MARA

Mobility and Accessibility in Rural Areas

Mobility and accessibility in rural areas – new approaches for developing mobility concepts in remote areas

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Develop New Mobility Solutions in the Partner Regions

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Bialystok University and Hajnowka District	PP2 and PP8	Feasibility study on Electric cars and bikes sharing between strategic points in Hajnowka
City of Petrozavodsk and Tourist Center of Karelia	PP7 and PP10	Feasibility study on the development of 1–3 safe water routes on the Onega Lake
Trafikverket and Dalarna University	PP6 and PP9	Detailed implementation strategy for producing an "Integrated mobility plan in the Sälen/Trysil area and the Åre area
Setesdal Region and one for Vidzeme Region	PP4 and PP3	Develop 2 investment concepts for e-bike / e-cargo-bike sharing

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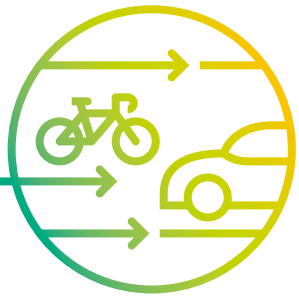


1. INTRODUCTION

The rural areas in Baltic Sea Region countries meet a wide range of economic, environmental and social challenges. The situation is uneven across the region and requires a different solution for different areas. Declining population figures can especially be observed in the north-eastern part of the Baltic Sea Region (parts of Lithuania, Latvia, Belarus, Russia and northern areas of Norway, Sweden, and Finland) and East Germany **(FIGURE 1)**. Contrary to that, the highest increases are visible for large parts of Poland as well as southern areas of the Nordic countries (Where the number of population in the Baltic Sea Region is growing or shrinking)

The positive population development in large areas of the south-western Baltic Sea Region is mainly caused by in-migration from the northeastern countries and by regional migration, in Poland also by positive natural population change. The development of cities happens at the expense of rural municipalities and regions. The partly substantial population declines in sparsely populated regions indicate a migration trend "from the countryside to the city" (Where the number of population in the Baltic Sea Region is growing or shrinking).

