mamba

mobility – accessibility – innovation

How economic factors influence innovative rural mobility solutions

WP 2, GoA 2.5

Authors: Agita Līviņa, Sarmīte Rozentāle, Sandra Brigsa and Jānis Bikše

Vidzeme University of Applied Sciences

Editors: Hunter Reinhardt, Hakan Uraz (REM Consult) and Linda Randall (Nordregio)

Published: May 2020

Interreg Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

How economic factors influence innovative rural mobility solutions

By Agita Līviņa, Sarmīte Rozentāle, Sandra Brigsa and Jānis Bikše

Published by: MAMBA

MAMBA – Maximising Mobility and Accessibility in Regions Affected by Demographic Change is a project funded by the European Regional Development Fund under the Interreg Baltic Sea Region Programme 2013-2020. The content of the report reflects the author's/partner's views and the EU Commission and the Managing Authority/Joint Secretariat are not liable for any use that may be made of the information contained therein. All images are copyrighted and property of their respective owners.

Contents

Figures and tables

Introduction

Accessibility to services is crucial for the wellbeing of rural residents and the social and economic resilience of rural communities (ENRD, 2017). Ensuring this accessibility can be challenging, as the long distances and low population densities that characterise most rural areas are not conducive to the provision of services or infrastructure. Large distances between communities and households present logistical challenges, while the lack of critical mass means that investments are often large relative to the number of people served. The resulting lack of accessibility can have a negative impact on economic activity and quality of life. This, in turn, may lead to the outmigration of the working-age population, intensifying the effect of population ageing and ultimately resulting in economic and social stagnation. Improving mobility and accessibility to services in rural areas is central to breaking this 'circle of decline' (OECD, 2010) (see Figure 1).

In the literature, access to transport is emphasised as a vital factor in increasing the competitiveness, sustainability and attractiveness of rural and remote areas by providing access to employment, education, healthcare and leisure activities (Codatu, 2016). **In contrast to urban areas, where transport initiatives generally focus on environmental concerns, rural transport initiatives tend to have accessibility as the primary focus (OECD, 2009). As such, a key challenge for rural areas is finding cost-effective ways to increase accessibility and mobility for all residents regardless their socio-economic and health status.**

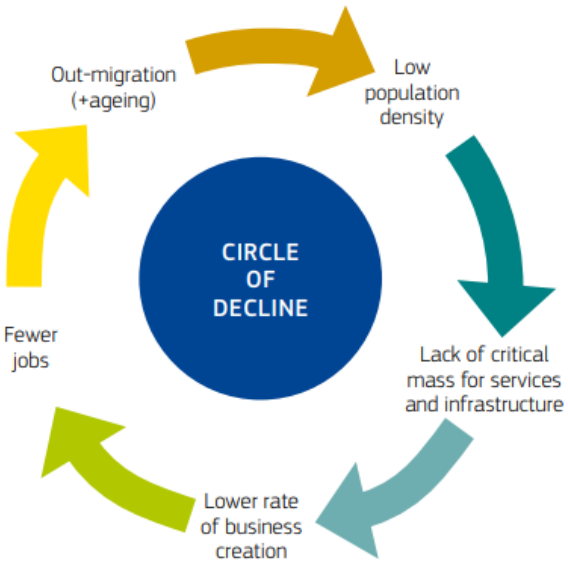


Figure 1. Circle of declining rural areas. Source: OECD 2010

Accessibility challenges in rural areas are by no means a new phenomenon. These challenges have been exacerbated in recent years, however, by cuts to public budgets, centralisation of public services and demographic change. Demographic trends such as population ageing have increased the demand for certain services, while at the same time, cuts to public service budgets have made them more difficult to provide. Thus, it is not only a question of meeting the increasing demand for existing services, there is also a need for innovative approaches that address accessibility challenges in new ways (Copus et al., 2016).

The emerging solutions for rural mobility are a combination of both social, digital and institutional innovations and are generally focused on novel and flexible forms of mobility and shifting a paradigm from car ownership to vehicle usage (e.g. car and ride sharing). Innovations are also emerging in the form of "service-to-people" initiatives. Local people and non-profit organisations are at the forefront of these innovative approaches, often acting as providers of solutions in the absence of state or market alternatives (ENRD, 2017). This study describes the economic determinants that may influence the development and uptake of innovative mobility solutions in rural areas.

Aim and scope

This study is an output of the MAMBA project (Maximising mobility and accessibility of services in rural areas of the Baltic Sea Region), funded by the Interreg BSR Programme 2014-2020. MAMBA project included a consortium of fifteen partners from six countries, and resulted in the implementation of a range of innovative rural mobility solutions in remote regions, towns and villages throughout the Baltic Sea Region. The study was originally published in July 2018 as a "pre-study", with the aim of supporting the MAMBA project partners to develop and implement innovative rural mobility solutions in rural locations around the Baltic Sea Region. At this time, the study was designed to highlight the economic deteminants that may influence the success of the innovative rural mobility solutions planned by the project partners. It addressed the key aspects for consideration in the context of the different solutions they were planning to implement. This revision includes much of the original material along with examples throughout that highlight the ways in which economic determinants acted as enablers and/or barriers in the implementation of the rural mobility solutions piloted through the MAMBA project. Where relevant, the revision also incorporates newly published material from other projects and research.

The study consists of four chapters. **Chapter 1** gives a brief description of data collection and analysis methods. **Chapter 2** describes socio-economic situations and mobility needs for MAMBA regions, using different economic indicators. **Chapter 3** provides a short account of the characteristics of mobility solutions used in MAMBA: objective and primary users, administrative, financial, and infrastructure considerations. The chapter ends with some learnings from MAMBA. **Chapter 4** highlights the main economic risks, as well as providing some hints about risk preventive measures. It also describes the economic potential for each mobility solution used in the MAMBA project. **Conclusions** summarize the main issues in the context of an economic analysis framework which should be taken into account in implementing any of these innovative mobile solutions.

1. Methodology

Data collection methods

To develop socio-economic profiles of the nine MAMBA partner regions — South Ostrobothnia and North Karelia in Finland; County of Plön, Cuxhaven and the remote island of Hallig Hooge in Germany; Bielsko County in Poland; Trelleborg Municipality in Sweden; Vejle Municipality in Denmark; and Vidzeme Region in Latvia — desk research, expert interviews, and input from MAMBA workshops were used for data collection.

The **desk review** was used for the following data sources:

- 30 scientific articles on mobility solutions;
- Reports on mobility issues by other ongoing and completed EU projects;
- The MAMBA "Inventory of Innovative Mobility Solutions" (70 case studies);
- Eurostat databases (Regional demographic statistics (reg_dem), Regional economic accounts - ESA 2010 (reg_eco10), Regional business demography (reg_bd).

Semi-structured interviews were carried out with experts from the transport industry in local municipalities, and regional transport specialists: Aldis Kušķis, former member of the Tourism and Transportation Commission of the European Parliament; Brendan Finn, Senior Consultant at ETTS Ltd; Bruno van Zeebroeck, Senior Researcher at Transport & Mobility Leuven, Belgium; and Angela Jain, Nexus Institute for Cooperation Management and Interdisciplinary Research, Germany. Interviews with experts have been carried out with their consent, for inclusion in the report. Answers were obtained during face-to-face interviews and electronically.

Moreover, notes from a Cost-Benefit Analysis Workshop at the International Transport Forum (25-26 April 2018, Stockholm, Sweden) were used in addition to findings obtained from discussions with partners during a "world café" session (MAMBA internal partner meeting in Joensuu, Finland, on 22 March 2018).

Data analysis methods

The data analysis for this study focused on identifying factors that can be used to clearly demonstrate the benefits of a given solution from an economic perspective. In other words, understanding the impact on the local situation, with or without the intervention. For this purpose, the so-called "results models" can be used. Several different types of results models have been developed, including the resource-result model, result-based accountability, the logic model, logical frameworks or log frames (Pollitt & Bouckaert, 2011). An adapted version of the Bouckaert input-output model has been deemed optimal for

understanding the economic context with regard to innovative rural mobility solutions. This model is shown in Figure 2.

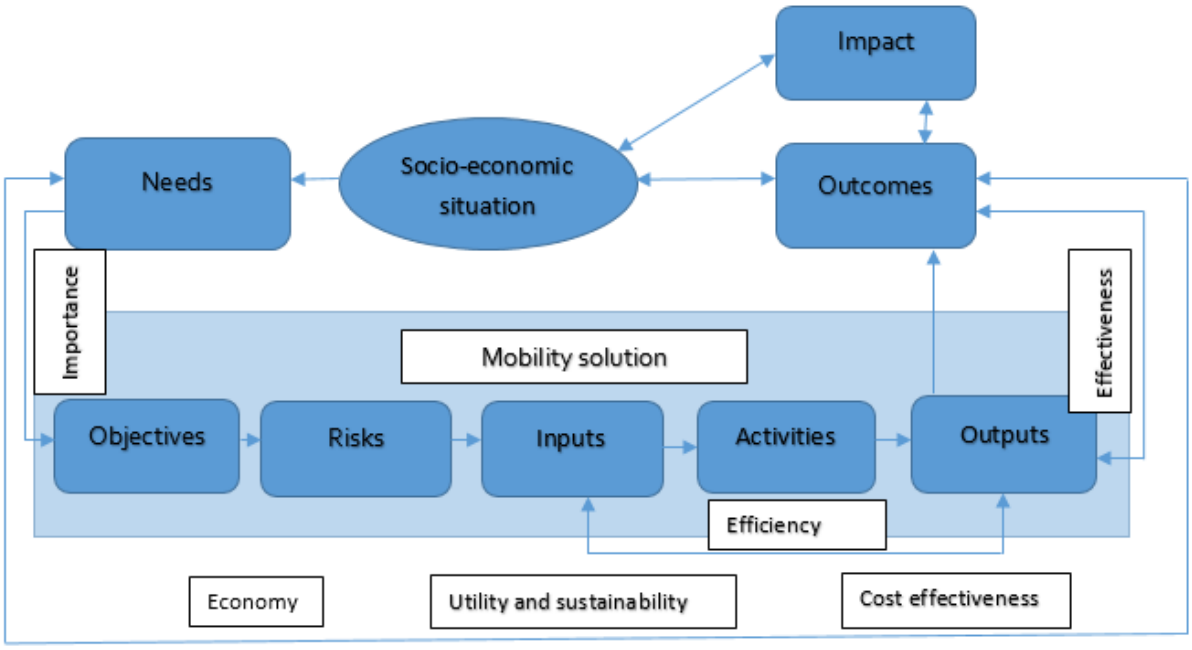


Figure 2. Authors' adapted resource and result model for mobility solutions by Pollitt & Bouckaert, 2011

The sequence and interaction of the elements presented in the model above can be applied to the MAMBA context as follows:

- **Socio-economic situation needs:** The analysis of the socio-economic environment identifies problems, from which the *goal* of the mobility solution is formulated. A comparative analysis of the economic conditions in the MAMBA regions will then be conducted, including the following indicators: *population size, population density, population structure, area, GDP per capita, main industrial sectors, and infrastructure.* To ensure the comparability of the partner regions, the economic indicators are selected at the Eurostat NUTS3 level *(see Annex 1)*. See Chapter 2 for a more detailed description.
- **Objectives:** Objectives are defined by the stakeholders implementing and designing mobility solutions. Objectives, in general, highlight the direction of activities required to reach the goal of the mobility solution project.
- **Risk analysis:** The economic potentials and risks of different innovative rural mobility solutions are assessed based on the project partner's business model canvases and socio-economic profiles, as

well as cases from an internal MAMBA inventory of good practice. The results of the analysis are provided in Chapter 4 of this report.

- In the context of this study, **inputs** are the human, financial, material, and information resources required to realise a mobility solution through planned targeted activities. Inputs can be mapped using the business model canvas, or other planning tools.
- **Activities:** These are measures carried out by Mobility Centres and the actors responsible for implementing mobility solutions. At this stage, it is crucial to record successes and difficulties encountered throughout the implementation process, with the purpose of creating a knowledge base for future decision-making. This includes activities such as the development of a strategy to communicate with the community and local government, marketing, and the choice of a digital solution or the selection of potential providers.
- **Outputs:** These are immediate results of the activities performed, characterised by different output indicators, such as the number of passengers. The economic efficiency of the achieved output is described by the input/output ratio. *The optimal solution is to provide the required level of services, or the amount of goods, with the lowest quantity of inputs.*
- **Outcome:** This is a result that has been achieved in the medium- or long-term, and shows changes in opinions, beliefs or behaviour in society. Outcome indicators describe the degree of achievement of the *goal* as a result of project implementation. The degree to which they are achieved is influenced both by the output of the project and the external (political, social, economic, fiscal, etc.) environment.
- **Impact:** The impact indicators show the extent to which the original goal has been achieved. In other words, how the project has affected the external environment, or socio- economic situation, in the region.

2. Socio-economic profiles of the MAMBA partner regions

Through the MAMBA project, several new and innovative mobility solutions will be implemented in the project partner areas. This chapter provides a brief description of the associated partner regions, in order to gain an insight into their economic framework and understand how the impact of economic factors influenced the choice of specific mobility solution in that area. Eurostat and open access data are used to describe the regions quantitatively.

A list of partner regions and planned pilots is attached *(see Annex 1)*. Further details on these activities are also available on the MAMBA website.

Finland – South Ostrobothnia

Total area	13,400 km^2
Population	190,000
Population density	14.4 per km^2
Urban-rural typology	Intermediate region[1]

Situated on the west coast of Finland, South Ostrobothnia (Finnish: Etelä-Pohjanmaa) is part of the Western Finland Province (Finnish: Länsi-Suomi). The regional centre and largest city, Seinäjoki, is located about 313 km north of Helsinki, and is home to more than 40% of the region's population. Economically, the food industry (agriculture, hunting, and ancillary food production), and the textile, clothing and leather industry are of particular importance to the region, contributing significantly to the nation's economic output in these fields. According to the region's Chamber of Commerce, technological manufacturing for the metal industry and wood processing are also important staples in the region, and business services also benefit from a healthy presence of SMEs (South Ostrobothnia Chamber of Commerce, 2019).

