ended survey questions and mapping tasks
NB: *The data used in the second paper are the primary data of the first paper. The data used in the fourth paper are the primary data of the first and third papers.				

4.3 Qualitative and quantitative data collection and analysis

As shown in Table 3, I employed a mixed-methods approach, integrating quantitative (close-ended surveys) and qualitative (open-ended surveys, mapping, semi-structured interviews, document analysis and participant observation) techniques in my study. In the following section, I explain how I have used these methods in my papers.

4.3.1 Paper I and II: Closed and open-ended surveys and mapping

The first and second papers addressed the second sub question of this thesis, namely, *how can the PPGIS method contribute to sustainable mobility planning in rural tourism regions*? The first paper sought to explore the potential of the PPGIS methodology for collecting data relevant to the early stages of transport planning: the initiation phase. To achieve the objective of the research, I concurrently collected three types of data. These were numerical data (using closed-ended survey questions), textual data (using open-ended survey questions) and spatial data (using mapping questions). The close-ended questions covered topics such as mode choice, trip characteristics (e.g., frequency of visit and main reason for visiting the study area) and socio-demographic aspects. In the open-ended sections, participants could give different or more detailed answers related to their travel experiences.

In addition, to better understand the participants' travel needs and preferences, each one of them was presented with a map and asked to mark the places they stayed in the study area (i.e., Sälen), their favourite places and places where mobility improvements were needed. Such a research technique, as mentioned earlier, in which spatial and non-spatial data are combined in a single study, is called a

PPGIS survey (Fagerholm et al., 2021). The combination of the three types of data in the PPGIS survey was appropriate to meet the research objective of exploring how data could be collected using PPGIS for the initial stages of transport planning, where comprehensive data is required to understand a transport problem.

Together with a research assistant, I distributed PPGIS surveys on site to tourists in Sälen from the end of February to the end of March 2020. Participants completed 162 surveys, which were included in the final analysis. I analysed the closed-ended survey data in SPSS, the textual information thematically and the spatial data in QGIS, generating descriptive statistics for the closed-ended survey responses and maps to visualise the spatial results. The second paper is closely related to the first. In the second paper, I used the experience and insights from the first paper to provide practical insights into how to design and effectively conduct mixed methods PPGIS studies in rural tourism and transport planning contexts.

4.3.2 Paper III: Semi-structured interviews, participant observation and document analysis

The third paper focused on the first sub question of this thesis, specifically, *what are the main transport challenges facing rural tourism regions as perceived by different stakeholders?* The paper draws on qualitative data from semi-structured interviews, document analysis and participant observation. These methods were appropriate for the research as they enabled me to explore the in-depth insights (Tracy, 2020) related to transport challenges and the steps by which practitioners in my study were addressing the problems. Between June 2020 and March 2021, I conducted a total of 12 interviews, each lasting about an hour. The interviewees were people familiar with the topic of

transport issues. The first participants I interviewed worked with transport and tourism matters in Sälen. Subsequently, I used a snowballing technique (Veal, 2018) to recruit the rest of the participants who worked on similar matters in Sälen and Åre. I conducted one interview in person and the rest digitally (i.e., by phone, Zoom, Skype or Teams). Most of the interviews occurred digitally as this was the most convenient alternative at the time of the study due to the restrictions caused by the Covid-19 pandemic (Waleghwa & Ioannides, 2024). I recorded the interviews with the consent of the participants and later manually analysed the material and generated themes (Saldaña, 2013).

To gain further insight into the topic, I analysed several relevant documents, such as the regional transport plans for the study areas and consulted the websites of the tourism destinations included in the study. The documents were particularly useful in providing unique information, such as the specific budget allocations for the development of various transport infrastructures in the study regions, which corroborated some of the findings (Tashakkori & Teddlie, 2010) from the interviews regarding issues of funding for various transport services. Furthermore, throughout the five-year duration of my doctoral studies, I have had the opportunity to visit the study areas on numerous occasions, thus facilitating the collection of data and the development of my research. These visits, conducted in both a professional and a personal capacity, have facilitated my comprehension of the transport and mobility services available in these regions. In this capacity, I have also been able to contribute to the study by drawing upon my own observations as a participant who has had first-hand experience of travelling in these areas.

4.3.3 Paper IV: Closed and open-ended surveys, mapping, and semi-structured interviews

The fourth paper focused on the first sub question of this thesis, namely: *what are the main transport challenges facing rural tourism regions as perceived by different stakeholders?* The paper delves deeper into the challenge of car dependency by unravelling the extent of this dependency and arguing for the urgency of rethinking car-based travel in rural tourism regions. The data presented in the fourth paper were derived from two main sources. The first set of data came from the PPGIS survey, which was conducted primarily for the purposes of the first paper. The second source of data was semi-structured interviews, which I conducted primarily for the third paper. Consequently, I used the same data collection and analysis techniques for the fourth paper as for the first and third papers.

However, in the fourth paper I analysed the spatial data in a different way. Specifically, I used density analysis in QGIS to create maps that showed the concentration of markers that car-dependent tourists had placed to identify places where they stayed, their favourite places, and places where they considered an improved mobility solution was needed. These maps varied from the maps in the first paper, which only visualised the location of the markers. However, each of the maps I produced was appropriate for the purpose of the study in the first and fourth papers, which was to explore the PPGIS method and to examine car dependency among tourists in the study areas, respectively.

4.3.4 Paper V: Closed and open-ended surveys and mapping

The fifth paper addressed the second sub-question of this thesis, namely, *how can the PPGIS method contribute to sustainable mobility planning in rural tourism regions?* The fifth paper has some similarities but also differences to the first paper in terms of how I collected and analysed the data. In particular, the fifth paper also included closed, open and mapping PPGIS survey questions. Nevertheless, the fifth study included just one mapping task (i.e., on mobility improvements), unlike the three mapping tasks included the first study. I decided to have just one mapping task in the fifth paper following feedback obtained from several rounds of pilot testing of the PPGIS survey conducted in the context of the project to which the study was linked (prior to commencing the formal data collection). That feedback from that initial testing conveyed that the mapping was cumbersome, which led me to decide that one mapping question would be appropriate for the study and also sufficient to meet one of its objectives. That objective aimed specifically to identify what temporary and permanent residents in the destinations perceive to be areas which witness mobility problems.