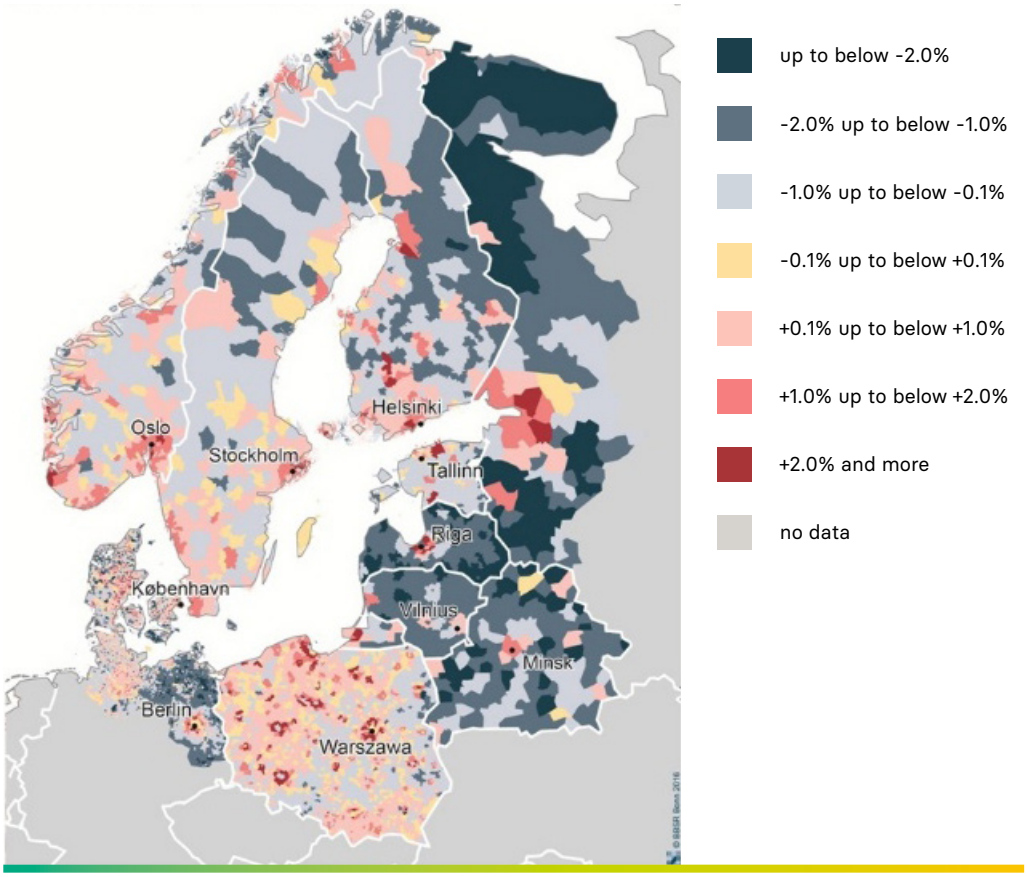


FIGURE 1. Average annual population development in local administrative units (Where the number of population in the Baltic Sea Region is growing or shrinking)

In the medium term, rural areas, which featured a positive natural population change over a long period, will not maintain sufficient population reproduction potential. In the Nordic countries, in Poland and Germany and partly in Estonia, smaller cities inside rural areas still show a particular population growth; however, at the expense of surrounding rural settlements (Where the number of population in the Baltic Sea Region is growing or shrinking, n.d.). In Latvia and Lithuania, population development seems to be worthiest

the big part of the population (more than 45% in Latvia and more than 55% in Lithuania) still lives in rural areas. By contrast, a relatively low share of the total population lived in rural areas in several of the most populous Member States, including Germany (22.4 %), Belgium (18.0 %), and the Netherlands (14.7 %) (Eurostat, 2020). That trend will likely continue in the nearest future. With changes in the population in rural areas, implementing the new achievements in connectivity, people's mobility must be ensured inside the regions and connections with other country's administrative units. The solutions will increase the attractiveness of the regions for the residents and tourists as well. In the long term, these decisions will stabilize the situation or even change the trend.

2. Possible mobility solutions, best practice examples in Europe

People's mobility plays an essential role in our daily lives and sustainable development because transport use much energy and generate many emissions. Many solutions appear every year in this field; however, most of them solve only urban mobility challenges. Such solutions cannot be applied in rural areas directly due to differences in people's needs and behaviour (habits) due to the social environment, density, infrastructure, etc.

Alternative and innovative solutions are needed to change the situation without restricting the people's movement in such areas. A possible mobility landscape in rural areas can be seen in **FIGURE 2**. First of all, conventional solutions should be discussed. The most popular solution is privately owned cars, such a solution has a high comfort level, regardless of high price and negative environmental impact. The second solution is different micro-mobility solutions, such as bicycles, scooters, etc. Third is public transport, which is not everywhere available and not always convenient or reliable.

Mobility is a complex system based on the interaction of many components, all of which must evolve together: behaviour, changes in habits, vehicle quality, infrastructure development, digitalisation, etc. This explains the difficulties in transitioning to new and more sustainable transport means. In addition to the financial difficulties that always persist in improving transport and its infrastructure, the development of intermodality, the use of ICT (information and communication technologies) for the elderly or those unfamiliar with new technologies, and access for specific target groups, for example, the disabled, foreign visitors, etc.

Digitalization is necessary for improving the public transport system. Consumers need to be able to use a variety of transportation solutions for their trip. With the help of technology to know their schedules, costs, possible delays, and the ability to combine multiple transportations offers to reach their desired destination. Regional and local authorities responsible for transport, with the community and local people's involvement, should be encouraged to work together to develop these information systems, available 24 hours a day via the internet or smartphones (Karakaitė, 2020).

A Flexible Transport System (FTS) may be one solution to emerging challenges of transport accessibility in rural areas, which have a low population density. FTS aims to provide passengers with flexibility in choosing routes, times, modes of transport, service provider, and payment systems (Velage et al., 2012). Authors propose that FTS is particularly applicable to rural areas, where there is often little if any availability of conventional transportation services. FTS types include carpooling, sharing solutions, shuttle services, call/dial services, etc. Such a concept is not new and has already been successfully applied in Great Britain, Italy, Ireland, Austria, the Netherlands, Belgium, Germany, and Luxembourg. In the latter country, improving transport also acts as a social innovation to help retrain the long-term unemployed.

In, e.g. the Swedish case, the social aspects are underlined as essential issues in the transportation area and indicate considerable challenges for transport planning and traffic safety. It has, however, been relatively neglected and is sparsely seen in the research field. To integrate gender and equity in the Swedish, Integrated Action Plan support is coming from the Swedish National Road and Transport Research Institute and their R&D program on gender equality and diversity in the transport sector (VTI program Mobility, social inclusion, and justice). Extracts from their presentation of the program show how activities within their research area, research, and investigative activities are being conducted to deepen the knowledge on social sustainability, social consequences, and welfare consequences concerning practices among different groups, their preconditions, and requirements concerning mobility and access to transportation. One crucial aspect is how equity and inclusion can be ensured for individuals and groups in a diversified society.