The most densely populated areas lie along the Kyrönjoki and Lapuanjoki rivers. However, even here, the region is very thinly populated, being among the lowest-density of all the MAMBA partner regions. Planning for South Ostrobothnia's developmental is largely focused on closer internal cooperation in the region. Intraregional accessibility is generally good, and both industrial and demographic mobility benefits from major highways, interregional railroads, and good access to ports.

However, road quality and infrastructure were identified as weaknesses, both by the Regional Council of South Ostrobothnia's regional development plan (2015) and through surveys conducted as part of the

[1] For the purposes of regional profiling, the following typology was utilised in assigning urban-rural typologies:
*Predominantly **rural** region*: rural population is 50% or more of the total population.
***Intermediate** region:* rural population is between 20 % and 50 % of total population.
*Predominantly **urban** region*: rural population is less than 20% of the total population.

MAMBA project. Furthermore, the sparseness of the population means that the lack of services is felt particularly strongly outside the region's small cities (see MAMBA Regional Profile, Facilities map). Demographically, the region is characterised by a high youth dependency ratio [2]; one which far exceeds national, EU, and even MAMBA partner region averages, as well as an above-average elderly dependency ratio.

According to the South Ostrobothnia Business, Transport and Environment Centre's Road Management and Transport Plan, 2018-2022, a present aim for the region is to increase demand for public transport in the urban areas of Kokkola, Seinäjoki and Vaasa. Connections in less concentrated areas often remain less developed, however, and rural parts of the region maintain only basic connections for morning and afternoon commutes.

With the ageing of regional populations, there is an increasing need for social and health services. Under the current administrative set-up, these services are currently provided at the municipal level in Finland. In line with the Regional Government, Health and Social Services Reform that was set to take place in Finland by 2020, the Regional Council of South Ostrobothnia set out to increase access to services by coordinating the disperate range of transport activities taking place within the social and health care sector in municipalities across the region. The regional reform was cancelled in 2019 however the Regional Council of South Ostrobothnia intends to continue with this work.

Finland – North Karelia

Total area	21,584 km²
Population	164,755
Population density	7.6 per km²
Urban-rural typology	Predominantly rural region

Bordering Russia, the region of North Karelia (Finnish: Pohjois-Karjala) is an expansive region of Eastern Finland, and the largest of the MAMBA partner regions. Joensuu, the regional centre and largest city of North Karelia, was established in the late 19th century as a commercial centre, and remains an important forestry, education, ICT and business centre.

There is also a significant student population of over 15,000, which is significant in the context of the city's total population

[2] Per the MAMBA Regional Profile Reports: "The dependency ratio is a measure of the population structure. It specifies the ratio of the population not in the labour force ("the dependent part", ages 0 to 14, and 65 and more) and the population typically in the labour force (ages 15 to 64). The two age dependency ratios are commonly used to measure the pressure on a productive population."

of around 76,000. Forestry and the bioeconomy are of chief importance to the region's economy. North Karelia is a predominantly rural region, being one of only two MAMBA partner regions identified as such.

Although North Karelia has passable public transport accessibility (see Regional Profile, proximity map) and a variety of commercial public transport options, the lack of appropriate density in most parts of the region — a necessary component for the economic viability of public transport — means that most are unprofitable, have ageing fleets, or have very low passenger numbers (Regional Council of North Karelia, 2010). This is particularly problematic in conjunction with an above-average elderly dependency ratio, and a generally low service proximity (see Regional Profile).

According to Finnish national law, elderly residents and those with disabilities are guaranteed a certain number of monthly trips. However, because of the inherent unprofitability of such a scheme in a region as vast and sparsely populated as North Karelia, the only way to maintain existing services is through improving cost-effectiveness. This leaves the door open to demand-responsive mobility paradigms, including a combination of trips for those groups in need alongside regular passengers. The North Karelian Transport Combination Centre, for instance, has existed since 2009, and provides call-based services to populations in peripheral areas.

The mobility solution being implemented in North Karelia most closely resembles **Mobility as a Service (MaaS)**, though, importantly, it does not include a common payment system at this stage. Instead it provides one platform thorugh which all mobility solutions on offer can be accessed through a single platform. The platform combines different mobility solutions in a single trip, giving the user easy access to information that can help them determine the best route.

Germany – County Plön

Total area	1,083 km²
Population	128,304
Population density	118.0 per km²
Urban-rural typology	Predominantly urban region

County (German: Kreis) Plön is a district in Schleswig-Holstein, Germany, and an attractive holiday destination. Located only 30 km from the state's capital, Kiel, and 50 km from its second-largest city, Lübeck, the eponymous district seat of around 9,000 people is regionally connected by a single East-West rail line. The county also borders Neumünster (with a population of almost 80,000) and is within commuting distance of Hamburg, 100 km south-west of Plön.

While the tourism industry is important to the district, which is dotted with lakes and attractive scenery, the district seat is also home to some notable service-oriented enterprises. For instance, the Fielmann optical company opened a non-profit optician training centre in Plön Castle in 2006, and the Bundeswehr (the German military) is

the largest employer in the city. There is hardly any manufacturing industry in County Plön, and the area is dominated by farmland.

This is despite its predominantly urban typology, which is due to its relative density and the concentration of population in a few small cities and townships. The general density of the county's population ensures relatively good public transport and service accessibility relative to the other MAMBA partner regions.

Kreis Plön is also one of the last counties in Schleswig-Holstein to own its own transport company. While many publicly-owned public transport companies are still active in Germany, especially in the east of the country, the operation of such services is often carried out by a private operator – one which receives a concession through a public tendering process (Van Zeebroeck & Florizoone, 2019).

Despite the district's relative density, however, buses do not run very frequently outside of the area's few cities, and then mostly only to suit school hours. This is particularly problematic in light of the county's high level of elderly dependency, which stands out as the highest among the MAMBA partner regions and exceeds national and EU averages.

Among its key points, the Kreis Plön Regional Transport Plan (Regionalen Nahverkehrsplanes des Kreises Plön, 2018) identifies the development of transport on-demand as being complementary to more traditional public transport (e.g. buses). Since a particular mobility challenge within the area is lack of public transport at weekends and in evenings, the mobility solution being implemented is a **Transport on demand (ToD) service,** combined with taxis and coordinated with major bus lines.

Germany – County Cuxhaven

Total area	2,058 km²
Population	198,103
Population density	96.0 per km²
Urban-rural typology	Intermediate region

Kreis Cuxhaven, located in Lower Saxony, is a rural county with a largely maritime history. Cuxhaven, the county seat, is one of the largest fishing ports in the nation, and both the county and its seat are shaped by the port logistics, food production, fishing, (blue) energy and tourism sectors.

Although the area has a degree of economically sustainable independence, thanks to its strong SME base, it is also caught up in the gravity well of Hamburg's metropolitan influence. The district is, for instance, involved in the "Creation of an Integrated, Cross-Traffic Mobility Concept" project of the Metropolitan Region of Hamburg. Although the city of Cuxhaven is its own transit authority, Cuxhaven County — together with seven other districts of the Metropolitan Region — also founded Nord-Ost-Niedersachsen mbH (VNO), which acts as the district's planning and management company in operational, traffic and organisational issues.

While public transport and service accessibility are relatively consistent throughout Kreis Cuxhaven, the district is notably subject to something many rural areas in Germany and abroad suffer from: namely, the effects of demographic change through depopulation and ageing. Because traditional public transport relies on sustainable demand generated by population density, declining passenger numbers means areas that undergoing demographic change need to adapt. In the county's transport plan, demographic change is therefore a recurring theme. While the elderly dependency ratio is above average in the area, equally notable is its far-below average youth dependency. Indeed, as school transport is often the backbone of public transport in rural areas, the local transport plan places particular emphasis on the declining school population. A student body in numerical decline may lead to the merging of schools, concentrating them into fewer locations. A consequent reduction in the number of schools may mean that more students will need more transport and, moreover, that additional means of transport will have to be provided (Nahverkehrsplan des Landkreises Cuxhaven, 2019, pp. 21-22). This decline in the number of pupils is therefore not only a challenge to the economic viability of public transport, but also to the morphology of the area.

Cuxhaven implemented the mobility solution **rural car-sharing (village car).** This is an association- or cooperative-based form of car-sharing. It features a voluntary shuttle service to increase access to and from rural areas with a decreasing population density.

Germany – Hallig Hooge (North Frisia)

Total area	2,083 km²
Population	165,462
Population density	80.5 per km²
Urban-rural typology	Intermediate region

Hallig Hooge is a small island in the Wadden Sea. It measures 5.78 km² and has a population of around 100, making it is by far the smallest of the MAMBA partner areas. The island is a part of the Schleswig-Holstein Wadden Sea National Park, which is a popular tourist destination in summer. It has little by way of social infrastructure. A new MarktTreff supermarket franchise in the centre of the island, operating beyond its primary purpose as a grocery store, serves as both a meeting place and as a medical centre. Public transport is, understandably, non-existent on the tiny island, which often floods. What little economic activity exists on Hooge almost exclusively comprises of tourism and agriculture.

The area lies in North Frisia (German: Kreis Nordfriesland), a county of Schleswig-Holstein and a predominantly rural area which has struggled to combat demographic change and depopulation in recent decades. Wind energy and agriculture comprise the large majority of the region's economy, but past decades have seen the same trend towards an ageing population which has largely come to shape rural Germany. The morphological rurality of the region means that mobility planning is often based around school commuting, which is another already-identified problem, in the light of a declining youth

populations. The geography of the district, however, makes effective administration of public transportation extremely difficult. The marshy conditions of polders and coastal areas are particularly poorly supplied. As a result of the settlement structures, there are no noteworthy concentrations of service provision, and a lack of local amenities is endemic in the coastal rural communities.

The mobility solution chosen for implementation is therefore the **service-to-people** approach. The aim is to improve the quality of life for Hallig inhabitants, providing them with the opportunity to receive counselling services, especially for elderly people who want to be able to grow old in the surroundings they are used to.

Poland – Bielsko County

Total area	2,354 km²
Population	162.926
Population density	355 per km²
Urban-rural typology	Intermediate region

Bielsko County is an administrative district in southern Poland, near the borders of both Czechia and Slovakia. It consists of 10 municipalities, all designated rural, with the exception of three small cities – Czechowice-Dziedzice (population 43,000), Szczyrk (population 5,450), and Wilamowice (population 14,200). The district's geography is dominated by the county's seat and regional centre, Bielsko-Biała, which serves as the area's economic and political hub. The city itself, however, is administered as a separate county. Bielsko's political boundaries are consequently wrapped around the city, severing it (in statistical terms) from the population centre. The county has by far the highest population density of all the MAMBA partner regions, as well as the highest population overall. Nevertheless, it is marked by a largely rural character.

Perhaps the most prominent feature of the Bielsko district economy is its geographic bipolarity, shaped by two poles with distinct economic characteristics. In the north of the district, the town of Czechowice-Dziedzice and its neighbouring municipalities form an industrial centre, which is rooted in the region's centuries-old industrial history. In the south, the town of Szczyrk and its neighbouring municipalities — Buczkowice, Wilkowice, Kozy, Porabka, and Jaworze — form a tourist centre. Most strategic development in the region is concentrated on economic and demographic growth in Bielsko-Biała, seeking to capitalise on the city-region's already rather impressive industrial and business profile.

As set out in the MAMBA Regional Profile, both public transport and service accessibility are relatively good, and there are few contiguous areas of low density population. However, dependence on private transport remains high, as the attractiveness of public transport is not enough to supersede private automobile transport. Moreover, the strong influence of the regional centre has led to progressive marginalisation in relation to the central city's urban agglomeration, which includes part of Bielsko

County (chiefly, Czechowice-Dziedzice). The presence of a mid-sized, economically developed city within the region is a key characteristic that is particular to Bielsko among the MAMBA partner regions.

The mobility solution selected here was a **Transport on demand service.** This mobility solution was chosen in order to be able to provide regular transport services from places where public transport does not provide sufficient coverage.

Sweden – Trelleborg Municipality

Total area	1,175.03 km^2
Population	43,359
Population density	126.8 per km^2
Urban-rural typology	Intermediate region

Trelleborg Municipality is the southernmost municipality of Sweden, in Skåne County, and is composed of the City of Trelleborg and five surrounding rural municipalities. Trelleborg's port is dominant in the municipality's economy, being the largest roll-on-roll-off facility in Sweden, and the city has been industrial since the 19th century. The impact of the municipality's economic geography on the county is overshadowed regionally, however, by Malmö — the third-largest city in Sweden, only 25 km to the north — and by Helsingborg in the north of Skåne.

In the region's development strategy, the polycentric layout of the county (distinctive to Sweden, whose cities are usually spread out and morphologically monocentric) is capitalised upon through its tailored transport infrastructure, as well as its nurturing of growth engines and regional hubs. Although the percentage of joint financing for infrastructure among the regions and municipalities is highest in Skåne, the Swedish Transport Administration has detailed some striking weaknesses in the region through its capacity study. According to the regional development strategy, Skåne's two labour market regions — Malmö/Lund/Helsingborg and Hässleholm/Kristianstad — have poor mobility both within and between them (The Open Skåne 2030, 2014). Trelleborg, though proximal to the former region, is caught in the economic orbit of neither. Although service provision and transportation accessibility are relatively high in the area, large parts of the municipality are contiguously low-density, and "reaching distant areas with lower population density" (mini-survey response in the MAMBA Regional Profile) remains problematic.

In Sweden, municipalities have a high level of political independence. This political independence does not necessarily correlate with a consolidated or streamlined approach to administration. Many rural (and urban) areas in the country suffer from the lack of a single system by which to manage all the different forms and modalities of transport, resulting in separately planned and somewhat balkanized operational frameworks (Beecroft *et al.*, 2019). Consolidating the competencies of the various responsible bodies, and establishing a more coherent regulatory framework for public transport and special passenger

transport services, could offer means of improving coordination and increasing the accessibility and efficiency of public transport.