In doing so, the study addressed one of the research gaps outlined earlier, specifically, the fact that limited research considers the perspectives of the aforementioned rural residents (Poltimäe et al., 2022) in the context of sustainable mobility planning. Moreover, the geographical focus for the fifth study was different (i.e., Malung-Sälen and Älvdalen municipalities). A further distinction related to this fifth study had to do with the sampling technique, which comprised a combination of on-site and short message service (SMS) surveys (administered to second homeowners and residents). I conducted the

study from 5th March to 5th May 2024. The final analysis included a total of 995 completed surveys. I followed the same procedure for analysing all the data as in the initial paper. However, instead of visualising the mapped responses, I carried out a density analysis (similar to the fourth paper), which produced a heat map identifying the hotspot areas in the study locations that respondents perceived as most in need of mobility improvements. In the following section I will introduce and elaborate on the issues of reliability and validity in my research, as these are crucial elements in ensuring the quality and rigour of any scientific research.

4.4 Reliability and validity in research

Firstly, the concept of reliability encompasses the dependability, replicability, and consistency of the findings derived from a specific piece of research (Leavy, 2022; Zohrabi, 2013; Lincoln & Guba, 1985). In quantitative research, reliability is primarily concerned with the consistency of findings and the replicability of the study. Indeed, as Leavy (2022, p. 128) observes, "if a measure, a survey instrument, or an experimental intervention is reliable, it will yield consistent results". To illustrate, a study about transport behaviour might include a number of survey questions designed to measure the variable "pro-environmental behaviour". As Leavy (2022) argues, it is expected that the questions pertaining to the variable under investigation will elicit consistent responses from the same respondent. Thus, inconsistencies in responses to the aforementioned variable on pro-environmental behaviour would indicate a potential issue with one or more of the questions (ibid). In addition, if the same results can be replicated when the study is repeated in similar circumstances, a quantitative study is considered reliable (Zohrabi, 2013).

Comparable outcomes in quantitative research can be attained with relative ease, given that the data are expressed in numerical form (ibid). Nevertheless, achieving similar results in qualitative studies designed in an identical manner represents a significant challenge. This is primarily due to the fact that the data are in textual form and inherently subjective. Accordingly, with regard to the reliability of qualitative research, Lincoln and Guba (1985) posit that it is preferable to concentrate on the consistency and dependability of the data, as opposed to striving to obtain identical results. Lincoln and Guba, therefore, contend that, rather than seeking replicability in qualitative research, it is preferable to accept that the results are consistent and dependable based on the thoroughness of the data collection processes employed.

In order to enhance the reliability of the qualitative and quantitative aspects of my research, I employed two main strategies. The initial strategy was peer evaluation (Zohrabi, 2013). I employed the strategy of peer evaluation in all five of my papers, integrating the findings and conclusions of other researchers into my own work (ibid). I achieved this by situating my findings within the broader context of previous research in the fields of tourism and transport. Furthermore, I utilised the peer evaluation process by presenting my work at various international scientific conferences, where I received feedback from experts in my fields. The second strategy was to collaborate with other scholars (Leavy, 2022) on my first, third and fifth papers, which enhanced the reliability of those papers. Indeed, as Leavey (2022) suggests, the involvement of multiple researchers in a single study is beneficial in terms of safeguarding against researcher fatigue and inadvertent bias.

Secondly, the concept of validity in both qualitative and quantitative studies is concerned with the credibility of the research in question. It comprises an evaluation of the research's veracity and precision, as well as an assessment of its alignment with the stated objective (Leavy, 2022). Validity can be classified into various categories, including internal and external validity. In essence, the notion of internal validity is concerned with the congruence between the empirical findings and the actual reality (Leavy, 2022). Furthermore, it encompasses the degree to which the researcher monitors and quantifies the phenomena under investigation. The concept of external validity pertains to the extent to which findings can be applied in other contexts or with other subjects (Lincoln & Guba, 1985).

In order to enhance the internal and external validity of my research, I adopted the strategy of triangulation (Zohrabi, 2013). I used the triangulation strategy in all my papers by using a combination of qualitative (paper III) and mixed methods (papers I, II, IV and V) techniques to collect data (Johnson & Onwuegbuzie, 2004). The use of multiple methods proved advantageous as it facilitated the collection of different types of data, which contributed to a more comprehensive understanding (Creswell, 2009) of transport challenges in rural tourism regions in my study and how to plan for sustainable mobility. Moreover, I implemented additional strategies to enhance the quality of my qualitative research. In a similar vein, Tracy (2020, p. 266) poses a pertinent question: "how do you make your qualitative project attractive, credible, and likely to be taken seriously?" Tracy presents a number of strategies for maintaining the qualitative research process at the requisite scholarly standard. These include, but are not limited to, a focus on aspects such as rigour and ethical research practice.

I consider my qualitative research to be rigorous as I have invested time, effort and thoroughness in carrying out the research (Tracy, 2020). For example, I observed the principle of saturation when conducting my interviews, after my decision to stop conducting further interviews after realising that further interviews would not have added any new information (Creswell & Creswell, 2018). Moreover, my research followed the principles of ethical practice. Specifically, it complied with the European Union's General Data Protection Regulation (GDPR). The information provided by research participants was treated as strictly confidential. Specifically, it was used only for research and educational purposes and disclosing no personal information. In the next section I turn to a summary of the main findings of my research.

5 Summary of main findings

This chapter presents the findings of the five papers that have formed the basis of this thesis. As previously stated, the aim of this thesis has been twofold. Firstly, it has sought to contribute to a more comprehensive understanding of the transport-related challenges encountered by rural tourism areas. Secondly, it has aimed to explore how to plan sustainable mobility in such locations. In order to contextualise the findings within the wider research area, I first specify the aim each paper addressed before providing a summary of its principal findings.

5.1 Paper I: Investigating PPGIS methodology in tourism transportation planning

Title: Exploring the use of public participation GIS in transportation planning for tourism at a Nordic destination

Authors: Beatrice Waleghwa and Tobias Heldt

Status: Published

Journal: *Scandinavian Journal of Hospitality and Tourism*

The initial paper addressed the second research question, which was to examine the potential of PPGIS method for the sustainable planning of mobility in rural tourism regions. In particular, this first paper sought to examine the potential of PPGIS methodology for the collection of data pertinent to the early stages of transport planning, with Sälen serving as a case study. The study demonstrated that PPGIS surveys that simultaneously obtain a variety of data types, including both closed-ended and open-ended survey information, as well as mapped insights, could be an effective method for transportation planning in rural tourism contexts. This is because such surveys concurrently lead to the collection of comprehensive spatial and non-spatial information.