The latest transportation achievements lead to the appearance of flexible transport services, such as the vehicle "on-demand", which is part of the public transport system. Two possibilities are possible here, first is flexible route demand, where the route may be selected depending on the need. Another solution is asset sharing; it covers car sharing and shared micro-mobility services (e-bikes, e-scooters, etc.). The last opportunity is a ride-sharing service, where passengers can be picked up during the journey (Smart villages and rurar mobility).

In GoA 3.2 four case studies are under investigation, they include electric bike sharing (Poland, Latvia, Norway); car sharing (Poland and Lithuania), inland water transport solutions (Russia), and Integrated mobility plan and conceptualism (Sweden).

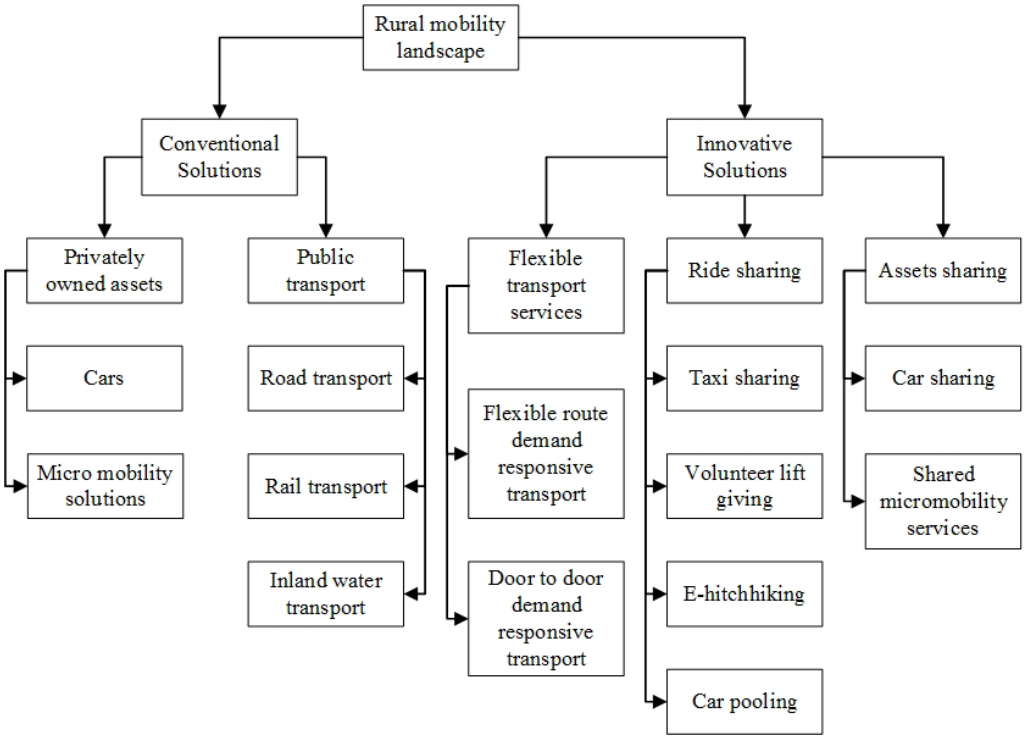


FIGURE 2. Possible mobility solutions in rural areas

The demographic changes, urbanization, and economic forces have created new businesses such as car sharing globally. According to the research proposed by the Klynveld Peat Marwick Goerdeler, the vehicle is used only about 2–3 hours per day (KPMG, 2012). For some groups of people, such a service became an alternative for a privately owned vehicle. There is a prognosis of three basic vehicle usage models in the future (Haboucha, 2017). The first one covers the privately owned vehicles when one person or family uses it; it is similar to the current ownership model. The second model takes the shared vehicle when the user is not the car owner, but rents and uses it when necessary. The third model is the communally owned vehicle when a group of people owns and uses the car. There are initiatives worldwide to reduce greenhouse gas and particle emissions generated in the transport sector, as environmental problems are an increasing challenge. Soon, the popularity of car sharing will likely increase, so the second and third vehicle usage models may be preferred as economically relevant in the future.