The mobility solution being trialed in Trelleborg Municipality is a service that increases social opportunities for older people by offering day trips on the weekend. The trips allow older residents to visit destinations that are quite hard to get to with existing public transport and are also designed to increase the confidence of elderly residents in using public transport. Trelleborg Municipality will also trial a **service-to-people** approach in the form of a coworking space.

Denmark – Vejle Municipality

Total area	8,777 km²
Population	111,743
Population density	105.6 per km²
Urban-rural typology	Intermediate region

Vejle Kommune is a rural municipality located in the south-eastern Jutland Peninsula. Its county seat, Vejle has a population of almost 55,000, making it Denmark's ninth largest urban area. It is also the main town in the Region of Southern Denmark. The city has been historically defined by its industrial development, earning the epithet "the Manchester of Denmark". The municipality is a key part of the so-called "triangle region" (formed initially by Vejle and the neighbouring municipalities Kolding and Fredericia, but now composed of seven municipalities). Historically, this grew out of the industrial and economic cooperation between the founding municipalities. Although this strongly industrial background has shaped the municipality's morphology historically, its character has remained largely rural, and the central city's economy has in the past decades been shifting from an industrial to a service-based one.

Despite the recent transition to a service and retail economy, however, economic growth remains slow in Southern Denmark. The region's development is focused on key industries (economic growth and productivity being the main indicators for this), and in its development plan, reference to rural areas is focused exclusively on "growth opportunities and potentials" (Region of Southern Denmark, 2012). The same plan makes little or no reference to infrastructure or mobility, let alone making them a strategic focus. Vejle, as a regional centre, is well-serviced and well connected. However, as the Regional Profile maps indicate, large patches of contiguous low-density areas are prevalent through the region, and it is readily apparent that there is both a relatively poor local transport service and a particularly pronounced lack of accessibility to that service.

In order to help solve the transport issues in Smidstrup/Skærup, the mobility solution chosen for implementation is a **ride-sharing application**.

Latvia – Vidzeme Region

Total area	15,245 km²
Population	195,998
Population density	12.9 per km²
Urban-rural typology	Predominantly rural region

The Vidzeme region lies in the northeast of Latvia and covers nearly a quarter of the nation, making it the largest region by area in the country. Its regional centre and largest city is Valmiera, with a small population of around 25,000 people. Typologically, it is one of only two predominantly rural areas among the MAMBA regions. Vidzeme's economy is largely emblematic of rural regions in general, being composed in large part of food processing, wood processing, industrial equipment, construction, agriculture, forestry and fisheries.

Historic developments in the past thirty years have had a drastic impact on rural Latvia. The post-socialist experience of many European countries — as well as its integration into the European Union's economic space, increased globalisation, and a consequent increase in mobility — have left the nation and its periphery profoundly changed. A concomitant depopulation of that periphery, fuelled by rural-urban migration, has meant that in a regional development context, an area's proximity to Riga is now becoming more important than regional differences (Zobena, 2015). As a result, mobility and accessibility paradigms are changing. As populations thin out, public transport becomes less financially viable, and the organisation of service provision needs to adapt.

As is set out in the MAMBA Vidzeme Regional Profile, transport and service accessibility remain significant challenges. This is due in no small part to the region's geography as a particularly large, rural area, second among the MAMBA partner regions only to North Karelia, in Finland, in terms of population density. The Vidzeme Planning Region Development Strategy through to 2030 (published in 2016) sets out six long-term priorities, one of which is to become an "accessible region". That is, to increase service accessibility for rural areas. In this, innovative mobility service solutions will need to complement the public transport system. Although all public transport providers in the country are private, the Latvian institutional framework has often stymied innovation in transport and mobility, as public transport services are required to be organised both hierarchically and as a network. Outside Riga and the other large cities (which organise their own public transport systems), public transport service operators are awarded exclusive Public Service Obligation (PSO) contracts, requiring them to provide public transport on specified terms within their jurisdiction. To date, no demand-responsive transport services exist in Latvia. However, the relevant legislation has recently been amended to allow app-based ridesharing, with the intention of sparking innovation in the field (Finn, 2019).

Transport-on-demand was therefore implemented, in order to provide older people with access to a variety of services in places where public transport is unavailable.

3. Economic framework

The economic framework describes the external and internal factors by which stakeholders are positioned. These conditions may impact the objectives, as well as implementation process of the mobility solution, in both directions – positive and negative. Understanding how the economic framework affects the intended (or already implemented) innovative mobility solution in a particular rural area is essential for effective decision-making. It begins with understanding the essence of internal and external factors:

- **External factors** are the macroeconomic conditions in a given context; for example, demography, population change, economic structure and legal requirements. Those factors are ones that, most likely, mobility solution implementers cannot change. At the same time, they should be taken into account when stakeholders are considering the optimal mobility solution for a given area.
- **Internal factors** are the aspects that can be selected and influenced by the decision-maker or project implementer: choice of financing, business models and processes (including technological solutions), customers, stakeholders, marketing and communications.

According to the scientific articles and previous project reports reviewed for this study, the most established economic factors influencing mobility solutions are population density, population structure and economic development level. More recently, lifestyle and habits has also been identified, in the behavioural economy literature, as having an increased impact on economic processes, including mobility practices (Pankratz, 2017; Keeton, 2018). For a detailed description of the impact of lifestyle factors on innovative rural mobility solutions, please refer to the MAMBA *Pre-study on sociocultural factors* (2018).

Together, these broad external factors establish the general context in which the proposed mobility solutions have been, or are being, established. Further, the internal qualities of relevant stakeholders, and consequently the structure and objectives of the proposals in question, influence the impact, effectiveness and sustainability of implementing new mobility schemes in rural contexts. The following sections will explore these factors in relation to the project regions.

3.1. External factors impacting the economic viability of mobility solutions

External factors affecting the economic viability of mobility solutions are population structure and population density; labour market provision (few large enterprises or many small enterprises, seasonality of jobs) (Litman, 2010); structure of the economy (*ibid*.); and lifestyle (estimation of time savings from new mobility solutions) (Keeton, 2018). Spatial-land patterns can be determined as a specific group of

external factors and include topography, climate, infrastructure and the placement of settlements (Rural Transport Handbook, 2004).

In the following, several external factors that influence the efficiency of newly introduced mobility solutions will be presented. In order to compare the partner regions, the macroeconomic situation of the MAMBA regions is analysed using the Eurostat NUTS 3 level (see **Table 1**). This must be accompanied with the caveat, however, that some of the regions do not precisely reflect the actual area of intervention statistically. Specifically, the following exceptions must be made:

- **Trelleborg Municipality** (composed of five combined municipalities and the city of Trelleborg) is a district at the southern extremity of Skåne county, the statistical profile of which is drastically weighted by the larger urban areas of Malmö (with a metropolitan population of almost 730,000) and Helsingborg (with a population of 108,334).
- **Vejle Municipality** is similarly a smaller sub-unit of the region in total. Its population of 110,000 is small in the context of the NUTS3 (South Jutland) region's 720,000.
- **Bielsko County** does not include the urban centre of Bielsko-Biała (population of 170,000) in its administrative district, where the mobility solution will be applied; the governing NUTS3 region, however, does.
- **Hallig Hooge** is only a very small island in the North Frisia region, with a population that does not exceed 150.

In all of these cases, the regional statistics allow for a relative comparison across the MAMBA regions, as they are in most cases emblematic of the region as a whole. They must also be analysed, however, with these caveats in mind.

Table 1. Age Group Structure in Partner Regions (NUTS III level – 2018)

	Total Population	Less than 15 years	From 15 to 64 years	65 years or over
EU Average	512,379,225	16%	65%	20%
Bielsko*	660,324	16%	67%	17%
Cuxhaven	198,100	13%	62%	25%
Hooge (North Frisia)*	165,462	13%	63%	24%
North Karelia	162,986	14%	61%	25%
Plön	128,842	13%	61%	26%
South Ostrobothnia	190,910	17%	59%	24%
Trelleborg (Skåne)*	1,344,689	18%	62%	20%
Vejle (South Jutland)*	724,520	17%	62%	21%
Vidzeme	188,494	15%	64%	21%

* These areas are those subject to the conditions/exceptions described in the introductory paragraph, 2.1

Population structure and population density

The demand for different types of mobility is affected by the population structure in rural areas, including migratory movements away from (or towards) rural areas, ex-urban residential dispersion, and the types and patterns of settlement. The importance of these factors is particularly emphasised by South Ostrobothnia being among the lowest-density MAMBA partner regions.

During the mobility planning phase (the "Input" element in the Bouckaert model), the socio-cultural characterisation and population statistics become an integral element of the economic framework, since forecasts — such as distance, direction, route, time of day, mode and brand of transport, and number of drivers — can be made on that basis. It can be assumed that the structure of a population, as well as the ability to pay for the service provided, affects the purpose, regularity and the timing of mobility. In most cases, the grouping of passenger types and modalities can result in a lower cost per kilometre for a passenger. For example, Flextraffic in Denmark is an option used by older people. Accordingly, prices can be adjusted to take into account their ability to pay.

The number of school-aged children in a region influences mobility needs and goals, such as travel to and from educational facilities during weekdays and leisure mobility on weekends. This is particularly felt in rural regions, which often rely on school populations as the backbone for scheduling and passenger

numbers, but suffer from disproportionately ageing populations (Regional Council of North Karelia, 2010). For this audience, it is vital to provide mobility services to larger centres; ones with cultural and additional opportunities unavailable in the local community (Farugia, 2016; Gabriel, 2004; Corbett, 2007).

This is the case in the Vidzeme region, for example, where transport on-demand is used by elderly people to attend cultural events. Passengers surveyed acknowledged that new mobility solutions allowed for more frequent attendance at cultural events at weekends and in evenings when public transport does not provide adequate coverage. In the long term, this creates a higher demand for cultural services, which has a positive impact on the development of the region, increases choice overall, and improves the quality of life.

Another example is the Trelleborg municipality, which uses the bus on weekends to offer opportunities for the elderly to join day trips and excursions. This enables the elderly, disabled people, and other groups suffering from transport poverty to socialise.

Overall, MAMBA project regions are characterised by ageing populations, with the 65+ population being up to 5% larger than the EU average in several of those regions.

The average population density in all MAMBA project regions is 90 per km²; with the highest in Bielsko County (Poland), at 355 pop./km², and the lowest in North Karelia (Finland) at 7,6 pop./km² (see Figure 3).

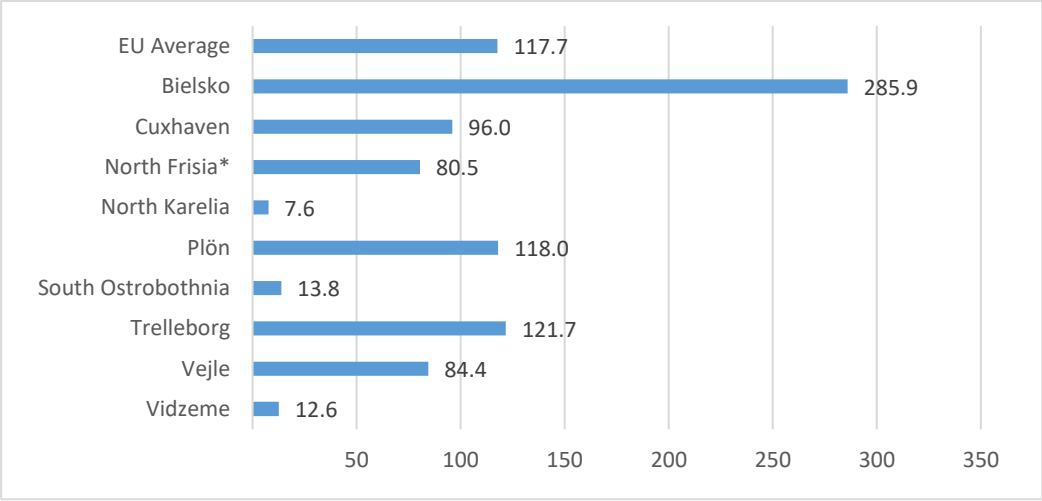


Figure 3. Population Density by NUTS III region (pop/km2), 2017. Source: Eurostat, 2019

The lower the density of the population, the more expensive it is to maintain the transport infrastructure. The availability and frequency of mobility services will therefore generally be limited in areas with a sparse population. Since 2000, five of the nine MAMBA regions have experienced population decline.

One of these, Vidzeme, has experienced the most extreme decline, losing almost a quarter of its population since 2004 (see Table 2).

Table 2.Population changes 2014-2018, by NUTS 3 regions. Source: Eurostat, 2019

	2000	2004	2008	2012	2016	2018	% Change '00-'18
Bielsko*	640,131	644,631	649,695	655,883	658,613	660,324	**+3%**
Cuxhaven	203,833	206,545	202,933	198,115	198,103	198,100	**- 3%**
South Ostrobothnia	196,795	193,954	193,815	193,735	192,586	190,910	**- 3%**
Hooge (North Frisia)*	163,974	166,342	166,727	163,029	163,960	165,462	**+1%**
Plön	131,960	135,038	135,422	127,212	128,304	128,842	**- 2%**
North Karelia	172,551	169,129	166,744	165,906	164,755	162,986	**- 6%**
Trelleborg (Skåne)*	1,123,786	1,152,697	1,199,357	1,252,933	1,303,627	1,344,689	**+20%**[3]
Vejle (South Jutland)*	-	-	712,249	716,152	720,296	724,520	**+2%**†
Vidzeme	-	243,342	228,424	208,728	195,998	188,494	**- 23%**†

* These areas are those subject to the conditions/exceptions described in the introductory paragraph, 2.1.

† Percent change from year of earliest recorded data in this set.

There is some correlation between age, mobility, and employment. Regions with an ageing population generally experience decreased employment. Demographic changes influence the purpose of mobility, the traffic load, and the pattern of transport usage. An ageing population may have an increased demand for social and health care service provision, which may cause changes in routes and the timing of transport services.