To illustrate this, the results of the closed-ended survey identified the car as the most preferred mode of transport to Sälen, with 87% of tourists utilising their own vehicles to reach the destination (Waleghwa & Heldt, 2022). Moreover, the open-ended survey responses implied that the lack of charging ports for electric cars constituted a significant issue related to mobility in Sälen that required attention. Furthermore, the mapped responses indicated that the area

surrounding Hundfjället and Tandådalen (two major ski slopes in Sälen) required the most significant transportation improvement (ibid). These insights are fundamental for the initial stages of sustainable mobility planning, as they could inform transportation planning and management at the destination level by indicating specific transport issues from a sustainability perspective that require addressing. These include, for example, how to reduce car dependency and the need for chargers for electric vehicles. Additionally, the insights indicate the specific places towards which stakeholders could strategically direct available resources when designing interventions to better understand the problems and eventually plan how to address them.

However, while the results of the first paper show that PPGIS surveys were helpful in collecting quantitative and qualitative data simultaneously in tourism contexts, challenges arose related to sampling and low response rates. It was incredibly difficult to get motivated participants to answer all the questions and participate in mapping. Therefore, one of the conclusions of the paper was the need for further research into how to encourage participants to respond to PPGIS surveys. The first paper also identified other potential avenues for future research, which I subsequently explored in my doctoral research. These included investigating the dominance of car travel in Sälen (paper IV) and the overall mobility challenges at the destination (papers III and V).

5.2 Paper II: Designing PPGIS studies in rural tourism contexts

Title: Mixed methods Public Participation GIS (PPGIS) in tourism; a concurrent triangulation approach

Author: Beatrice Waleghwa

Status: Published

Book: P. Mason, M. Augustyn & A. Seakhoa-King (Eds.), *How to Use Mixed Methods in Tourism* (PP 85-105). Edward Elgar.

The second paper addressed the secondary research question, which was to examine the potential of PPGIS method for the sustainable planning of mobility in rural tourism regions. In this regard, the second paper, which was based on the lessons learned from the initial paper, provides practical insights into the design and effective conduct of mixed methods PPGIS studies in rural tourism and transport planning contexts. In order to achieve the aim of the second paper, I provided an in-depth account of the concurrent triangulation mixed-method approach (Creswell, 2009) employed in the initial paper.

In terms of the practical recommendations for the design of concurrent mixed-methods PPGIS studies appropriate for transportation planning in rural tourism contexts, the principal findings of the second paper were based on two fundamental issues. Firstly, it was vital to clearly define the aim of the study and to determine the type of questions to include in a PPGIS survey in order to best fulfil the study's objectives (Waleghwa, 2024). Secondly, it was essential to carefully select the sample for the study, determining from whom the data will be collected.

In regard to the initial issue of defining the study aim and type of questions to include, a concurrent mixed methods PPGIS survey necessitated that equal weight be given to quantitative and qualitative questions in the study's design and subsequent data collection, analysis, and interpretation (Creswell, 2009). This implied that, as evidenced by the findings of the second paper, the number of close-ended, open-ended, and mapping questions needed to be meticulously chosen to guarantee that they comprehensively address the objective of the study while simultaneously avoiding overwhelming the respondents. This was particularly crucial given that mapping questions demand a relatively greater investment of effort and time to answer compared to standard survey questions.

The second issue concerned the sampling considerations. The second paper underscored the importance of identifying the most suitable population to which the PPGIS survey should have been administered. This second issue was consistent with the challenge of low response rates observed in the tourist-oriented PPGIS survey presented in the initial paper. These difficulties may be attributed, at least in part, to the fact that tourists often have less time at a destination where they wish to engage in leisure activities rather than participate in research. In light of the findings presented in the second paper, it became obvious that it would be prudent to plan for data collection periods with the understanding that a significant investment of time may be required to achieve a higher response rate from tourists.

5.3 Paper III: Unravelling rural tourism travel challenges

Title: "Everyone wants to drive there"; Challenges to transport sustainability in rural tourism destinations

Authors: Beatrice Waleghwa and Dimitri Ioannides

Status: Published

Journal: *International Journal of Tourism Research*

The third paper addressed the first research objective, which relates to contributing to a broader understanding of the transport challenges faced by rural tourism destinations. Specifically, the paper applied social representation theory to examine how tourism and transport practitioners perceive transport challenges in rural destinations and how they overcome these problems, using Sälen and Åre as case studies. The findings revealed two main thematic social representations of the transport challenges of travelling to and within both destinations, and how practitioners addressed these problems.

Regarding the first theme, the results showed that the main transport challenges for travelling to Åre and Sälen are, among others, an over-reliance on car travel and inefficient and infrequent public transport. Car dependency is not only a problem for getting to the destinations, but also for travelling within the destinations. According to the practitioners in the study, the remote location of the destinations and the sprawling nature of the service points and settlements in the regions where the destinations are located make car travel to and within the destinations necessary (Waleghwa & Ioannides, 2024). In addition, the results show that car travel to and within the study areas is partly due to challenges related to alternatives such as public

transport. Indeed, practitioners bemoaned the challenge of increasing public transport provision given the low permanent population in the study areas. This is mainly due to the fact that, as the results also show, the transport supply in the regions is determined by the number of people who live, study and/or work in these regions throughout the year (ibid).

Regarding the second theme, the practitioners in Åre and Sälen addressed the challenges of getting to and within the destinations in several ways. Surprisingly, one solution for addressing challenges related to travel to the destinations was to promote air travel. This specific solution, not to mention the destinations' over-reliance on private car use, showed that they have not yet started the transition to a low-carbon transport future. Still, the practitioners' efforts to address transport challenges within the destination have been geared towards increasing collective means of transport, such as the operation of ski buses. Moreover, the practitioners have been working towards enhancing the use of electric vehicles at the destinations and in the wider rural community by investing in more electric charging points.

5.4 Paper IV: Challenging car dependency in rural areas

Title: Rethinking car-dependent rural tourism mobility

Author: Beatrice Waleghwa

Status: Published

Journal: *Applied Mobilities*

The fourth paper addressed the first research objective, which aims to contribute to a broader understanding of the transport challenges faced by rural tourism destinations. In particular, the fourth paper

built upon the findings of the third by exploring the challenge of car dependency in greater depth. This involved an investigation into the extent of car dependency among domestic tourists in Sälen. The central argument I presented in the fourth paper was the necessity for a reconsideration of the system of automobile-based travel in rural tourism regions. This argument has yet to be addressed in the context of sustainable mobility research and practice. Indeed, automobiles are commonly perceived as the default mode of transportation in rural areas (Shergold et al., 2012). This perception, in turn, presents a significant obstacle to the adoption of sustainable travel practices in such settings.