Business to Client (B2C) carsharing business models are widespread in towns with a population higher than 500,000. There are recommendations that the minimal fleet for one company should be more than 50 vehicles (Car Sharing Business Model: Understanding How to Build Yours., 2018). Currently, for cities with 500,000 inhabitants' fleet can grow up to 180 vehicles for 100,000 people, in the future this number may increase if the popularity of service will grow. For cities with a population, less than 100,000 inhabitants roundtrip and *Point-to-point* car sharing have been adopted worldwide (Car Sharing Business Model: Understanding How to Build Yours., 2018).

In Poland, the largest carsharing service provider is Panek Car Sharing. It is one of the most dynamically developing services in Poland. It appeared in 2017, and at the beginning, it covered only large cities. Now service is available (pays off) in all cities with over 40,000 inhabitants, while in other countries this number is about 100,000. Cars can be rented in all PANEK zones and returned within zones (250 of them) paying only for the time and kilometres travelled. The fleet consists of 2,000 cars; about 20 car models have electric/hybrid drivetrain. Other companies operating in Poland are MiiMOVE (400 cars); 4MOBILITY (250 cars); CITYBEE (150 cars); EASYSHARE (250 cars); INNOGY GO (400 cars); PKP Mobility (10 cars); TRAFICAR (1,200 vehicles); WOZIBUS (5 cars).

Currently, in Lithuania, there are two car sharing companies. The first one is CityBee (https://www.citybee.lt/lt/); the company was established in 2012 as part of the Modus Group. In 2019, the fleet consisted of 810 cars and 50 light freight vehicles. Also, the company develops business in the field of micro-mobility. Currently, it is bicycles and electric scooters. CityBee cars are available in the most prominent Lithuanian cities: Vilnius, Kaunas, Klaipėda, and in the seaside resort city Palanga. The company uses a free-floating business model. With CityBee cars, it is possible to travel between cities, for example, to pick up a car in Vilnius and leave it in any CityBee area Kaunas. International journeys are also available; for example, it is also possible to travel to Riga or Tallinn, as the company has representative offices. The second company operating in Lithuania is SPARK; it is a car-sharing company established in 2016, with a free-floating business model. The main difference, compared to CityBee, is that all fleet consists of electric vehicles. This is an environmentally friendly company, however, performing with some limitations. Right now, service is available only in Vilnius, the capital of Lithuania. The company SPARK does not operate in other areas, as charging station infrastructure is not sufficient still. Currently, there are 136 charging stations in Vilnius, where SPARK cars can be charged.

The three prominent companies providing car sharing in Latvia are Carguru, CityBee, and Fiqsy. They mainly operate in the capital city Riga and a few other large cities, all of them are expanding services, so coverage situation changes dynamically. All companies use a free-floating business model. Each company has a share of electric vehicles in its fleet. All of them aim to go fully electric (at least for passenger vehicles, not light freight vehicles) in the foreseeable future.

In Sweden, the car sharing service is not new. Currently, only in Stockholm, there is M Car Sharing, KINTO Share, Aimo, which provides only electric vehicles. However, some companies as Car2Go and DriveNow discontinued their services. Despite companies'

efforts and loyal business partners, the necessary number of members or car-usage was not reached. The second reason was increased operating costs, such as congestion tax and parking fees.

In Norway, there are several car sharing companies, all in the bigger cities and hubs. Car sharing in Norway has grown formidably since 2015 due to the new type of car sharing between private individuals and the Pear to Pear (P2P) business model. More data is presented in **TABLE 1**.

There are no car sharing systems in the Setesdal region (Norway), mainly due to the rural settlement, a high number of privately owned cars, and few inhabitants.

The first car sharing was launched in Russia in 2012. The service has been developing rapidly in recent years. As of November 2019, the Russian car sharing fleet consisted of 39,000 cars. Four operators account for the majority of this fleet (about 91%). Russian Automotive Market Research (RAMR) predicts that the car sharing fleet will increase to 60–75 thousand vehicles by 2025. Among the drivers of the Russian car sharing growth is the support of local authorities. For example, in Moscow, car sharing companies receive parking privileges. The Moscow region is also the leader in terms of the number of trips on the car sharing – 84.6%; on average one user makes 33 trips a year. St. Petersburg and the Leningrad Region occupy just over 8% of the market (21 trips per user per year), while the Sverdlovsk Region occupies just over 1% (13 trips per user per year). Another 6% of the market is in all other Russian regions. In 2018, representatives of 83 Russian regions took advantage of sharing services at least once. About 30 operators are currently working in 15 cities, although 17 operators (65% of companies) are concentrated in Moscow, where there is maximum demand for the service. The primary users of car sharing in Russia are young people aged 21–35 years, making 7–19 trips per month. According to J'son & Partners Consulting, car sharing services are gaining popularity in Russia, and the number of projects and coverage of cities is growing. The most popular in Russia in terms of the number of users are network taxi aggregators and the BlaBlaCar car pulling project.