Increases in the working population, on the other hand, will have a correspondingly positive impact on the demand for mobility. Bielsko and Skåne stand out statistically in this regard. However, it should be noted that both these regions have large urban areas that tip the scales in terms of both employment and density, and thus the economic sustainability of mobility solutions (see Table 3).

With the exception of some worrying indicators about a decrease in employment since 2010, there is a steady increase in employment in the Plön and Vidzeme regions overall in recent years, which indicates

[3] This anomalous number is a result of Skåne län's inclusion of Malmö—+70,920 pop. (+27.5%) in the same time frame (Eurostat, 2019) — and other urban regions in its statistical boundaries.

the potential for stability of mobility flow demand. Between 2014 and 2016, only the Finnish regions experienced a decline in employment. In both cases this began in 2010.

Table 3.Employment (thousand persons) by NUTS 3 regions. Source: Eurostat (2019)

	2010	2012	2014	2016	% Change '10-'16
EU Average	225,624.7	225,048	226,796.6	232,228	**+3%**
Bielsko*	255.7	276.1	270.8	285.3	**+12%**
Cuxhaven	68.5	70.6	71.5	71.6	**+4%**
Hallig Hooge (North Frisia)*	111.8	112.5	112.5	114.4	**+2%**
North Karelia	67.7	68.7	65.7	64.5	**- 5%**
Plön	43.1	42.3	42.4	43.5	**+1%**
Southern Ostrobothnia	87.9	90.1	87.5	85.8	**- 2%**
Trelleborg (Skåne)*	559.0	572.0	587.0	607.0	**+9%**
Vejle (South Jutland)*	358.0	352.0	355.0	363.0	**+1%**
Vidzeme	83.8	82.2	74.8	77.5	**- 8%**

Improved access to transport solutions (including through lower cost) may also give more people the opportunity to enter the labour market (Laird *et al.*, 2013). Litman (2010) indicates that "lower-income workers often benefit most if they can minimise vehicle expenses by sharing vehicles and rides, and using alternative modes when possible" (p. 51). Therefore, *it is essential to analyse employment in a particular region not only generally, but also in terms of wage levels.*

Sometimes manufacturing companies provide transport to the workforce in surrounding settlements themselves. Alternatively, employees will occasionally organise themselves and utilise ridesharing, thus reducing transport costs and providing mobility to those workers who do not have a vehicle of their own.

Transport on demand (ToD), implemented by several partners in the MAMBA project, is likely to be more appropriate for regions with a lower population density, with its typical population ageing, and with micro and small businesses in the region. On the other hand, in areas with many medium-sized and large companies, Mobility as a service (MaaS) — the use of multimodal full-service mobile applications for public transport, shared mobility, and ridesharing private vehicles, in combination — may be a more suitable solution.

Structure of local economy

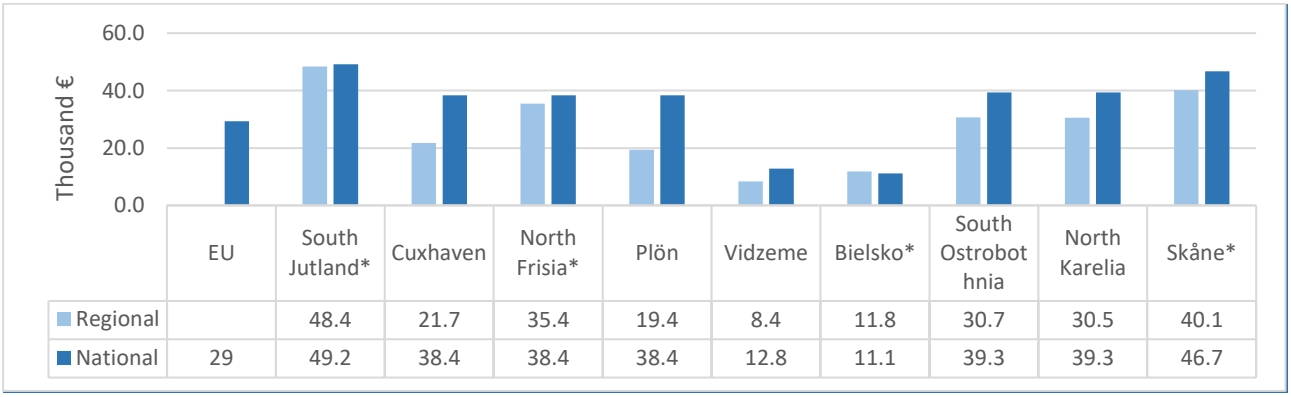
The characteristics of the local economy strongly influence mobility flow in the region (OECD, 2013; Owen, 2012). In rural areas, seasonal jobs are more common in such sectors as agriculture, forestry, and construction. Seasonal workflows should therefore be taken into account in the planning process for new mobility solutions (Pitkanen, 2017). With respect to agriculture, those activities which necessarily have a seasonal character tend to be accompanied by seasonal mobility flow. This is also an industry which has seen a substantial decline in the size of its workforce as a result of new technologies (Eurostat, Labour force: number of persons working in agricultural farms).

Of the partner regions, several are heavily dependent on agriculture or food production (Cuxhaven on fishing, for instance, or South Ostrobothnia and Vidzeme region on hunting). Forestry and bioindustry are also present in rural economies, exemplified in the MAMBA project by the Vidzeme, North Karelia, and South Ostrobothnia regions. Manufacturing is generally developed and deployed in areas that have a history of industrial development. Vejle Municipality and Bielsko County's namesake county seats, for instance, have a long history of predominantly industrial development, and have consequently suffered to some extent from — and have attempted to mitigate — the decline of these industries. Small and medium-sized enterprises are often seen as a health metric in many rural areas, such as Cuxhaven. But larger businesses stand out in rural regions because of their relative scarcity and the proportionately high number of jobs they provide in the area (Trelleborg Industries and the Port of Trelleborg, for example).

Marsden (2002) asserts that rural locations are changing from production-oriented activities to spaces for consumption or tourism landscapes. Indeed, **tourism** is an important source of income in nearly all of the project regions, as agriculture and industry decline. Mobility services are therefore also required for visitors during the tourism season, including both domestic and international tourists. For example, Joensuu (North Karelia) has developed centralised and up-to-date information on public and private transport provision in the region for use by local people as well as tourists.

Information and communications technology (ICT) and the high-tech sector, nominally rare in rural areas, are somewhat developed in some regions, namely North Karelia and Vejle. In some of the partner areas, the regional centre often serves as a service or education centre for the region and beyond; one which influences the cultivation of ICT and similarly advanced industries. In Seinäjoki (South Ostrobothnia), Joensuu (North Karelia), and Valmiera (Vidzeme), for instance, the population is weighted by a disproportionate number of university students. Development of ICT infrastructure plays an important role in rural regions (Stratigea, 2011) and is also an important element in implementing many mobility solutions, since access to information and data are central both to consumers and to administrators of transportation services.

There are significant differences between the MAMBA Regions on a national level, for example with regard to GDP per capita (see Figure 4). In regions where GDP per capita is substantially below the national average, there is potentially more demand for municipally subsidised mobility services.[4] This is, of course, influenced by various other factors – for example, geographical location, multimodal accessibility, the presence of academic and science establishments, and the activity of technology sectors. A study in Belgium from 2017, for instance, shows that the length of roads and transport infrastructure has a positive impact on GDP (Meersman & Nazemzadeh, 2017).



	EU	South Jutland*	Cuxhaven	North Frisia*	Plön	Vidzeme	Bielsko*	South Ostrobothnia	North Karelia	Skåne*
Regional		48.4	21.7	35.4	19.4	8.4	11.8	30.7	30.5	40.1
National	29	49.2	38.4	38.4	38.4	12.8	11.1	39.3	39.3	46.7

Figure 4. GDP per capita at current market prices by NUTS 3 regions, thousand €, 2016. Source: Eurostat

Spatial Patterns

Historical settlement structure also has an impact on the provision of different types of mobility solution (Kompil *et al.*, 2019). If dwellings are too far from each other, it may be less feasible to have a centrally located bus stop. This may also limit opportunities for colocation of transport hubs with other services such as grocery shops, petrol stations, or post offices.

Climate conditions, along with the terrain of the area, affect the accessibility of transport under specific weather conditions, such as a heavy snowfall, icy mountainous terrain, wetland roads, the varying quality of gravel roads during the spring season, etc. *These circumstances should be assessed when deciding on the purchase and use of various types of vehicle for new mobility solutions. For example, the purchase of standard cars or 4x4-powered cars or electric bikes instead of standard ones.*

The population structure affects the frequency and cost of mobility as well as its accessibility. In less-populated areas with poor quality road infrastructure, for example, transport mobility may be limited

[4] Information from the transnational partner workshops MAMBA in Vejle (2019) and Joensuu (2018).

during the winter and spring periods. The placement of infrastructure determines the three main types of mobility flows, as shown in Table 4.

Table 4.Types of mobility flows. Source: DfT, 2002 according to KonsSULT 2003. www.its.leeds.ac.uk/project/konsult/public/levelo

Many to one	One to many	Many to many
Individual passengers are picked up at locations specified by them (perhaps their home) and taken to a single destination (e.g. school, workplace, train or bus station), generally at a specific time or within a time window.	Passengers are picked up from a fixed boarding point and taken to disparate destinations on demand.	Passengers are picked up from various locations, on demand, and taken to disparate destinations (within a defined geographical area of operation).

3.2. Internal factors impacting the economic viability of mobility solutions

As noted above, internal factors include the profile of the main stakeholders, technological solutions, financing (funding sources, discounts, payment methods, and the specific costs of a mobility solution), and connectivity to other networked services.

Main stakeholders

Our stakeholder analysis identifies four different types of stakeholders who are relevant for the development and implementation of new mobility solutions: **regulators, operators, authorities and users**. Other types of stakeholder, such as educational, financial and tax institutions, are not explored in this report.

In some ways, the **regulator** is an external factor, since the body implementing the mobility solution cannot directly (or only to a very limited extent) influence the decision-making process of the regulator. Nevertheless, through different communication channels, it becomes possible to influence the decision-making process and to propose amendments to the existing legislative framework – with the purpose of making the implementation process of mobility solutions sustainable.

The **transit authority** has a statutory (or otherwise delegated) responsibility for the provision of transport services (Ambrosino *et al.*, 2003). In the partner regions, municipalities and regional public organisations (for example, the Public Transport Association of Schleswig-Holstein (NAH.SH), Region Skåne, the Centre of Economic Development of South Ostrobothnia, or Public Transport Services in North Karelia) provide the mobility services. Alternatively, private operators that provide MaaS services serve as best practice examples among those not operated by public bodies (e.g. SMILE in Vienna, UniGo in Gothenburg, Switch in Hamburg, and Whim in Helsinki).

The **transport operator** is directly involved in the provision of the transport service to the end user (Ambrosino *et al.*, 2003). The transport operator may be a private, public (national, regional, municipal) or a joint private-public service provider, which includes social operators (Mulley *et al.*, 2018). This depends upon the type of financing. The World Bank (2002) reports that transport operators mainly impact the development of the transport sector through sectoral associations, which may have an effect on the quality, quantity and price of transport services.

Mobility services can be subsidised by local and regional authorities, as is seen in the example of Denmark's Sydtrafik. Municipalities and regions in Denmark spend €22 million on Flextrafik every year.[5]

[5] Data from a public presentation at the MAMBA Rural Mobility Seminar on 21 February 2019, in Vejle, Denmark.

At the same time, it is noted that politically and economically strong transport associations in rural areas, working without competition, make transport services expensive and less attractive to the user (World Bank Technical Report, 2002). In addition, conditions often prevent newcomers from entering the market at all.

Sometimes existing legislation contains restrictions preventing the development of new forms of transport. For example, the Vidzeme planning region encountered difficulties in introducing Transport on demand (ToD), since the current legislation in Latvia provides only for transport at the place of work or in relation to assignment at an educational institution. From its pilot experience, the Vidzeme region concluded that legislation is so tightly defined that it is difficult to find legal opportunities for new mobility solutions.

New service providers entering the market – including NGOs, social entrepreneurs, or other privately organised bodies– can compete with the existing supplier, however. This is a positive feature from the perspective of the user. Nevertheless, without subsidies, it is doubtful whether this can happen in regions with a low population density. The municipality, or other donors, needs to bear part of the mobility project costs.

For example, the village car in Cuxhaven, Germany, has a non-profit business model. The solution included, initial investment in the purchase of a vehicle was recovered, and a village association was created to operate this cooperatively-based car-sharing service. It could also be described as a voluntary shuttle-service. However, the sustainability of this particular mobility solution will depend upon the availability of public funding to cover running costs in the long term.

Users are the most important stakeholders from the mobility demand perspective. There is an undeniable necessity to providing mobility solutions for all user target groups. Special attention should be paid to generally vulnerable or under-serviced groups of people – for example, those who cannot drive or who cannot afford to have, or maintain, a car; and those with special needs (Mulley *et al.*, 2018). Their role must be understood in the context of specific sociocultural and economic factors in the different partner areas.

The innovative rural mobility solutions implemented through MAMBA project reach a broad range of user groups. For example, the solutions implemented in the Bielsko-Biala, South Ostrobothnia, and Vidzeme Regions all have a particular emphasis on the elderly and people with disabilities. The service seeks to provide access to social, cultural, healthcare, and education facilities. Old and young people, as well as small groups, are using the village car in Cuxhaven to access activities in the next villages. The main users of the mobility solution in Velje, Denmark, are young people travelling to Vejle for schooling, or people without a driver's licence who need to reach public services in Vejle. It can also be used by older people who want to participate in social events.

Technological solutions

Smart mobility services, digital platforms and Geographic Information Systems (GIS) all have an impact on the service provision process, accessibility, and convenience for the mobility service user when providing fast, high-quality services — e.g. trip information, trip booking, trip tracking, cancellation, payment, and setting up routes at a given time (Global Mobility Report 2017; Acheampong & Silva, 2015; Hertzog, 2012).