The findings of the fourth paper indicated that a notable proportion of Swedish tourists in Sälen demonstrated a high level of car dependency. The survey results clearly illustrated a high level of car dependency, with 89% (118 respondents out of 132 in total) of visitors travelling with their own vehicles to the destination (Waleghwa, 2025). It is noteworthy that of the 118 respondents who travelled to Sälen by car, 74 subsequently used the same mode of transport within the destination. This exemplifies monomodalism (Shergold et al., 2012), whereby the 74 respondents employed solely the car to fulfil their mobility requirements to and from but also within Sälen.

Furthermore, a comparison of the relationship between tourists' transportation choices and their accommodation preferences demonstrated that 100% of individuals who selected alternative lodging arrangements (e.g., those who did not stay in hotels) also utilised personal vehicles for travel to Sälen. Alternative lodging arrangements included the use of a camper van, a bed and breakfast establishment, or a hostel, as well as staying with friends or relatives.

The survey results also indicated that none of the respondents in the study selected public transportation as their mode of travel to Sälen, despite the availability of this alternative (ibid). Figure 3 shows that there are bus stops on the way to and along the major ski areas in Sälen. This confirms that public transport services are available to and within the destination. Still, the qualitative data from the fourth paper, comprising interviews and open-ended survey questions, revealed the existence of obstacles to the utilisation of public transportation to Sälen. These included the unpopularity of the available public transport due to poor bus connections from Mora town to Sälen. Such factors may have deterred visitors from utilising the bus to reach Sälen.

Nevertheless, the utilisation of buses for journeys within the destination was also low (2%), despite the availability of this alternative mode of transport (a ski bus service is operated by the stakeholders for travel within Sälen). Therefore, a principal concluding argument of the fourth paper was that, although the development of infrastructure and services to support alternative modes of travel to the car is relevant, it is not a sufficient measure for reducing car dependency among domestic tourists to Sälen. It would be prudent for rural tourism policy in the destination to place an additional focus on encouraging tourists to alter their travel behaviour. One potential approach could be to provide incentives for the utilisation of alternative modes of transportation and to impose restrictions on the use of private vehicles, particularly within the destination (Waleghwa, 2025).

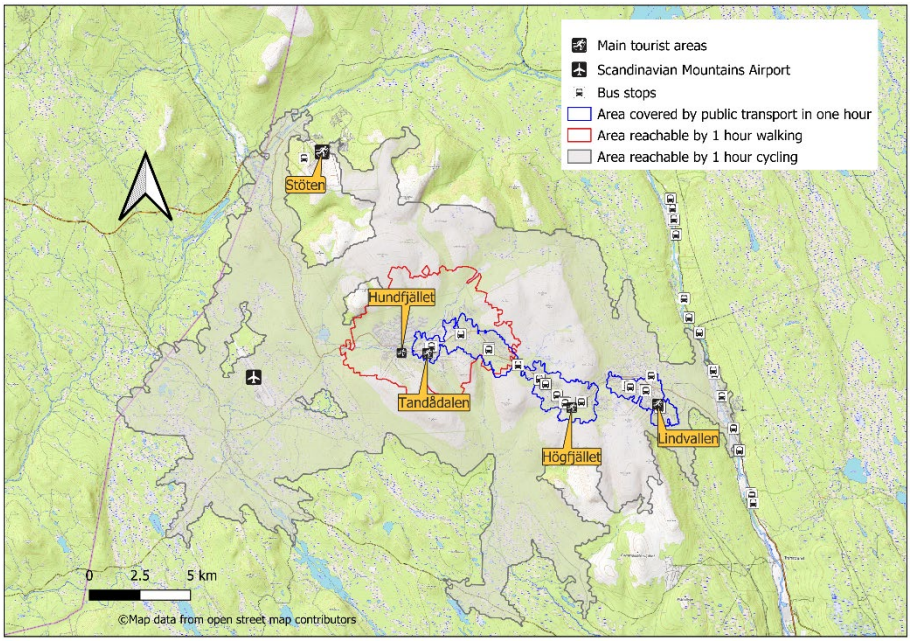

Figure 3: Transport supply options in Sälen

Note: I chose Tandådalen (because it is approximately in the middle of Sälen) as the starting point for the analysis of reachability by walking, cycling and public transport (Source: Waleghwa, 2025).

The fourth paper yielded an additional key argument: the advent of a political regime explicitly endorsing the transition away from automobile dependency in Sälen is essential to advance beyond the prevailing car-centric, high-carbon transportation system to a more sustainable one.

5.5 Paper V: Planning for sustainable mobility in rural tourism areas

Title: Mapping transport improvement areas and travel patterns in rural tourism regions; implications for sustainable mobility planning

Authors: Beatrice Waleghwa and Tobias Heldt

Status: Manuscript

Journal: To be decided

The fifth paper addressed the secondary research question, which was to examine the potential of PPGIS method for the sustainable planning of mobility in rural tourism regions. In this regard, the paper built on the first by identifying, through the use of a PPGIS survey, the travel patterns and perceived mobility improvements of both permanent residents and temporary residents, namely tourists and second homeowners. Moreover, it demonstrated how sustainable mobility planning for these groups can be conducted using the PPGIS methodology. The case study areas for the fifth paper were the municipalities of Malung-Sälen and Älvdalen. In doing so, the study addressed two of the research gaps previously identified, namely the paucity of research considering the perspectives of both temporary and permanent rural residents (Poltimäe et al., 2022) in the context of sustainable mobility planning and the dearth of sustainable planning tools for non-urban tourism contexts (Tomej & Liburd, 2020).

Regarding the travel patterns of permanent and temporary residents in the study regions, a key finding of the fifth paper showed that, not surprisingly, the car - petrol or diesel (78%) - dominates travel within the municipalities of Malung-Sälen and Älvdalen for all groups. It was

interesting to note that 9% of the respondents used electric vehicles for travelling within the study regions. The findings also showed that respondents rarely used other alternative modes of transport such as public transport, cycling and walking.

Another key finding from the fifth paper was that respondents marked 956 unique locations on the maps of the study regions. A heat map based on the mapped responses showed that the respondents highlighted two "hot spot" areas in Malung-Sälen (Malung town and Sälen destination) and two in Älvdalen municipality (Älvdalen town and Idre destination) as the ones they believed need most mobility improvements (see Figure 4). Furthermore, following the placement of a marker, respondents were provided with this follow-up query: "What problems do you think the place has?" In response, participants expressed concern regarding the dearth of cycling and walking paths and public transportation in the two municipalities under study.