The main competitor of car sharing companies is not the drivers with privately owned vehicles, but services when a passenger is hiring a vehicle and a car with a driver. Examples of this type of business model are Uber, Bolt, and Yandex taxi.

TABLE 1. Car sharing schemes in Norway, users and available cars. (figures from 2018, unless otherwise stated)

Source: (Nenseth, 2020)

COMPANY/PROVIDER – START UP YEAR	BUSINESS MODELL	BILER	MEMBERS/USERS
Bilkollektivet, fra 1995, 5 byer	Cooperate	>400	about 10,000[1]
Trondheim bilkollektiv, fra 1996	Cooperate	95	1800[2]
Bildeleringen Bergen, fra 1996	Cooperate	200	>1900 (1830 private+ 90 company customers)[3]
Hertz bilpool, fra 2010	B2B, B2C	>100	<7,000 (<4,000 private + <3,000 company customers)
Move About fra 2007, ren elbilflåte	B2B, B2C	90	8,500[4]
Nabobil fra sept. 2015	P2P	Ca 6000	170,000[5] registered users (50,000 transactions last year)
GoMore fra 2017	P2P	2,000	–
Hyre, fra 2018	B2C/P2P	500	–

COMPANY/PROVIDER – START UP YEAR	BUSINESS MODELL	BILER	MEMBERS/USERS
GreenMobility, din bybil	B2C (énvei)	250	–
Og More	P2P	2,000[1]	–

*Sources: Interviews, web pages, news coverage, own estimation and set up (vibeke.nenseth@toi.no)

During last year's popularity of micro-mobility solutions increased significantly. Conventional businesses working in the renting service field propose a simple solution, where you can use the vehicle for a specified time, after that you need to return the vehicle to the initial point. Such services are well known and widespread all over Europe; however, the service level is not very high. The new solution is a free-floating service when the vehicle can be unlocked through the app and left anywhere within a perimeter at the end of the journey. Such solutions combine various light vehicles, often enabled by technological innovations, such as rental e-bicycles, folding bicycles, hoverboards, or monowheels (McKenzie, 2019). Much sharing economy-based business appeared that propose not to own a vehicle but rather rent it when you need it. The introduction of such transport mode impacts other users of public space, for transport and other uses, and thus changes that public space (Tuncer & Brown, 2020). Some service users ride on the sidewalks out on the road and cause emergencies simultaneously. The regulation will be needed soon, to classify the vehicles and requirements to the users.

E-bikes are an emerging micro-mobility technology with the potential to strengthen sustainability transitions. Such transport mode is more environmentally friendly than a conventional car, as it needs less energy and uses "green" energy; thus it is a cheaper alternative to car travel (McQueen, MacArthur, & Cherry, 2020). A report from AKT from 2016 (Routeinformation AKT) indicates that extending services that include bikes gives several benefits, i.e. public health improvement, environmental benefits, and less area consumption. The public health benefits of such a system are described in several studies. These studies indicate that introducing e-bikes as an option for transportation in different ways is highly beneficial for different people. Changing the commuting mode from car to E-bike will significantly increase levels of physical activity while commuting" (Berntsen, Malnes, & Langåker, 2017). There are studies where employers offered e-bikes to their employees (Lobben, et al., 2018); providing parents with children in kindergarten with access to e-bikes might increase and sustain cycling during the winter season (Bjørnarå et al. 2019). In all the cases, activities give a positive health effect.

According to investigation results provided in Sweden by (Hiselius & Svensson, 2017), it was found that there are sustainability benefits to be gained from the use of e-bikes since e-bike trips predominantly replace car journeys. There are, however, no significant differences in travel behaviour changes when using e-bikes and comparing urban and rural areas. People living in urban areas tend to travel shorter distances and more commonly by bicycle and public transport, whereas people in rural areas tend to travel longer distances and more often by car.