ICT allows the integration of bus, train, car/bike sharing, and fractional car ownership options into one virtual transportation platform, serving both residents and visitors (Hertzog, 2012). For example, Velje has a virtual mobility centre in the shape of a mobile phone application for neighbourhood-based, non-commercial ridesharing.

The main limitation of ICTs is the potential digital divide they could create between urban and rural areas, where the digital literacy of the population is lower, as more older people live there. This challenge is demonstrated in the Vidzeme region, where the areas served by the transport on demand solution consist mostly of older people. In these cases, the on-demand transport service can be ordered using a standard telephone. The operator who talks with the user creates an additional emotional link to the service, one which is highly appreciated by the customers.

Although ICT becomes embedded in people's lifestyles, not everybody has equal access to technology or the inclination to use it. In addition to the gap between those with different digital skill levels, there is also an economic barrier to purchasing ICT. This trend can be observed in both individuals and local government. It will take some time for user interfaces and technologies to be cheap enough to be on the list of the poorest households, as well as the most deprived municipalities.

However, with the ongoing trend towards digitalisation in all sectors, there should be concomitant advancement towards interactive mobile applications. This is reflected in the use of ICT solutions in many of the MAMBA mobility solutions. The idea and vision for transport services in the South Ostrobothnia region is to form a model which will include one transport service unit per province/hospital district by 2022. The unit will be responsible for all planning, procurement and transport system processes.

Financing

Type of funding sources: The funding sources for new mobility solutions can be public, private, or a combination of the two. In all of the MAMBA regions, public transport is subsidised by the state or regional budgets. The way transport on demand solutions are implemented indicates that their business model is not aimed at making a profit or paying dividends to the owners, but rather at providing the service. In some cases, DRT is funded from the social or education budget, and may be integrated in other services. In the mobility solutions planned by the partners, public funding will be used, and user co-

financing — i.e. ticket fees for the service — is expected. For example, the Vejle mobile phone application contains a flat payment option for the drivers – €0.75. The Municipality then covers the licence cost for the mobile application – €2,500 for one year for the municipality. But the app developer does not receive any payments from users (unlike Uber, or other commercial ridesharing services).[6]

Categories of discount: *During the planning stage of the price policy for the mobility service, different target groups' ability to pay must be considered, not just the total number of planned end-users.* Discounts are allocated to several user groups, such as people with disabilities, seniors, students and those on low-incomes. Discounts may also be offered for tickets with longer periods of validity (e.g. a year or a month). In more innovative forms of mobility provision, such as car-sharing, providers often work with discounts in the form of incentives – whereby users receive credits or free minutes when they refuel the vehicle at a certain filling station (e.g. below 25% capacity), for instance.

Payment method: Payment methods depend upon the mobility solution in question, the service's users and behaviours, and previously mentioned technological developments – as well as the existing legislative framework for the transport sector. These factors may increase or decrease the use of remote payments; in particular, the development of personal mobility accounts, in which the user transfers the money and tops it up as needed, which reduces the number of cash settlements. The benefit of such a payment system are timesaving for both the user and the service provider. Personalised accounts are widely used as a subscription service to support MaaS-based mobility schemes. They allow the user to pay for different transport services from one account (MariAnne Karlsson *et al.*, 2016; Mulley *et al.*, 2018).

Analysis of examples of good practice has led to a recommendation *to introduce a cancelation fee in order to avoid the misuse of a particular service and save costs.* The cancelation fee is charged if the service is ordered but not used, or is not cancelled within the specified time limit. In this way, resources are utilised efficiently, and the user is more responsible for the service he or she has ordered.

Costs of a mobility solution: In order to analyse the costs of a given mobility solution, the following aspects should be taken into consideration:

- Factors affecting both fixed and variable costs
- Variables affecting cost drivers
- The definition and calculation of relevant fixed and variable costs
- Assessment of unit costs and total costs

The aim of such an analysis is to find the relevant principles, models and methods of verification for establishing a reliable and transparent cost calculation methodology for mobility solutions. This

[6] MINUTES from the meeting 7th Transnational Partner Meeting in Szczyrk, Poland, 13 - 14 November 2019.

necessitates tracking the costs and benefits of mobility solutions, as well as the number of users during the project implementation period and beyond.

Connectivity with other services

In rural areas, through cooperation in the provision of a mobility service, links with other service providers (a petrol station, shop, cafe, one-stop shop, or Wifi provider) can reduce the cost of the transport service itself (Ambrosino *et al.*, 2003). While waiting for transport, the mobility service user can stay inside an amenity, use common resources (web platforms, smart mobile applications, buildings, etc.), work remotely, make necessary purchases, or ultimately just socialise. This spill-over effect can help create a dynamic economic environment and increase revenues at connection nodes, It can also contribute to quality of life in general, through the efficient use of the transit time – freeing up the time saved for recreational purposes at the end of a journey.

3. Economic implications of different mobility solutions

Having addressed the external and internal economic factors observable in the MAMBA partner regions, the following chapter will turn to the specific mobility solutions which have been implemented through the project. It will explore their objectives, administrative or governance structure, users, financial and business structure, and the infrastructure needed. Definitions of the different mobility types presented here can be found in the MAMBA Glossary: https://www.mambaproject.eu/database. These mobility solutions are also explored in depth in the MAMBA pre-studies on legal determinants (Ellner *et al.*, 2018, pp.2-41) and socio-cultural determinants (Randall *et al.*, 2019), as well as in the best practice case studies on the MAMBA project website.

3.1. Transport on demand (ToD)

Objectives:

ToD is mainly concerned with ensuring mobility in sparsely populated areas, as well as ensuring mobility for social and health services, or "mobility in the last mile". This type of mobility is often used when public transport facilities are limited, or to replace a larger vehicle with one of lower capacity, thus reducing costs. ToD additionally provides accessibility in cases where conventional public transit/bus services have been withdrawn.

Administration/ Governance:

Coordination of ToD involves accommodating users on public transport or in reserved vehicles. *Service integration*, on the other hand, involves linking ToD journeys with other public transport modes, and is achieved officially or unofficially, either through formal scheduling or when practical connections are available. This practice was observed in the Bielsko-Biala project, where the MC and the Liaison Agency helped coordinate calls, so that they did not overlap but rather complemented the public transport schedule.

The choice as to who runs a particular scheme is crucial, because it determines exactly how tax and insurance authorities treat each service, as well as the legislation and regulations the operators need to abide by when licensing routes. These can either be a private for-profit operator, or an organisation operating without a view to profit, public or otherwise.

Users:

ToD provides door-to-door services for all users in locations with little or no public transport. It can be a meaningful complementary service to connect users to main public transport nodes. Although it serves the entire local population, people with reduced mobility are frequent users of this type of mobility.

Finance/ Business:

The ToD business model, because it is not expected to make a profit and does not need to pay dividends to shareholders, is a generally a resilient model. Nevertheless, it is reliant on public investment. Indeed, the creation of such community transport services often becomes necessary when a commercial or subsidised service is withdrawn or limited, especially in rural areas (The Future of Demand Responsive Transport, 2017).

Funding may potentially draw from several different budgets — from social services, education or conventional bus subsidy funding streams, for example — to provide a more integrated service.

It may also be partially financed by the user, who, for example, might pay 10% of the total price, while the price for users on low incomes might be paid in full by a local municipality. The proportion of the co-payment can differ between countries, regions and municipalities.

The commercial application of ToD has recently become more prevalent in both urban and rural contexts, especially the latter (Davison *et al.*,2014). One hypothesis is that this is largely due to the technological advancement of ICT and data-driven toolsets. While previously, commercial operators had to operate at scale from a single, top-down approach (through one centralised "back office"), the more granular, bottom-up perception of demand enabled by new technology has allowed those services to become increasingly profitable (The Future of Demand Responsive Transport, 2017).

The level of demand is the determining factor for ToD to work. For example, if the demand is too low, then it becomes too expensive to operate; but if it is too high, then it is not possible to meet the requirements of all users. One of the major problems is the difficulty of correctly measuring demand for the service. To ensure success, an emphasis should be placed on preliminary research studies, which are crucial for properly and correctly assessing potential demand, and therefore the nature of the transport services required. This was a case in Plön, where the solution is based on a "Potential study for demand-oriented public transport in the county of Plön". This gave them the scientific background to start discussions with municipalities about a ToD project in their region.

Infrastructure:

Currently, the technological infrastructure's main functions relate to communications and booking, ensuring the timetabling and scheduling of DRT services. This can involve online booking or booking by phone. The duration of the booking period varies from two days in advance to one hour in advance of the trip.

Well-structured software is necessary to guarantee good functionality for users and mobility providers. A well-equipped car of adequate capacity is required, taking into account the needs of potential drivers and the road infrastructure.

With the advent of more advanced algorithms, which are currently being tested and developed further (e.g. MOIA or Clever Shuttle in German cities), optimal routing and real time information to facilitate even more efficient service delivery is to be expected in the future.

Nevertheless, too much emphasis on ToD reduces the scope for other solutions, such as active walking or cycling, which provide benefits to human health and the environment, and reduces the ability to use public transport efficiently.

Experiences from MAMBA

ToD has been implemented by the Vidzeme Planning Region and the Latvian Road Transport Administration in Latvia; County Plön in Germany; and the Bielsko-Biała Regional Development Agency and Bielsko District in Poland. The description above summarises findings from literature studies, reports of projects (The Future of Demand Responsive Transport, 2017; Hunkin & Krell, 2018; Lekauers & Niedole, 2012; Davison, 2014; Ardenis & Vidzeme Planning region, 2014; Ambrosino et al.2003; Bosetti, 2018; Gonzalez & Nogues, 2018, etc.), analysis of best practice examples (mentioned in Table 5), as well as observations from the implementation of ToD solutions in the MAMBA project.

People gradually appreciate being able to attend events that were previously inaccessible. Their habits are changing, as is the desire to pay for a service within their capabilities, of course. It is therefore essential for each region to develop a sustainability strategy, to ensure the financial sustainability of TOD and MC.

If new mobility solutions are introduced in rural areas, they should involve a local formal (or informal) leader who will be able to involve the local community. Without a local leader, the mobility solution will not work. Such is the case in the Vidzeme Region, where informal leaders of the local community, together with the head of Aluksne Municipality (Vidzeme), were actively involved in implementation of the proposed solution. In order to promote innovation, it is important to have good examples of something that works well. For example, if it works well in Mazsalaca (a municipality within Vidzeme Region) then it will be easier to implement it in Aluksne (another municipality in Vidzeme).

It is very important to collect data on the cost and volume of the service, as is done in Plön and Vidzeme. This helps in negotiations with stakeholders.

3.2. Car-sharing

Objectives:

The primary objectives of car-sharing schemes are often based on sustainability. Fewer cars means less pollution, both during the production process and while they are on the roads. The use of car-sharing not only encourages more energy-efficient travel behaviour. In urban areas, it is also often encouraged as a means of reducing traffic, congestion and pollution.

Although it relies on a density of users in order to remain practical, car-sharing works in rural areas in a way that is complementary to other sustainable transport options. It is implemented in order to make a positive impact on both its users and the local community at large, both in terms of the cost of mobility, and with regard to the traditional implications of transport in for the environment and energy consumption (Deloitte Monitor, 2017).

Car-sharing may also provide an incentive to households not to buy a second car.

Administration/Governance:

As per the Deloitte Monitor (2017, p. 2), "stationary car sharing is managed as a closed system in which inhabitants can access vehicles on a sharing basis, and is a reliable alternative for a municipality to operate their fleet. The municipality ensures the booking and connections." For example, in Cuxhaven, the legal owner of the car is the Town of Geestland and a voluntary association is responsible for the maintenance of the car. There is a special rental contract for this.

Users:

Private trips by individuals: employees, job seekers, families, seniors and tourists.

Finance/Business:

A car-sharing station requires a significant investment. However, rural areas have population density, and therefore fewer customers. Stationary providers are often locally organised and do not operate at a macro/global level. Many of them are supported either by public funding or by private investors, and success is usually attached to regional particularities based on strong local market knowledge and an understanding of customer needs (Deloitte Monitor, 2017). The biggest investment in Cuxhaven was the leasing price for an electronic vehicle (around €25,000). Other costs were incurred for setting up the charging station, for the carport, and for the introduction of a booking platform.

Infrastructure:

There are two traditional models for car-sharing schemes: *free-floating*, where users pick up and return the vehicle to anywhere in a given area; and *stationary*, where they use fixed stations. While the free-

floating model provides a higher degree of flexibility and can compete with taxis and new mobility providers (e.g. app-based ridesharing businesses) mainly in urban areas, the stationary model can be used for longer trips — particularly necessary in rural areas — and can be used as a substitute for rental cars or for car ownership (Deloitte Monitor, 2017).

In the peer-to-peer (P2P) model, individuals rent their car to private users via an online or app-based platform (e.g. Drivy, Turo, Snappcar). This type of model allows for longer distances than traditional car-sharing schemes, and often serves as an alternative to short-term rental or car-pooling (*ibid*.). P2P car sharing offers vehicles belonging to private individuals to a specific user community. A car needs to be returned to the pick-up area, so is only available for round trips. Pricing is based on a daily tariff, and this provides a good alternative to the stationary model or rental cars.

An appropriate car and is needed and it has to be maintained properly. This type of mobility is provided by a local municipality or a non-governmental organisation (NGO) in rural areas (Davison, 2014; Deloitte, 2017). The structure of housing must be taken into account in a rural area. A model like this might be possible if it is proposed for a village with a relatively dense core and short walking distances.

Experiences from MAMBA

Car sharing has been tested in the County of Cuxhaven, Germany. The "Verkehrsverein Neuenwalde" association has done a lot of voluntary work to introduce, provide and promote the village car there. The success of the solution was mostly due to a professional team, which kept up-to-date on legislative changes and performed daily routine tasks. When implementing this type of mobility solution, it is essential to plan for a long-term financial model through the introduction of a travel fee. The success of the project depends to a great extent on the active involvement of the village community.

3.3. Ridesharing

Objective:

To provide flexible, cheap and environmentally friendly mobility by utilising the excess capacities of vehicles, reducing per capita emissions per trip, and ultimately reducing car ownership.