The two key findings, as previously outlined, collectively demonstrated the potential of PPGIS methodology in engaging both temporary and permanent residents in rural tourism areas in the planning of sustainable mobility. This is because the results indicated two key areas for intervention: firstly, delineated spatial parameters, or "hot spot" areas, and secondly, transport policy areas. The latter category encompasses the previously mentioned absence of dedicated cycling and walking routes, as well as a dearth of accessible public transportation options within the study region. This specific PPGIS approach to sustainable mobility planning is consistent with prior research indicating that the public can engage in planning and decision-making processes through various avenues, including, but not limited to, the delineation of intervention areas (in terms of both

spatial and thematic parameters) and the prioritisation of policy objectives (Czepkiewicz et al., 2016; Cascetta & Pagliara, 2013).

6 Discussion

This thesis has been concerned with the study of sustainable mobility in rural tourism areas. In particular, it aimed to i) contribute to a better understanding of the transport challenges faced by rural tourism areas and ii) explore how to plan for sustainable mobility in such places. In order to achieve the aim of the thesis, I focused on the following overarching research question: *How can rural tourism regions promote sustainable mobility*? In seeking to answer this question, my approach was premised on two key issues inherent in the sustainable mobility paradigm (Banister, 2008) as previously stated. Firstly, that a change in user practices (for instance, in the selection of transport modes) and secondly, the implementation of land use policies that facilitate the adoption of sustainable travel options, are crucial elements in the transition towards a sustainable, low-carbon transport future.

The aforementioned issues have been addressed to a considerable extent in the existing literature in the fields of transport, tourism and sustainability (see for instance, Holden et al., 2019; Banister, 2008; Hickman et al., 2013; Hopkins, 2020; Gössling, 2017; Peeters & Dubois, 2010; Peeters et al., 2019). Nevertheless, the issues remain pertinent, particularly in the context of rural tourism, given that the existing literature in the fields overwhelmingly focuses on urban settings (Tønnesen et al., 2022; Zhao & Yu, 2020). This is demonstrated, for instance, by the scarcity of sustainable planning tools for non-urban tourism contexts (Tomej & Liburd, 2020).

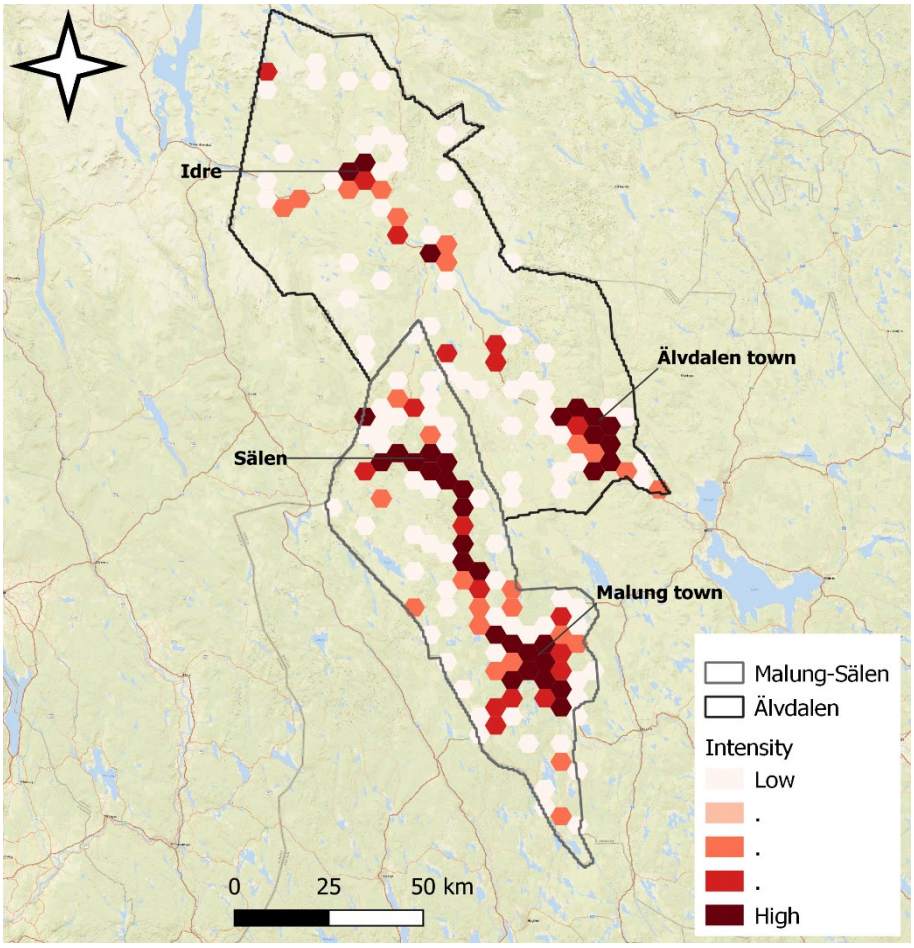

Figure 4: Heat map showing "hot spot" areas in Malung-Sälen and Älvdalen municipalities

Source: Waleghwa and Heldt (forthcoming).

It must be acknowledged, however, that by focusing on the two previously outlined issues inherent in the sustainable mobility paradigm, it has not been my intention to claim that this thesis should be regarded as a definitive solution for addressing sustainable rural

mobility problems. Rather, this thesis constitutes my contribution to the ongoing scholarly discourse on sustainable mobility, particularly the challenges for transitioning to a low-carbon transport future, with my empirical point of departure being the hitherto neglected peripheral rural tourism regions.

To gain a comprehensive understanding of the transportation challenges and travel practices of various groups in rural tourism regions, as well as how to plan for sustainable mobility in such settings, I divided the overall question into two sub-questions: 1) *What are the main transport challenges facing rural tourism regions as perceived by different stakeholders;* and 2) *how can the PPGIS method contribute to sustainable mobility planning in rural tourism regions*? This chapter is organized around two primary themes that correspond to the two sub-questions. It draws on the empirical material from my five papers, as well as theoretical discussions related to the main findings that emerged from this thesis.

6.1 Challenges of sustainable rural mobility; a crisis of uncontested poly-challenges

In response to the initial sub-question, the collective findings of this thesis demonstrated that the primary challenge to sustainable mobility in rural tourism regions is one that I describe as *a crisis of uncontested poly-challenges*. In other words, these regions are simultaneously confronted with a complex set of transport challenges, including the pervasive dominance of the private car, inadequate public transport services, and an unfavourable political regime that hinders the transition from the current car-centric transport system to a more sustainable one.

The finding of this thesis regarding the hegemony of car travel is unsurprising considering the remote locations of the rural destinations, the sprawling nature of service points and settlements in the regions, and the poor or non-existent public transportation services that characterise these areas. These factors converge to render automobile travel to and within rural destinations a necessity (Waleghwa & Ioannides, 2024; Tomej & Liburd, 2020).