In Lithuania, bicycle sharing is a popular service. One of the oldest companies working in this field is Cyclocity (Cyclocity). This service offers bike ranting from particular parking lots, and the bicycle can be left in any parking lot available over the city. Another solution is electric scooter renting, a typical representative of such a service is CityBee. The main difference that there are no specific parking slots for this transport, you can take every free scooter, and left it in place, which is comfortable for you. The main disadvantage that the service is available only in big cities. Another possibility is P2P ranting (Dalinuosi).

In most cases, you need to return the electric scooter to the original location. There are no micro-mobility sharing services in the Lithuanian rural areas investigated during the project; however, conventional offline and online renting of bicycle and electric

scooters is available. Such a service is oriented on tourists, you may rent a vehicle for an hour or a few hours and visit the neighbourhood, but you need to return to the starting point in the end. Such a service is not suitable for the needs of residents.

In Latvia, the situation is similar to Lithuania; there is a bicycle share system in Riga's capital city, provided by a single company Nextbike (Nextbike, 2020). However, the e-bike share system currently does not exist in Latvia. There is an e-kick scooter renting platform RIDE (RideMobility). In the beginning, they used the Bolt platform. After one year of collaboration, they started using Atom Mobility software. There are e-bike rent options for tourism purposes (companies usually provide from 5–10 e-bikes); in these cases, e-bikes can be taken for private rides or in groups with the guide.

Bike sharing services are popular in Sweden. Also, some services provide e-bikes. There are Stockholm City Bikes; Styr & Ställ; EU-Bike; and others. In 2018, the City Bikes initiative was launched Stockholm's bike sharing program; the idea was to upgrade a fleet of 5,000 electric bikes due to increased demand for more locations and more extended borrowing periods. According to the investigation (Hiselius & Svensson, 2017), it was found that e-bikes are a popular transport mode in rural areas of Sweden. 72% of users were men, and only 28% of women what is impressive that 68% of users were between 35 and 64, and 27% of respondents were 65 and older. In urban areas, only 12% of users were 65 and older. With conventional sharing platforms that perform bike sharing service in Sweden, there is (Atom Mobility, 2020) which proposes solutions for hotels and guest houses that want to operate a small fleet of scooters or bikes as an additional service dor tourists.

E-bikes are becoming increasingly popular in Norway. Several cities are planning to introduce an e-bike system as a part of the public transportation system. Already there is a system for e-bike sharing in the Stavanger region (neighbour region to Agder/ Setesdal) handled by the regional provider of public transportation, (Kolumbus). Kolumbus has established a system for e-bike sharing that has been in operation for several years. This includes i) selecting bikes and charging systems; ii) operation and maintenance system; iii) digital solutions and management.

Bike sharing systems (BSS) have been developing in Russian cities since 2013. The forecasts say the micro-mobility segment, which includes electric bikes and scooters, will grow most rapidly, at 25% per year. Moscow has already pioneered the introduction of "new mobility" in Russia. E-bike share system currently does not exist in Russia. There are rules for ordinary bikes but no legal regulations for even electric scooters and gyro scooters. With an electric motor of more than 0.25 kW and less than 4 kW, this vehicle can be called a moped.

Furthermore, to drive it, it requires a driver's licence of category "M". If the engine produces more than 4 kW, it can already be considered a motorbike. Aligning electric bikes with mopeds will make it possible to establish at least some kind of control over them. However, there are electric scooter sharing companies, Whoosh (Whoosh, 2020), for example. Currently, service is available in Moscow, Saint Petersburg, and six more cities.

The first Polish BSS was introduced in Cracow in 2008. According to (Bieliński, Kwapisz, & Ważna, 2019), there were bicycle-sharing systems in 56 Polish cities by 2018. Bydgoszcz, Katowice, Cracow, Lublin, Lodz, Poznan, Szczecin, Warsaw, and Wrocław, where the largest bicycle-sharing systems were developed. The biggest company offering this kind of service is (Nextbike, 2020); however, conventional bikes are available, not electric ones. There are no e-bike sharing systems (eBSS); however, there are electric scooters sharing systems. For example, the (Blinkee.city, 2020) sharing system provides such a service in more than 40 towns, but not in rural areas.

Water transport is one of the most energy-effective means of transportation. Diesel consumption by inland waterway for every 100 tonne-kilometres is lower than for other modes of transport – rail or road (Gołębiowski, 2016). The inland navigation market share is about 6.3% (Sys, Van de Voorde, Vanelslander, & van Hassel, 2020). The main weakness of this transport mode is transportation speed. For example, the Antwerp – Bonne route is covered by barges in 3 days, in the case of road transport, the 230 km from Antwerp to Bonn can be overcome in less than three hours (Gołębiowski, 2016).