Administration/Governance:

There are different solutions for the administration of ridesharing schemes:

- Voluntary initiatives without any supervision (for example Facebook, WhatsApp);
- Voluntary initiatives by the local community;
- Regular companies with limited profit targets, or social entrepreneurs.

The case study of Elli in Germany, where an administrator checks the information about a car which will be used for a user/passenger, provides an example of a more secure ridesharing solution (see the MAMBA good practice example, "ELLI – a ride sharing service as a complement to public transport").

There are also less formal ridesharing solutions, for example where commonly used social media platforms are used simply to connect drivers with potential passengers. This is a good example of citizens' self-organisation in relation to their transport needs. The best known commercial ridesharing provider is BlaBlaCar, which operates in 22 countries around the world. It validates users, provides a platform on which to offer rides, rates drivers and passengers, and has a cashless payment system.

Users:

Young people, adults who commute to work, elderly people, and those commuting for hobbies and socialising in or near villages or towns. Children rarely use ridesharing platforms (MAMBA Inventory of Innovative Rural Mobility Solutions).

Finance/Business:

Users pay a service provider (an individual driver, or a company which provides the service). There are different payment approaches, such as payment in cash, quarterly e-bills, etc. In some cases, drivers receive compensation for their volunteer work on a yearly basis. The following case is detailed in the MAMBA Mobilsamåkning good practice profiles:

> "When a community (or a local development group) have decided to start using Mobilsamåkning, they also make a collective decision on a fare per kilometre, to at least partially cover their driving expenses. The fare should be on par with public transport. It is not an ambition to compete with buses or train services, but to complement their schedule. The community using the system/app is benefitting and saving the money by getting their driving expenses partially covered while driving others. […] The system registers expenses and payments to and from all users, and accumulates this in a report to Skatteverket (the Swedish tax authority). In their individual tax declarations, village drivers can then easily confirm that they did not earn any extra money from service users; they only got their driving expenses partially covered." (Hildestrand, 2018).

In the case of commercial providers (e.g. BlaBlaCar) a fee for each ride has to be paid by the passenger, which increases the cost per trip. This can be offset by the comfort of the service, and the security provided by the solid infrastructure and processes .

Infrastructure:

People share their own private cars or public/company cars through different kinds of booking systems. Users pay car owners or service providers (a non-profit company) on a per trip basis. This mobility service

is appropriate for remote areas with a low population density, as well as for places where large numbers of people what to go to the same destination.

Different types of ICT infrastructure are required – for example a closed public account on Facebook, a system for an administrator of a village project, booking by phone call, or a specific app or web application (e.g., in the case of Mobilsamåkning, https://www.mobilsamakning.se). Mobilsamåkning also has a Facebook account with almost 400 followers. No transport infrastructure is required to set up a ridesharing initiative, because the participants use their own private cars.

Interaction with Public Transport (PT):

The aim of ridesharing is to complement public transport. It serves as a necessary, "last mile connection" to the rest of the public transport system for the people living in the area (see case studies from Germany, Sweden, for example). It can fill gaps in schedules, or provide accessibility to connection nodes.

Experiences from MAMBA

Based on the experiences of th partners in Bielsko-Biała (Poland) and Vejle (Denmark), the hardest thing is to change people's habits and convince them that using a new transport solution is neither difficult nor expensive. It is essential to reach an agreement with the project stakeholders from the start, and to payattention to local partners. There is not always time for the regional authorities to take on local mobility projects. A ridesharing application works in areas with reliable mobile phone reception. Online services may also be accessed from a fixed-line computer but the potential of the service is unlikely to be fully reached if people cannot access it while they are out and about.

3.4. Combined transport solutions (CTS)

Objectives:

Combining the regular transport sector with public transport bridges the "last mile" between two locations. In the KombiBus best practice case, for instance, CTS allows rural agricultural producers to access already-existing freight space in the transport sector and on the local bus, improving farm productivity and — indirectly — the quality of life in rural areas through the reduction of logistics costs (Kempers, 2018). As is the case in most of the mobility solutions described here, CTS also saves energy and reduces CO_2 emissions by increasing the efficiency of transport logistics.

Administration/Governance:

CTS may be initiated by a private company in cooperation with the local authorities. One example of this is the LandLogistik Operational Group, in the German State of Brandenburg.

Users:

Users of CTS include not just individuals who do not own (or do not want to use) a private car, but also manufacturers who want to transport their products within and beyond the region. In rural regions, this would predominantly be farmers or other food producers. The CTS could also be used by postal and parcel services, which otherwise struggle to maintain an economically viable service due to a low population density. The issue of goods reaching the customers in a cost-effective and sustainable way – especially in remote areas – is gaining significance, particularly because of the increasing importance of online retailers.

Finance/Business:

It is important that locals and small and medium-sized enterprises accept the idea, so that the project can be economically viable.

Infrastructure:

An example of the successful implementation of combined transport solutions can be seen in the Berlin-based KombiBus, which brings together passenger and freight traffic in the rural region to the north of the German capital. As described in the MAMBA best practice profile,

> "the general idea is a bus service that combines passenger transport with freight and post-delivery. The concept is not new: similar services exist in Switzerland and Sweden, and until the 1970s a passenger/freight bus service operated in Germany [...] The first manufacturers and producers in the region (mainly farmers) proved of major importance in establishing a network with partners that would ship their products with the KombiBus." (Kempers, 2018).

An important prerequisite for a successful solution is delivery in a timely manner, taking into account the terms of product sales, and the customer preference for accuracy and speed of deliveries.

3.5. Service-to-people

Objective:

The primary objective of service-to-people mobility is to deliver services to the place where people live, rather than moving people to go wherever services are available.

Administration/Governance:

Service-to-people is often organised and provided by a local municipality, or by public institutions, in order to provide services to local people, particularly to disabled and elderly single people. While this is normally organised through public provision, private businesses operate in this field in order to provide services and goods (retail services, hairdressing, etc.) door-to-door for people in the villages.

Users:

This is dependent upon the particular solution.

Finance/Business:

Usually, service-to-people solutions are funded by a local municipality (through social welfare funds), the national budget, or European Union funds (particularly the ERDF or ESF). The idea is to establish a service by providing a place (the building of a service house; ICT infrastructure) or to equip cars to provide a service. Service-to-people services may also be funded through sponsorship, fundraising, or charity. Private companies provide such services as a business venture, but their services are usually expensive, because they need to cover expenditure for logistics and the salaries of professional staff.

Infrastructure:

There are generally two main types of service delivery: firstly, a *service on wheels*, when a car is adapted to provide the service with all the technical equipment included; and secondly, where a service provider comes to a place to provide a *service on a specific spot* (a one-stop agency, village centre, etc.). However, more recently, e-services such as counselling or health consultations have gained importance. For example, the solution implemented by Diakonie Schleswig-Holstein (Germany) offers online counselling services for the people of Hallig-Hooge island. Co-working spaces in rural areas – also a rather new concept, and one gaining popularity – can reduce the need for some professionals to commute to distant agglomerations. This is the case in Trelleborg, where a special meeting place has been established (a social, co-operative space) so that locals can meet to discuss vital subjects. The co-working space in Sodra Aby is used by 5 to 15 people every week.[7]

The frequency of services and the way they are booked differ, and may take the form, for instance, of regularly scheduled services. Alternatively, there may be a public listing available in a village house, where everyone can see the availability of services; or pre-booking of a service by phone or on-line.

[7] MINUTES from the meeting 7th Transnational Partner Meeting in Szczyrk, Poland, 13-14 November 2019.

Interaction with public transport (PT):

Service-to-people mobility has limited interaction with PT, and would generally operate in areas with limited or no access to PT.

Experiences from MAMBA

The service-to-people mobility solution has been tested by Diakonie Schleswig-Holstein in Hallig Hooge, Germany, and by the Municipality of Trelleborg in Sweden.

The experiences of the MAMBA partners highlights the need to involve users in from the outset in planning and implementing the service. For example, the people of Hallig Hooge attended meetings, talked about the counselling services they wanted to see, and in doing so helped set up the decision-making tree.

3.6. Mobility as a service (MaaS)

Objectives:

MaaS is the term used to describe the combination of different transportation services, ranging from public and private solutions, to a unified door-to-door service.

The MaaS Alliance provides a clear description of the MaaS mobility concept and its key features:

> *"MaaS is the integration of various forms of transport services into a single mobility service, accessible on demand. For the user, MaaS offers added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations." (MaaS Alliance, 2019.)*

Administration/Governance:

In Europe, the first MaaS initiatives began operating in 2014, following political support for the concept at the European ITS Congress (ITS International, 2015). The most recent studies have focused on European trials. The EU has, for instance, supported the collaboration and research programme known as ERTICO, which has also been instrumental in triggering a pan-European MaaS Alliance (*ERTICO website, 2018)*. Further research programmes include the "Mobility as a Service for Linking Europe (MAASiFiE)" project, financed by the CEDR Transnational Road Research Programme (2014) on Mobility and ITS.

MaaS can be managed as a stock company, a private-public company, or a private company. Three broad MaaS business models have emerged:

- **A public model,** in which public transport is the backbone of MaaS in cities with extensive public transport.
- **A broker/hybrid model,** which allows flexible outcomes to be brokered by government, between different organisations.
- **The private or public/private partnership model**, which combines private models with public sources of funding or coordination (ERTICO, 2018).

However, so far, none of the business models deployed appear to offer long-term sustainability. All trials referenced in the recent 2016-2018 papers were still in their early pilot stages, and are yet to be fully proven (König *et al.*,2016; Sochor *et al.*, 2018; Mulley *et al.*, 2018; MAASiFiE).

Users:

Urban citizens and tourists, as well as rural citizens with and without private cars. This mobility solution is appropriate for all ages.

Finance/Business:

The emerging business models for MaaS solutions are the subject of ongoing research (Aapaoja *et al.*, 2017). While the existing best practice examples show that MaaS can successfully provide services in large cities, *there is currently no evidence to support the idea that MaaS would work in rural areas with a low population density, without subsidies.*

The case of the public-private partnership (PPP) as a MaaS operator model can be observed in the Kätevä Seinäjoki/Sito case in Finland. This is a collaborative initiative between Sito Ltd., the municipality of Seinäjoki, and local transport operators. Together they are providing new mobility services in the regional centre of South Ostrobothnia. In an analysis of the Kätevä Seinäjoki case, Aapaoja *et al.* (2017) asserted that:

> *"compared to the other business models, the PPP MaaS operator business model may consist of local logistics service providers (LSP) in addition to other services providers. [The described case] strives to intensify statutory social service transportation (SST), i.e. trips for disabled and elderly people, etc., by connecting the organisations responsible for these trips to the MaaS service" (p. 11).*

The authors also found that:

> *"According to the initial results and findings, the PPP MaaS business model could be especially suitable in rural or low-density populated areas, where overall transport volumes are low, but travel distances are relatively long. In an environment of this kind, efficiency is a key enabler and thus combining logistics services with school and statutory social service transportation together through MaaS is seen to be an efficient solution for future development. However, it should be taken into*

account that all operator models can include logistics services and other additional services; the PPP model usually integrates logistics services from the beginning, due to available transport capacity and long distances." (Aapaoja et al., 2017, p. 11).

Necessary infrastructure:

Essential to the concept of MaaS is the idea of a single interface through which customers create and manage their total journey, with payment to all of the service providers coming from a single account in a single payment, providing integrated ticketing (i.e. integrated fares), possibly through a monthly subscription (Mulley *et al.*, 2018). It is vital to consider open payment methods (some form of e-ticket or e-payments), as well as intellectual property protection (TfNSW, Future Transport 2056 Strategy; Karlsson et at.,2016) in these instances.

Interaction with Public Transport:

As a MaaS operator, the public transport operator may choose to extend its services by augmenting its regular service portfolio with other transport-related services. This may include taxis or carpooling and — in urban contexts — city or e-bikes, as well as inclusive digital services such as a mobile ticketing and mobile payment systems, or a multimodal planner (Eckhardt and Aapaoja, 2016).

Experiences from MAMBA

MaaS is one of the most recent mobility solutions and is gaining popularity, particularly in urban areas. In the MAMBA project, the Seinäjoki University of Applied Sciences in Finland have tested the MaaS mobility solution in a rural area. In fact, in recent years, this has been a much-studied mobility solution (Future Transport 2056 Strategy; Aapaoja et al., 2017; König et al., 2016; MariAnne Karlsson et al., 2018; Mulley et al., 2018; Aaltonen, 2017; Eckhardt et al., 2017; MAASiFiE project; etc.).

MAAS is a complex, multi-level structure which requires considerable financial resources to set up and maintain. Stakeholder support and consistency of long-term sustainability in implementation strategies with regional or national development policies are both essential for this mobility solution to be sustainable. There is a need to improve cooperation between different operators, to look beyond regional borders, and to exchange information and reach compromises. An additional success factor is providing easy access, and services that meet the needs of communities. That can be achieved through proper coordination and scheduling, as well as appropriate fares. The MaaS platform provides such prerequisites.

4. Risks and economic potential for rural mobility solutions

This chapter provides an overview of the risks and opportunities for each of the innovative rural mobility solutions identified above.