Moreover, as highlighted earlier, automobiles have become the dominant form of travel in the modern era, characterised as "quasi-private" mobility, which subordinates other forms of mobility (Urry, 2004). Accordingly, the transition from the current, car-centric transport system to a more sustainable one in rural tourism regions presents a significant challenge (Dickinson & Dickinson, 2006; Dickinson & Robbins, 2007; Dickinson et al., 2009). This is partly due to the fact that, as Urry (2004) further highlights, the *automobility* system is a highly complex entity, comprising a multitude of interrelated elements, including infrastructures, practices, policies, technologies and regulations. Furthermore, this system has become self-reinforcing as a result of a process of path dependence and lock-in.

The transition from the current, car-centric transport system to a more sustainable one in rural tourism regions is further complicated by the continued acceptance and unchallenged status of cars as a means of rural transportation (Shergold et al., 2012; Waleghwa, 2025). As observed by Shergold et al. (2012), the sustained reliance on personal vehicles for transportation in rural regions has resulted in the emergence of a monocentric transportation system. As previously outlined, this situation has been described by Shergold using the term "monomodalism", which denotes the tendency to prioritise a single

mode of transportation, in this case, the automobile, to fulfil the majority of, if not all, mobility needs. Shergold additionally posits that the consequence of monomodalism is that those engaged in the formulation of rural policy have not devoted sufficient attention to the development of transport policies that encourage the utilisation of alternative modes of transportation to the private automobile.

Nevertheless, as the findings of the third paper indicated, practitioners engaged in the fields of tourism and transportation in Sälen and Åre have demonstrated a commitment to the development of alternative transportation options to and within the destinations. The results of the third paper also revealed that one alternative mode of transport to the destinations in question is surprisingly the promotion of air travel. This is surprising given the growing unpopularity of air travel in an era of heightened awareness of the dangers of climate change (Becken, 2006; Gössling, 2017; Peeters & Dubois, 2010; Peeters et al., 2019). As an example, air travel in Sweden is increasingly becoming unpopular for some people as evidenced by a growing movement known as "Flygskam" (translated to English as flight shaming) (Ozturkcan & Ozdinc, 2024). The Flygskam movement aims to persuade people to avoid flying by shaming them on social media when they share praise for flying, in order to raise awareness of the negative impact flying has on the environment (ibid). The promotion of air travel, coupled with the fact that Sälen and Åre continue to rely heavily on private vehicle use, demonstrates that they have yet to fully embark upon the transition to a low-carbon *desirable transport future*, in which there is a commitment to reduce CO_2 emissions (Peeters et al., 2019).

Nonetheless, as the findings of this thesis highlighted, practitioners' endeavours to address transport issues in Sälen and Åre have been

focused on the enhancement of collective transportation options, such as the introduction of ski buses. Furthermore, the practitioners have been working to facilitate the utilisation of electric vehicles at the destinations and in the broader rural communities by investing in an expansion of electric charging points.

However, while the use of electric vehicles within Sälen and Åre may be perceived as a more sustainable transport solution than fossil-fuel dependent cars, this approach gives rise to a *wicked problem* (Noto & Bianchi, 2015; Rittel & Webber, 1974). This is because the introduction of electric vehicles to address one issue (namely, the reduction of CO_2 emissions from fossil-fuelled cars) gives rise to new challenges, such as the worsening of traffic congestion (Ioannides & Wall-Reinius, 2015; Waleghwa & Ioannides, 2024) in both locations, which has already been a significant issue during peak periods (Waleghwa & Heldt, 2022).

The conceptual model (Figure 5) provides a summary of the principal transport challenges confronting rural tourism regions. This summary is based on the findings of this thesis and supported by prior research in the field, as I have detailed in the preceding discussion. As Figure 5 further illustrates, the challenges can be broadly categorised as car dependency and poor public transport services. Moreover, the places included in this study have historically been in a marginal position in the context of transport planning research and policy. This situation is not exclusive to the study areas addressed in this thesis. As previously indicated, rural tourism regions rarely feature in transport and sustainability research (Zhao & Yu, 2020; Tomej & Liburd, 2020), which serves to further exacerbate their peripheral position (Christaller, 1964) with regard to the promotion of sustainable mobility.

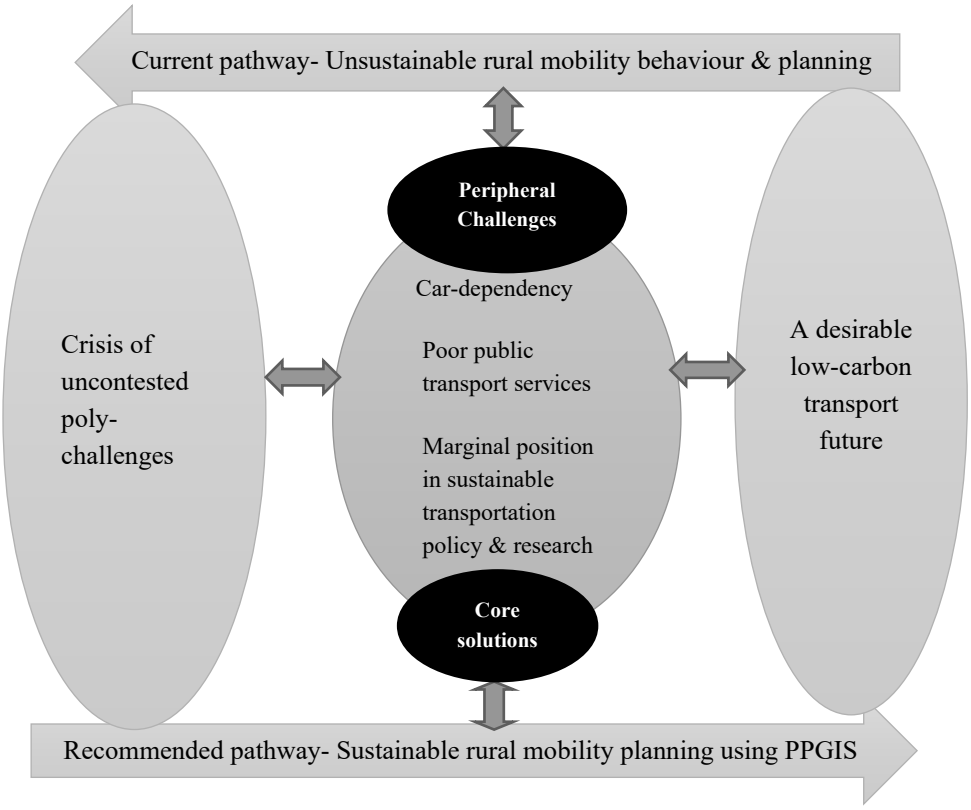

Figure 5: Conceptual model of rural travel challenges and (un)sustainable mobility planning

Figure 5 also serves to illustrate my proposition that PPGIS methodology constitutes a core approach with the potential to address the current crisis of *uncontested poly-challenges* and to propel rural tourism regions onto a sustainable path towards a desirable transport future. Figure 5 further illustrates that a trajectory towards sustainable rural mobility is a viable proposition. However, this requires a consistent and unwavering commitment to the pursuit of sustainable mobility, since a lack of such dedication could potentially result in an unsustainable outcome (i.e., a return to the current state of affairs).