Speaking about inland water transport often means transportation of goods, however people transportation with this transport mode is also a vital task.

Poland has four seaports of fundamental importance to the national economy: Gdańsk, Szczecin, Gdynia, and Świnoujście. According to the Central Statistical Office, the length of the inland waterway network in Poland in 2019 was 3,722 km, i.e. 68 km more than in the previous year. 2,512 km of this network were regulated navigable rivers. There was 3,513 km of navigable operation, i.e. 94.4% of navigable roads. The condition of Polish inland navigation is considered insufficient, and its influence on Polish transport is decreasing.

In Lithuania, inland water transport is not popular. There is one route where the boat runs periodically; it takes passengers from Kaunas to Nida; it functions only during the summer season. The rest services are short time excursions in some cities (e.g. Vilnius, Klaipėda, and Trakai).

In Latvia, inland water transport is not popular as well. Available routes are mainly for tourism and recreation purposes during the summer season. River Daugava and Lielupe are the most popular (some routes connect both rivers through a short gap in the Gulf of Riga. Smaller capacity boats provide short trips in Jelgava city (river Lielupe) and Valmiera city (river Gauja).

In Setesdal, Norway, no water transport for public use is available. However, in the summertime, an old passenger boat (steamboat) is available for tourist purposes and runs daily. The (MS Bjoren) started operating as a passenger boat in 1867 and continued until 1957. In Norway, generally, car ferries and passenger ferries are still a big part of the infrastructure, particularly in Norway's western and northern parts. The ferries are a vital part of the Norwegian transport system. Approximately 20 million vehicles and 40 million passengers have transported annually on Norwegian car ferries (Ferjesambandene er en del av vegnettet).

In European regions, Russia's water transport is the most on-demand for tourists. This is due to the developed infrastructure of other means of communication – rail and road. In this regard, shipping, which is characterized by low speed, is used only for pleasure trips. It should be noted that the numerous cascades of the Volga and Kama hydro systems, built in the last century, turned the rivers into deep transport arteries. Thus, all large inter-basin connections form a single path, the length of which reaches 6,300 km. (Внутренний водный транспорт России). The waterways of Zaonezhye (Karelia region) have distinct features: i) seasonality in operation (usually from mid-May to mid-November, from 180 to 185 days); ii) the need for construction and maintenance of appropriate infrastructure (including dredging) and maintenance of the navigation environment; iii) inland waterways transportation of passengers is subject to licensing. The waterways are non-alternative for residents of the Kizhi skerries as well as tourists visiting the State Historical, Architectural and Ethnographic Museum-Reserve "Kizhi." The main water transport problems are the high cost of transport services by water during navigation (2,950 Roubles (during the 2019 summer season it was appr. 42 Euro/person travel "back and forth" Petrozavodsk – Kizhi Island – Petrozavodsk with a 4-hour stay on Kizhi Island or 2,300 Rubles (appr. 33 Euro)/ person "one-way" when buying tickets for different dates). There are no alternative transport modes and excursion routes by water transport in Zaonezhye.

In Sweden, maritime transport remains an essential complementary transport mode, and Swedish short sea shipping plays an essential role within the EU intermodal export chain. Maritime sea transport represents an essential source of employment and revenue for Sweden: the sea transport sector employed over 13,000 people. In 2013, there were 767 sea transport enterprises, and the industry turned over EUR 3.5 billion. Inland water transport is much less significant for Sweden, with only 1,500 people employed in 478 enterprises (Research for TRAN Committee Transport and tourism in Sweden). Recreational water activities along the coastline and the central lakes, e.g. Vänern and Vättern, are popular among inhabitants and tourists visiting Sweden. A particular scenic attraction is the Göta Canal which is a part of a waterway 390 km long, linking several lakes and rivers to provide a route from Gothenburg (Göteborg) on the west coast to

Söderköping on the Baltic Sea. It was built in the early 18 hundreds for people and freight but soon became obsolete with the railways' advent. Now its use is recreational.

The European Commission strongly recommends that European towns and cities of all sizes embrace its concept of Sustainable Urban Mobility Plans (SUMPs) (Sustainable Urban Mobility Plans). The idea is to develop a solution that will combine all transport modes in urban areas to improve people's mobility while making transport environmentally friendly. Besides, it solves challenges such as traffic congestions, parking demand, pollution, climate change, and road accidents. The solution should be person-oriented. Currently, primary attention is given to urban territory; mobility is not practical without a privately owned car for many people leaving in rural areas.