TRANSPORT-ON-DEMAND (ToD)

Based on: MAMBA case studies from Vidzeme Planning Region, Latvian Road Transport Administration, County of Plön, Germany, Bielsko-Biała Regional Development Agency and Bielsko District, Poland, as well as case studies from Gothenburg (Sweden), Sydtrafik (Denmark), Vippari (Finland), CallConnect (Lincolnshire County, United Kingdom), Līvāni (Latvia), Go Mobil (Carinthia, Austria), Thessaly (Greece) and academic articles (Davison *et al.* 2014)

Economic Potential	*Risks*	*Risk prevention measures*
• **Complementary to Public Transport;** • **Might be appealing to local businesses in smaller communities;** • **Increased access to education, employment, healthcare and other services for isolated or marginalised populations;** • **Flexibility in scale and time;** • **Increased overall population mobility, which contributes to the wider economy.**	• Significant structural barriers in regulatory and institutional terms; • Insufficient revenue; • Difficulties in finding financial resources to maintain transport services, and thus secure long-term financing; • Ineffective competition with public transport or/and private vehicles; • Lack of skills or lack of interest in rural communities to deal with the complexity of the procurement process and funding schemes, limited skills to demonstrate the social benefits of ToD applying for public funding.	• Before implementing the ToD, identify the institutional barriers that need to be addressed in order to establish a sustainable local transport system; • Consider legislative initiatives in municipalities: for example, some tax incentives for the service provider, or subsidies to citizens for transport services; • ToD costs may be reduced if the availability of local service providers, for example doctors, is planned in line with the driving schedule and, at the same time, carries more passengers. Access to services benefits not only the recipients of the service but also the service providers – medical institutions, shops, cultural institutions – by increasing their customer base; • Governments should take an integrated view of sectoral and territorial budgets, by designing programmes for rural communities. Funding comes from a variety of budget and alternative sources; • Create a ToD offer as a supplement to weak public transport connections, but not as a substitute for improved comfort; • Provide parking spaces at an affordable price; • Even in the case of a partnership between ToD and public transport, it is necessary to collect and analyse data on the use of both modes, to improve transport planning and identify synergies as opposed to symbiotic relationships. Such an approach would expand the range of service users and make the services more profitable; • Provide regular and meaningful opportunities for cooperation between local authorities, communities and service providers; • Organise information campaigns in municipalities, libraries, post offices, shops, cultural institutions, and schools.

CAR SHARING

Based on: MAMBA case studies from County of Cuxhaven, Germany. Rural car-sharing service, as well as "village car" Dörpsmobil Klixbull (Germany), Village bus (Kolsillre, Sweden), Wigtownshire (Scotland, United Kingdom)

Economic Potential	*Risks*	*Risk prevention measures*
• **Provides people with short-term access to private vehicles without the high costs and obligations of ownership, such as vehicle registration, taxes, depreciation and maintenance;** • **Increased economic activity due to increased mobility in rural areas;** • **Flexible alternative to fill special market niches if no conventional vehicle rental service is located nearby;** • **Faster return on investment: lower fixed costs and higher variable costs than private-vehicle ownership;** • **Less parking infrastructure and investment in the maintenance of transport infrastructure;** • **Decreases air pollution and energy dependency.**	• Difficulties in establishing and maintaining a critical mass of users due to their age, number, and income level; • As car-sharing increases, the share of public transport use may decrease, resulting in a substitution effect; • Insufficient trust from all involved parties. • Difficulties in changing car owners' habits and convincing them of the benefits, as opposed to restrictions on personal freedom.	• Build the service as a non-profit cooperative (or public initiative) involving local organisations and the community, which facilitates car sharing, and intends to change driving habits rather than make a profit; • Increased economic viability, if rental transactions could be self-serviced or run as a side-line by existing businesses, such as local stores and service stations; • Possibility of integrating car-sharing into the public transport system, and to add value through the integration effect; • Provide regular and meaningful cooperation between local authorities, communities and service providers; • Organise information campaigns in municipalities, libraries, post offices, shops, cultural institutions, and schools.

RIDESHARING

Based on: MAMBA case studies from Bielsko-Biała Regional Development Agency and Bielsko District, Poland, as well as Facebook groups (Latvia), Elli (North-Eastern Germany), Flinc (the Gängerstadt region, the Shamrock region, Germany), Carpooling (Podkarpackie region, Poland)

Economic potential	*Risks*	*Risk prevention measures*
• **Reduced number of cars used for personal travel, improved utilisation of available seat capacity;** • **Reduced road infrastructure load, congestion, fuel consumption and parking requirement;** • **Reduced travel costs and travel time;** • **Addition to public transport in areas which would otherwise be difficult or impossible to reach;** • **Increased overall population mobility, which contributes to the wider economy.**	• As ridesharing increases, the share of public transport use may decrease, resulting in a substitution effect; • Dependency of service provider revenue on the number of users and their income, which may be irregular; • Insufficient social insurance contributions; • The personal vehicle insurance policy might not cover a liability insurance for passenger transportation; • Difficulties in changing car owners' habits and convincing them of benefits, as opposed to restrictions on personal freedom.	• Possibility of integrating car sharing into the public transport system, and adding value from the integration effect; • Build a service as a non-profit initiative involving the local community, with the goal of changing driving habits rather than making a profit; • Voluntary development or self-organisation bases; • Creating social networks within the community; • Possibility for the service provider to combine this work with another job, provide the service outside regular business hours, and generate additional revenue.

MOBILITY AS A SERVICE (MAAS)

Based on: MAMBA case studies from Municipality of Vejle, Denmark, Regional Council of South Ostrobothnia, Finland & Seinäjoki University of Applied Sciences, as well as Ylläs (Finland), UbiGo (Gothenburg, Sweden), SMILE (Vienna, Austria), Switch (Hannover, Germany), MaaS Global: Whim (Helsinki region, Finland), Amsterdam (Netherlands), the West Midlands (United Kingdom)

Economic Potential	*Risks*	*Risk prevention measures*
• **One-stop shop principle for customers;** • **Shared use of infrastructure, thus maintaining a cost-effective approach to service delivery;** • **The focus shifts from solely providing the supply of transport to what and where the demand is and how to cater for it more effectively;** • **Price negotiations between transport service providers, service packages and payment options to suite consumer needs.;** • **Inclusion of walking and cycling as vital parts of the whole system;** **Potential to provide the last mile for tourists in protected areas, create new markets and demand for public transport in areas where it previously did not exist.**	• Challenges developing contractual frameworks that can efficiently integrate multiple modes and organisations into a seamless trip chain, for example: • unclear responsibility division for delays and compensations; • unclear data sharing and security requirements between component organisations of the integrated service; • Lack of common understanding about goals or resources for a shared transport service model; • Disconnection for people who do not have knowledge of modern technologies.	• Public transport authorities could lead MaaS developments by procuring development and operation from private actors, thus ensuring adherence to proper legal requirements according to national/regional or local transport policies; • Integration of transport planning between levels of government (municipalities, cities and regions) and modes of transport. Rural and urban transport strategies and policies need to be coordinated to improve the connectivity of rural transport to local, national and regional networks; • Provision of various transport ordering channels.

COMBINED TRANSPORT SOLUTIONS (CTS) **Based on: MAMBA case studies from Municipality of Trelleborg, Sweden, as well as Kombibus (Brandenburg, Germany), Freelway (Sweden), PIMMS (Chauffailles, France)**		
Economic Potential	***Risks***	***Risk prevention measures***
• **Smart pooling of transport capacity should also save energy and reduce CO_2 emissions;** • **Creating these new, affordable delivery options can open up new market opportunities for farms and other rural businesses, as well as improve the quality of life in rural areas.**	• Inhabitants' and entrepreneurs' lack of trust in the viability of the service in long-term perspective.	• Assign additional functions to existing infrastructure components. For example, use of school buses on weekends for other transportation purposes; • Involve a local formal or informal leader who will engage the local community; • Organise information campaigns in municipalities, libraries, post offices, shops, cultural institutions, and schools.
SERVICE-TO-PEOPLE **Based on: MAMBA case studies from Diakonie Schleswig-Holstein in Hallig Hooge, Germany, Municipality of Trelleborg, Sweden, as well as Ilomantsi (North Karelia, Finland), Mobile dental buses (Latvia), Mobile Health Care Centre (Latvia), DB Medibus (Germany), Sorø Senior Service (Denmark), Aijjoos (Finland), Mobile mail service (Hungary), Ronald McDonald House Charities (Latvia), mobile retail shops (Latvia)**		
Economic Potential	***Risks***	***Risk prevention measures***
• **Service centres provide access to services that would otherwise only be available over long distances;** • **Service to People can provide home care for the elderly in rural areas using specially equipped caravans, including power generators, hot showers and toilets, kitchens, washing machines, foot care,**	• The local municipality does not want to provide such services and allocate budget for it if it is not a legally assigned responsibility; • High salary costs for the driver who must be paid for time spent waiting at the venue.	• Work closely with stakeholders and decision-makers at the national and local level to suggest amendments to municipal legislation, in order to promote the development of service-to-people provision; • To adapt the existing building as a service house in the villages where service providers could sell services on particular days, according to schedule; • To develop cooperation between different providers of services.

and hair clippers. There are several solutions in Latvia, such as blood donor buses, dental and primary care buses for children, and library buses; • **The availability of different services for local people: more extensive benefits for society (early diagnostics, lower spending on therapy).**		

Conclusions

This study has highlighted the key economic considerations when designing, implementing and evaluating innovative rural mobility solutions. A number of **external factors** should be taken into account; for example, population structure and population density, the structure of the local economy, spatial patterns related to settlement and infrastructure, and the lifestyles of the population.

During the decision-making process we have to consider **internal** factors, such as the needs of the main stakeholders for a given mobility solution, the availability of technical solutions, the availability of adequate financing, and how to facilitate connectivity with other services.

Mobility opportunities are affected by **economic factors** such as an ageing population, isolation, a lack of job opportunities, and the digital divide. The development of mobility services is hampered by a lack of knowledge of the solutions available to a rural population, and the lack of alternative business models for starting an enterprise.

Overall, new **needs are driven** by limited access to public transport and route connectivity, longer distances without public transport and/or lack of alternatives to private cars, as well as the lack of funding. Low population density, scattered and small villages, inadequate spatial planning: these are factors that create a high level of car dependence in rural areas. Limited mobility also results in a lack of accessibility to other services such as the postal service, health services, shops, pharmacies, cafes and more.

Rural areas vary from country to country, and from region to region. The rural population can also include high-income families, as well as poor households. There are differences in topography, climate and seasonality. These differences make it *difficult to choose a single model that would suit all territories*.

Therefore, when planning a mobility solution, it is initially necessary to carry out an *analysis of the local situation* and the needs of potential local users, as well as to identify their needs and the reasons why they should have a fresh mobility solution. An objective and comprehensive assessment criterion is *accessibility of services*, which helps to reduce social exclusion among the rural population. It is crucial to *assess the socio-economic benefits,* such as health and wellbeing. Transport solutions must be sustainable, so that they contribute to long-term behavioural change of citizens, with added benefits for security, health, education for employment, and regional business development.

One of the significant *challenges* for sustainability is securing funding for transport services. There are several causes of this problem. One of them is the restriction on the transfer of funds between national sector budgets. Programmes for rural communities are often lacking, too. There are legislative restrictions, or low requirements, for the provision of minimum services to remote populations. This, in turn, leads to a need for subsidies, and limited access to sources of funding.

Other issues related to scarce resources are the complexity of the procurement process and the complexity of the funding schemes, which require adequate administrative capacity, both in preparing the application dossier and when applying for funding. In such situations, it is particularly important to demonstrate the socio-economic benefits of mobility solutions, the link between activities, and the goals and outcomes of the region's sustainable development strategy.

References

Aaltonen, S. (2017). MaaS Readiness Level Indicators for Local authorities. Civitas Eccentric. Retrieved from https://civitas.eu/sites/default/files/maas_readiness_level_indicators_for_local_authorities_web.pdf

Aapaoja A., Eckhardt J., & Nykanen L. (2017). Business models for MaaS. Conference Paper: 1st international conference on Mobility as a Service. ICoMaaS 2017 Proceedings. http://www.tut.fi/verne/aineisto/ICoMaaS_Proceedings_S1.pdf

Acheampong R., & Silva E. (2015). Land use–transport interaction modelling: A review of the literature and future research directions. *Journal of Transport and Land Use*, 8(3), 11–38.

Ambrosino, G., Nelson, J.D., & Romanazzo, M. (2003). Demand Responsive Transport Services: Towards the flexible mobility agency. *ENEA*.

Angus, A. (2018). Top 10 Global Consumer Trends for 2018: Emerging Forces Shaping Consumer Behaviour. *Euromonitor International*. Retrieved from https://www.euromonitor.com/

Ardenis and Vidzeme Planning Region (2014). Action plan for service "Implementation Transport on Demand in Vidzeme region". Interreg IVC project Regions for Intelligent Transport Solutions.

Beecroft, M., Nelson, J., & Mounce, R. (2019). SMARTA Sweden Insight Paper. *SMARTA – Smart Rural Transport Areas*.

Bielsko-Biała City Hall Strategy and Economic Development Department. (2015). Bielsko-Biala Entrepreneurship City. Retrieved from http://www.bielsko-biala.pl/uploads/pub/pages/page_69/text_images/ BB 2015 ENG_1.pdf

Bosetti, S. (2018). New mobility approaches to fight transport poverty and improve accessibility in European cities and regions. Horizon 2020 project. www.hireach-project.eu.

Camarero, L., & Oliva, J. (2016). Mobility and household forms as adaptive strategies of rural populations. *Portuguese Journal of Social Science*, 15(3), 349–366.

Cancellara, P. (2019). Improving Rural Mobility in the Cairngorms National Park: the INCLUSION pilot in Scotland (U.K.). Retrieved from www.h2020-inclusion.eu

Chiffi, Cosimo, Simone Bosetti, Stefano Borgato, Vasco Reis, André Freitas, Gorazd Marinic, Anne Reynaud, Patrick Van Egmond, Joanne Wirtz, Andrei Gheorghiu, Valentin Iordache (2019). Drivers and barriers of organisational frameworks aimed at delivering innovative mobility options. Retrieved from https://hireach-project.eu/

Corbett, M. (2007). Learning to leave: The irony of schooling in a coastal community. Black Point, NS: Fernwood.

Davison L., Enoch, M., Ryley, T., Quddus, M., & Wang, C. (2014). A survey of Demand Responsive Transport in Great Britain. *Transport Policy,* 31, 47-54.

Deloitte Monitor. (2017). Car Sharing in Europe: Business models, National variations and upcoming disruptions. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/de/Documents/consumer-industrial-products/CIP-Automotive-Car-Sharing-in-Europe.pdf

Development of Cities in the Baltic Sea Region. (2016). VASAB Secretariat.