6.2 Planning for sustainable rural mobility; a PPGIS approach

In this section I present a synthesis of the key findings from the first, second and fifth papers in this thesis, which were specifically dedicated to the second sub-question, which asked *how can the PPGIS method contribute to sustainable mobility planning in rural tourism regions?* As I mentioned in earlier sections of this thesis, due to its participatory mapping approach, PPGIS leverages the technological capabilities of GIS with the ultimate goal of improving the quality of life for community members by involving them in local planning processes (Shannon et al., 2021; Tulloch, 2008; Brown, 2017; McCreary et al., 2020).

A principal objective of PPGIS is to incorporate the perspectives of members of the public, who would otherwise be marginalised in planning and decision-making processes (Munro et al., 2019; Mukherjee, 2015). In addition, as discussed previously, early and ongoing public engagement is considered a key factor in the success of any planning process (Cascetta & Pagliara, 2013). Such engagement often results in public support for the decisions that emerge from the process (Banister, 2008). I explored early engagement in planning processes in my first paper, where I investigated the potential of the PPGIS method for public engagement in the early stages of transport planning in the context of rural tourism by collecting data relevant to this planning stage.

The findings of the initial study indicated that PPGIS surveys, which concurrently gather a range of data types, including both closed and open-ended survey information as well as mapped insights, could be an efficacious approach for the preliminary phases of transport planning in rural tourism contexts. This is due to the fact that such

surveys result in the simultaneous collection of comprehensive spatial data (e.g., locations requiring an improved mobility solution) and non-spatial information (e.g., existing travel patterns). Such comprehensive information is particularly pertinent in the initial stages of transport planning, where the objective is to gain insight into the existing transport service before developing alternative solutions in subsequent stages of the transport planning process (Bruton, 2021; Litman, 2013; Nijkamp et al., 1998).

Furthermore, the integration of diverse qualitative and quantitative inquiries (such as the incorporation of spatial and non-spatial questions) to examine a singular phenomenon, such as transport planning, could enhance the study by corroborating the findings of a research project (Seakhoa-King et al., 2021; Tashakkori & Teddlie, 2010; Creswell & Creswell, 2018). This is particularly the case when the various approaches yield distinctive insights that would otherwise be unattainable through a single methodology (Tashakkori & Creswell, 2007; Johnson & Onwuegbuzie, 2004).

Nevertheless, as the findings of the second paper in this thesis demonstrated, when designing concurrent PPGIS studies (Creswell, 2009), it is of the utmost importance to exercise caution in defining the study's objective and determining which questions to include in the survey. This is to ensure that the survey adequately addresses the study's objective while simultaneously avoiding overwhelming the respondents. This was of particular importance, given that mapping questions require a greater investment of effort to answer than standard survey questions (Waleghwa & Heldt, 2022).

The findings of the second paper also underscored the importance of identifying the most suitable participants for inclusion in a PPGIS study, in order to ensure that the study's objectives are met. Indeed, as Brown and Kyttä (2014) argued, the term "public" in PPGIS studies encompasses a diverse range of stakeholders, including residents or visitors to a particular area, experts or non-experts, and those who influence decision-making processes. Additionally, the authors highlight that the definition of the term "public" in PPGIS is not fixed and can vary depending on the context. For example, the term may be understood to include decision-makers, individuals who are directly or indirectly affected by a decision, or even the general public.

As previously discussed, public engagement in planning processes is advantageous for several reasons. Firstly, it can facilitate more effective decision-making by incorporating the input of experts and community members (Shannon et al., 2021). Secondly, it can facilitate a more nuanced comprehension of the circumstances at the local level (Tang & Waters, 2005). Thirdly, effective engagement (for example, early and continuous engagement, transparency in the planning process) can result in better policies (Le Pira et al., 2016). This is of particular importance in the context of tourism, where policy is considered to be of primary importance in relation to all other aspects of tourism planning (Gunn & Var, 2020).

The findings of the fifth paper of this thesis demonstrated that engaging the public (in this case, temporary and permanent rural tourism residents) is beneficial, as they can contribute to sustainable rural mobility planning and decision-making processes through various avenues, including, but not limited to, the delineation of intervention areas (in terms of both spatial and thematic parameters)

and the prioritisation of policy objectives (Czepkiewicz et al., 2016; Cascetta & Pagliara, 2013). As illustrated in Figure 5, which is a central argument of my thesis, the PPGIS approach is a core method for advancing sustainable mobility from its current peripheral position in rural tourism contexts. This is because PPGIS can facilitate a comprehensive understanding of the multifaceted transport challenges facing rural tourism regions (as illustrated in my first and second papers) and engagement of the public in sustainable mobility planning (as demonstrated in my first and fifth papers).

7 Conclusion

As previously indicated, a significant contribution to the understanding of how to conceptualize the relationship between transportation and tourism is to consider it on a continuum with *transportation for tourism* on one extreme and *transportation as tourism* on the other (Lumsdon & Page, 2004). The former is where transportation serves as a functional means to travel to and from destinations, as well as within destinations. The latter is where transportation is considered a form of tourism. In essence, transportation can become an attraction in itself (Duval, 2020), as evidenced by passengers' recreational utilization of heritage trains (Gross & Klemmer, 2014).

Most studies, as evidenced by what constitutes the majority of transportation geography research endeavours (Hopkins, 2020), which deal with transportation, tourism and sustainability issues have focused on the topic of *transportation for tourism*. Such studies tend to concentrate on quantifying the characteristics of users and the logistics of transport provision in assessing transport to and within destinations

(Dickinson & Dickinson, 2006). This thesis rests mainly within the body of research focusing on transportation for tourism, specifically travel to/from and within rural tourism regions. However, unlike previous studies that have primarily used quantitative methods (Dickinson & Dickinson, 2006), this thesis includes qualitative aspects in addition to quantitative techniques. This has been done to ensure that the subjective perspectives of my research participants (e.g., those of practitioners involved in transportation planning) are captured in my study.