Dotter, Fred (2016). Transport poverty. CIVITAS Thematic Policy Note. Retrieved from https://civitas.eu/content/civitas-thematic-policy-note-transport-poverty

Eckhardt, J., Aapaoja, A., Nykänen, L., Sochor, J., Karlsson, M. & König, D. (2017). MAASiFiE European MaaS Roadmap 2025. Conference of European Directors of Roads.

Ellner, M., Schumacher, O., & Hatwig, M. (2018). Pre-study report on legal determinants for innovative rural mobility solutions. Institute for Climate Protection, Energy and Mobility. MAMBA. Retrieved from https://www.mambaproject.eu/wp-content/uploads/2018/08/GoA_2.4_Legal-pre-study_IKEM.pdf

EPOMM Newsletter December 2017. (2017). European Platform on Mobility Management. Retrieved from http://www.epomm.eu/newsletter/v2/eupdate.php?nl=1217_2&lan=en

ERTICO (2018). Mobility as a Service: From modes to mobility. https://3zehwq3sp4yz1yq4v9sz8991-wpengine.netdna-ssl.com/wp-content/uploads/2018/09/Ertico_MaaS-vision-paper-2018_www.pdf

European Union. (2017). Exploratory study of consumer issues in online peer-to-peer platform markets - Task 4 – Uber – Case study report. Retrieved from https://ec.europa.eu/newsroom/document.cfm?doc_id=46226

Farrugia, D. (2016). The mobility imperative for rural youth: the structural, symbolic and non-representational dimensions rural youth mobilities. Journal of Youth Studies, 19(6), 836–851.

Finn, B. (2019). SMARTA Latvia Insight Paper. SMARTA – Smart Rural Transport Areas. Retrieved from http://ruralsharedmobility.eu/wp-content/uploads/2019/04/SMARTA-IP-Latvia.pdf

Future Transport Strategy 2056. (2018). NSW Government. Retrieved from https://future.transport.nsw.gov.au/sites/default/files/media/documents/2018/Future_Transport_2056_Strategy.pdf

Gabriel, M. (2004). Youth, mobility and governance on the North West coast of Tasmania. PhD Thesis. University of Tasmania. https://eprints.utas.edu.au/17324/1/Whole-Gabriel-thesis.pdf

Giesel, F., & Nobis, C. (2016). The Impact of Carsharing on Car Ownership in German Cities. Transportation Research Procedia, 19, 215-224.

Global Mobility Report 2017: Tracking Sector Performance. Washington DC, License: Creative Commons Attribution CC BY 3.0 P. http://www.sum4all.org/

González-González E., & Nogués S. (2018). Long-term differential effects of transport infrastructure investment in rural areas. *Transportation Research Part A: Policy and Practice*, 125, 234-247.

Hauka, E. (2019). TVNET pēta: kā izdzīvo nomaļos Latgales ciemos (in Latvian). Retrieved from https://www.tvnet.lv/6720674/tvnet-peta-ka-izdzivo-nomalos-latgales-ciemos

Hertzog, C. (2012). How ICT is creating a new mobility grid. GreenBiz. Retrieved from https://www.greenbiz.com/blog/2012/10/10/how-ict-creating-new-mobility-grid

Hoadley, S. (2017). Mobility as a service: Implications for urban and regional transport. Polis Traffic Efficiency & Mobility Working Group. www.polisnetwork.eu

Hunkin, S., & Krell, K. (2018). Demand Responsive Transport: A Policy Brief from the Policy Learning Platform on Low-carbon economy. Interreg Europe.

Interreg Central Europe Project Peripheral Access. (2018). Ed. Reichenberger, A., Rubini, L., Mazzarino, M., Virág, A.

ITS International (2015). Mobility as a Service gaining traction in US and Europe. Retrieved from https://www.itsinternational.com/sections/transmart/features/mobility-as-a-service-gaining-traction-in-us-and-europe/

Karlsson, I.C.M., Sochor, J., & Strömberg, H. (2016). Developing the "Service" in Mobility as a Service: experiences from a field trial of an innovative travel brokerage. *Transportation Research Procedia,* 14, 3265-3273.

Keeton, A., A. (2018). Mapping incentives to change. Rocky Mountain Institute.

Kempers, A. (2018). KombiBus — Delivering passengers, freight and post in rural Germany. Retrieved from: https://www.mambaproject.eu/wp-content/uploads/2018/08/WP2_good-practices_KombiBus_New-Final.pdf

Kompil, M., Jacobs-Crisionikstra, L., C., Dijkstra, & Lavalle, C. (2019). Mapping accessibility to generic services in Europe: A market-potential based approach. *Sustainable Cities and Society,* 47, 101372.

König, D., Eckhardt, J., Aapaoja, A., Sochor, J., & Karlsson, M.A. (2016). MAASiFiE Business and operator models for MaaS. Conference of European Directors of Roads.

Kreis Plön. Regionaler Nahverkehrsplan (RNVP). Retrieved from https://www.kreis-ploen.de/Wirtschaft-Tourismus/Mobilität/Regionaler-Nahverkehrsplan-RNVP-

Laird J., Mackie P., & Johnson D. (2013). Wider economic benefits of transport schemes in remote rural areas. Institute for Transport Studies University of Leeds

Lektauers, A., & Niedole, I. (2012). Presentation Vidzeme public transport modelling system (in Latvian). Retrieved from www.vidzeme.lv/upload/lv/Esfondi/RTU_prezentacija_20120427.ppt

Litman, A. (2011). Transportation Market Distortion. *Berkeley Planning Journal*, 19(1).

Litman, T. (2018). Evaluating Transport economic development impacts. Victoria Transport Policy Institute.

López-Iglesias E., Peón D., & Rodríguez-Álvarez J. (2018). Mobility innovations for sustainability and cohesion of rural areas: A transport model and public investment analysis for Valdeorras (Galicia, Spain). *Journal of Cleaner Production*, 172, 3520-3534.

Marsden, T. (2002). Rural Futures: The consumption countryside and its regulation. *Sociologia* Ruralis, 39(4), 501-526.

Meersman, H., & Nazemzadeh, M. (2017). The contribution of transport infrastructure to economic activity: The case of Belgium. *Case Studies on Transport Policy*, 5(2), 316–324.

MaaS Alliance (2019). Recommendations on a User-Centric Approach for MaaS. *Vision paper of the MaaS Alliance Users & Rules Working Group.* Retrieved from https://maas-alliance.eu/wp-content/uploads/sites/7/2019/04/Recommendations-on-a-User-Centric-Approach-for-MaaS-FINAL-180419.pdf

Mulley, C., Nelson, J.D., & Wright, S. (2018). Community transport meets as a service: On the road to a new a flexible future. *Research in Transportation Economics*, 69, 583-591.

Nahverkehrsplan des Landkreises Cuxhaven (2019). Verkehrsgesellschaft Nord-Ost-Niedersachsen mbH and Verkehrsmanagementgesellschaft der Landkreise Cuxhaven. Retrieved from https://landkreis-cuxhaven.de/media/custom/2736_108_1.PDF?1547629828

Owen, D., Hogarth, T., & Green, A. E. (2012). Skills, transport and economic development: evidence from a rural area in England. *Journal of Transport Geography*, *21*, 80–92.

Pitkänen, K., Sireni, M., Rannikko, P., Tuulentie, S., & Hiltunen, M.J. (2017). Temporary Mobilities Regenerating Rural places. Case studies from Northern and Eastern Finland. *Journal of Rural and Community Development*, 12(2-3), 93-113.

Pollitt, C., & Bouckaert, G. (2011). *Public Management Reform: A Comparative Analysis – New Public Management, Governance, and the Neo-Weberian State*. Oxford: Oxford University Press.

Regional Council of North Karelia. (2010) Rural Transport Solutions in Northern Periphery. Retrieved from https://www.pohjois-karjala.fi//documents/33565/34205/134+Rural+Transport+Solutions+in+Northern+Periphery.pdf/c6daddfd-224c-4a66-a34f-cb23a5b27e69?version=1.0

Regional Council of South Ostrobothnia. (2015). South Ostrobothnia's Future Path: Regional development plan 2040 & Regional programme 2014–2017. Retrieved from https://www.epliitto.fi/images/A44_SouthOstrobothniaRegionalCouncil_FuturePath_2014.pdf

Region of Southern Denmark Strategy 2012-2020. (2012). Region of Southern Denmark Growth Forum. Retrieved from https://vaekstforum.regionsyddanmark.dk/wm415685

Regionalen Nahverkehrsplanes des Kreises Plön. (2018). Regionales Kompetenzzentrum ÖPNV. https://www.kreis-ploen.de/media/custom/2158_2834_1.PDF?1543929364

Rural Transport Handbook. (2004). ARTS - Actions on the integration of Rural Transport Services. Project in the fifth framework programme of the European Union. EPOMM. Retrieved from http://www.epomm.eu/old_website/docs/ARTS_Rural_Transport_Handbook_english.pdf

Shaheen, S., Martin, E., & Bansal, A. (2018). Peer-To-Peer (P2P) Carsharing: Understanding Early Markets, Social Dynamics, and Behavioral Impacts. Report. UC Berkeley Institute of Transportation studies. Retrieved from https://escholarship.org/uc/item/7s8207tb

Smith, G., Sochor, J., & Karlsson, I.C.M. (2018). Mobility as a Service: Development scenarios and implications for public transport. *Research in Transportation Economics.*

Sochor, J., Arby, H., Karlsson, M.A., Sarasini, S. (2018). A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. *Research in Transportation Business & Management 27.*

South Ostrobothnia Business, Transport and Environment Center. (2018). Road Management and Transport Plan 2018-2022. Retrieved from http://www.ely-keskus.fi/documents/10191/56023/Tienpidon_liikenteen_suunnitelma_2018-2022_1_2_2018.pdf/27c24fe5-8c32-4688-b40a-be98b630c743#page=7

South Ostrobothnia Chamber of Commerce. (2019). https://etela-pohjanmaankauppakamari.fi/en/

Stadt Plön. Wirtschaftsregion. Retrieved from https://www.ploen.de/city_info/webaccessibility/index.cfm?item_id=840978

Stratigea, A. (2011). ICTs for rural development: Potential applications and barriers involved. *Netcom*, (25-3/4), 179-204.

Ström Hildestrand, Å. (2018). Mobilsamåkning AB, Sweden – a ridesharing application. Retrieved from https://www.mambaproject.eu/wp-content/uploads/2018/07/WP2_good-practice-cases_Mobilsam%C3%A5kning-FINAL.pdf

Sustainable Mobility for All. (2017). Global Mobility Report 2017: Tracking Sector Performance. Washington DC, License: Creative Commons Attribution CC BY 3.0

The Future of Demand Responsive Transport. (2017). Institution of Mechanical Engineers. Retrieved from https://ctauk.org/wp-content/uploads/2018/05/The-Future-of-Demand-Responsive-Transport-1.pdf

The Open Skåne 2030: Skåne's Regional Development Strategy. (2014). Region Skåne. Retrieved from https://utveckling.skane.se/siteassets/publikationer_dokument/rus_slutdokument_210x275_eng.pdf

UbiGo home page. (2018). http://ubigo.se/

Vision 2030 for mobility. (2018). ERTICO home page. http://ertico.com.

Van Zeebroeck, B., & Florizoone, W. (2019). SMARTA Germany Insight Paper. SMARTA – Smart Rural Transport Areas. Retrieved from http://ruralsharedmobility.eu/wp-content/uploads/2019/04/SMARTA-IP-DE.pdf

World Bank Technical Report. (2002). Improving Rural Mobility: Options for Developing Motorized and Nonmotorized Transport in Rural Areas. Retrieved from https://pdfs.semanticscholar.org/573d/e2643e608f318e6a686f0988122ode3f1dea.pdf?_ga=2.104634245.405394497.1532607160678862580.1532607160

Worsley, T., & Mackie, P. (2015). Transport Policy, Appraisal and Decision-Making, Report to RAC Foundation, London. Retrieved from https://www.racfoundation.org/research/economy/transport-policy-appraisal decision-making-research

Zobena, A., (2019). Changes in Mobility Patterns and Services Use of Rural Population. Retrieved from http://llufb.llu.lv/conference/economic_science_rural/2015/Latvia_ESRD_40_2015-196-204.pdf

Annex 1. List of partners

1. Diakonie of Schleswig Holstein, Germany (Lead Partner)
2. Nordregio, Sweden
3. Vidzeme University of Applied Sciences, Latvia
4. Vidzeme Planning Region, Latvia
5. County of Ploen, Germany
6. County of Cuxhaven, Germany
7. Regional Council of South Ostrobothnia, Finland
8. Seinäjoki University of Applied Sciences
9. Regional Council of North Karelia, Finland

10. Vejle Municipality, Denmark
11. Municipality of Trelleborg, Sweden
12. Bielsko District, Poland
13. Bielsko-Biala Regional Development Agency, Poland
14. Institute for Climate Protection, Energy and Mobility, Germany
15. Road Transport Administration, Latvia

Source: https://www.mambaproject.eu/about-us/#partners

European Union statistical units for comparison of project partners:

Code	NUTS 1	NUTS 2	NUTS 3
DK0	DANMARK		
DK03		Syddanmark	
DK032			Sydjylland
DE			
DE9	NIEDERSACHSEN		
DE93		Lüneburg	
DE932			Cuxhaven
DEF	SCHLESWIG-HOLSTEIN		
DEF0		Schleswig-Holstein	
DEF0A			Plön
DEF0B			Rendsburg Eckernförde
LV0	LATVIJA		
LV00		Latvija	
LV008			Vidzeme
PL2	MAKROREGION POŁUDNIOWY		
PL22		Śląskie	
PL225			Bielski
FI1	MANNER-SUOMI		
FI19		Länsi-Suomi	
FI194			Etelä-Pohjanmaa
FI1D		Pohjois- ja Itä-Suomi	
FI1D3			Pohjois-Karjala
SE2	SÖDRA SVERIGE		
SE22		Sydsverige	
SE224			Skåne län