Accordingly, I employed a mixed method research design to investigate sustainable mobility in rural tourism areas. In particular, my aim was to contribute to a better understanding of the transport challenges faced by rural tourism areas and to explore how to plan for sustainable mobility in such places. My overarching goal has been to answer the research question: *How can rural tourism regions promote sustainable mobility?*

The collective findings of this thesis demonstrate that a significant impediment to the promotion of sustainable mobility in rural tourism regions is the presence of a complex set of transport-related challenges, which I have termed *a crisis of uncontested poly-challenges*. The challenge of car dominance, as evidenced by my third and fourth papers, is not unexpected, as it is well-documented that cars predominate in rural mobility (Dickinson & Robbins, 2007). However, what is noteworthy is the normative acceptance of the car as "the" solution for rural transportation (Shergold et al., 2012), as I have emphasized in my fourth paper. This complicates the transition from the current car-centric transport system to a more sustainable one (Urry, 2004).

Accordingly, as previously mentioned, innovative methodologies that encompass land use planning and public engagement are needed to plan for sustainable mobility in rural areas (Hall, 2008; Broaddus & Cervero, 2019). Related to this, I have explored how PPGIS - a participatory land use planning method - could contribute to sustainable mobility planning in rural tourism contexts. As demonstrated in my first, second and fifth papers, PPGIS can facilitate a comprehensive understanding of the diverse transport challenges facing rural tourism regions and facilitate public engagement in this planning. For example, the public could be involved in sustainable rural mobility planning using PPGIS by defining intervention areas (e.g., identifying "hot spot" areas in need of an improved mobility solution) and suggesting which aspects of transport policy should be prioritised (Czepkiewicz et al., 2016; Cascetta & Pagliara, 2013). The public could do this, for instance, as the results of the first paper showed, by highlighting the shortage of transport infrastructure such as charging points for electric vehicles at specific locations.

7.1 Contributions of the thesis

The primary theoretical contribution of this thesis to the fields of tourism, transportation, and sustainability research is the conceptualization of rural travel challenges *as a poly-crisis*, with car dominance as the primary catalyst of this crisis. Furthermore, by employing contemporary concepts of wicked problems, undesirable transport futures, and monomodalism in sustainability discussions and social representation theory, this thesis contributes to an in-depth understanding of the transport challenges. To illustrate this contribution, by using the theory of social representation in my third paper, it was possible to highlight and interrogate the hegemony of the

car. The theory was useful in understanding how the representation of the car as "the rural" transport solution continues to dominate our thinking in modern day. According to the theory, this hegemonic representation of the car as the chief purveyor for rural mobility indicates our shared knowledge and understanding of how people travel in rural areas. In essence, we possess a form of common sense (Moscovici, 1988) understanding regarding rural travel. This understanding, which is often resistant to change, exerts a dominant influence on our attitudes and rural transport behaviour (Dickinson et al., 2009).

This thesis also makes methodological and practical contributions to the fields of tourism, transport, and sustainability. In my first paper, I explore the potential of PPGIS in the early stages of transport planning. In my fifth paper, I focus on the use of PPGIS in engaging both permanent and temporary rural residents in sustainable mobility planning. Taken together, these two studies provide insights into the opportunities and challenges of using PPGIS methodology for planning in a tourism context. This could be valuable for future tourism studies aimed at exploring this method, which has so far received minimal attention in tourism contexts. Furthermore, in my second paper, I concentrate on how to design PPGIS studies, thus providing practical guidelines on how to effectively execute such studies.

Furthermore, the findings of this thesis have implications for transport policy in rural tourism areas in Sweden, especially those included in this study. The thesis has emphasised the significance of the transport planning system in Sweden in considering the travel requirements of both permanent (local residents) and temporary (e.g., tourists, second

homeowners) rural residents. As I highlighted in the fifth paper of this thesis, the current transport planning system in rural tourism areas in my study only considers the travel needs of the permanent population, resulting in a mismatch between transport demand and provided transport services. It is, therefore, recommended that the current methods for transport planning used by municipal stakeholders, regional transport entities, and other key stakeholders at the municipal, regional, and national level involved in tourism and transport matters be improved by more clearly including the travel needs of the temporary and permanent population. One potential approach to achieving this enhancement is to adopt the PPGIS method, which could involve the collection of pertinent data from both temporary and permanent residents concerning their travel requirements and perceived mobility improvements. The utilisation of such data can facilitate a comprehensive understanding of transport issues during the early stages of the transport planning process, as evidenced in the first paper of this thesis.

7.2 Limitations and proposed future research

This study is not without its limitations. To begin with, I have investigated the extent of car dependency among Swedish tourists in Sälen (Paper IV). The results of my thesis point to poor public transport, such as unreliable bus connections as well as the lack of train services between the town of Mora to Sälen as a key factor in the high level of car use in Sälen. However, further research is needed to investigate other factors (e.g., environmental attitudes, socio-demographic characteristics) beyond the lack of alternatives that influence tourists' decisions to travel by car to and within Sälen. An in-depth examination of additional factors which encourage car use is necessary since the

findings in this thesis have also shown that tourists still choose to mostly travel in private cars despite the availability of alternatives (like the ski buses for travel within Sälen).

Furthermore, the environmental aspect of sustainable mobility has been the principal focus in this thesis, particularly drawing attention to, and arguing for a shift away from the current carbon-intensive system dominated by car and air travel to a cleaner transportation future in rural tourism areas. Nevertheless, future research could consider the equally important social and economic aspects of sustainable mobility. In this regard, prospective research could also focus on accessibility from an equity and inclusion perspective within the regions in my study. For example, such research could consider how and in what ways transportation could be planned to better meet the travel needs of marginalized groups (e.g., people with disabilities, the economically disadvantaged, the elderly, also including the growing share of the population without a driver's license) in the areas.

On a final note, it is my hope that this thesis will inspire scholars in the fields of tourism, transport and sustainability research to adopt and apply the PPGIS method in their research. This is because I believe that the learnings from my research (particularly on how to conduct PPGIS effectively) are transferable to other research contexts. I also hope that transport planners in my study areas and beyond will be encouraged to broaden their range of planning tools to include the PPGIS method, as the results of this thesis have demonstrated the potential of this method for sustainable mobility planning. I further hope that tourism and transport stakeholders in my study areas who are working to achieve sustainable mobility will find inspiration in this thesis, as well as reassurance that their efforts will eventually pay off. Granted, there

are many complexities involved when seeking to achieve sustainable mobility, but the examples of peripheral tourism destinations (e.g., Whistler in British Columbia Canada, Alpine Pearls destinations in Europe) that have successfully implemented sustainable tourism development should provide comfort that sustainable mobility can be achieved.

8 References

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