Over the BSR region, there are areas and residential quarters, but they are instead separated from each other. The distance is a few or tens of kilometres between the two endpoints. This is a weakness when it comes to organizing public transport. The preferred mode of choice for most people is the car. Sometimes it is possible to go by train or take a bus, depending on where a person wants to go. Such a task will be solved during the project. In Sweden in Salen/Trysil and the Are areas, there are several ski areas and residential quarters, but they are preferably separated from each other will be investigated. The distance is about 70 km between the two endpoints.

SUMP has been at the centre of attention of various cities and municipalities in Poland (Wołek, 2018). The national dimension of SUMP in Poland was formalized under the act on collective public transport in 2010 which introduced, e.g. obligation to pass the plan for sustainable development of public transport in municipalities of over 50 thousand inhabitants and counties (including cities) of over 80 thousand inhabitants (Wołek, 2018). As can be seen, there is no solution for rural areas. The new strategic framework for planning sustainable urban mobility in Poland has been defined by the Partnership Agreement providing directions of intervention within the Cohesion Policy. One of the intervention's priorities indicated the development of low-emission public transport and other environmentally friendly urban mobility forms. To develop the idea of e-mobility in Poland, the President of the Republic of Poland signed the Act of August 14, 2020, amending the Act on bio components and liquid biofuels and some other acts. The goal is to liquidate the Low-Emission Transport Fund and replace it with a new long-term commitment of the National Fund for Environmental Protection and Water Management. The intention is to accelerate public funding for the development of low-emission transport and correspond with the scope of activities of the National Fund for Environmental Protection and Water Management as an environmental protection institution responsible for financing environmental protection. Ultimately, the funds are to be allocated to co-financing projects related to e-mobility. The scope of projects that can receive funding is extensive – support may be provided, for example, to producers of means of transport, local governments investing in clean public transport, and producers of bio components, including financial support in purchasing electric cars.

In Lithuania, 20 SUMSs developed for the cities; part of them are designed for the towns in rural areas under investigation in the MARA project. However, only the situation in the towns themselves is investigated without adjacent regions. There is no integrated mobility plan that will include urban, suburban, and rural areas.

In Latvia, cities and municipalities are not required by law to develop such plans. When mobility and transport planning related documents are developed, it is done because of the local interest. These documents do not follow strict guidelines (for example, SUMP). However, they aim to solve local issues in some cities: public transportation, parking, walkability, micro mobility, or a combination of them. Sometimes these documents are the foundation for future investments in other cases they are structured more like thematic analysis of some mobility related issue. For now, only a small share of municipalities and cities, have such documents.

The choice of directions for the development of the transport system is based on the forecast of the long-term socio-economic development of the Russian Federation until 2030 and other federal documents. The strategic documents defining the perspective directions of development of economy and social sphere of the Russian regions,

branches of economy, the transport system of the country as a whole and separate modes of transport, prospects of development of transport and logistic infrastructure, prospects of international transport integration are taken into account. Other sectoral development programmes have been taken into account in developing the Transport Strategy of the Russian Federation until 2030. The development and implementation of strategic documents and initiatives in transport development abroad have been considered when forming priority directions of the Russian transport system development. The State Programme of the Republic of Karelia "Development of the Transport System" includes 2 phases: the first phase: 2014–2018; the second phase: 2019–2030. It consists of three sub-programmes: 1 "Development of road facilities", 2 "Improving road safety", 3 "Development of transport services for the population". It is financed from the Republic of Karelia's budget and from non-repayable target revenues to the Republic of Karelia's budget. The Programme's responsible executor is the Ministry of Road, Transport and Communications of the Republic of Karelia.

Setesdal Norway is a part of the Norwegian National Transportation Plan (Nasjonal Transport plan (NTP). NTP shows a strategy for developing the overall system for road, rail, air, and sea transport in Norway. The plan deals with both operation, maintenance, and investments, mainly regarding new and better roads. The reconstruction of the main road in Setesdal, RV9, is a part of this plan. There is also a regional plan for the bigger county Agder, (Regionplan Agder, 2030), describing desired development in transportation, communication, and mobility in the region. Each of the municipalities in Setesdal has its main municipality plan for both society and area. This includes road structure and other plans to improve mobility in the municipalities. The municipalities also have a Traffic Safety Plan and a Climate and Energy Plan, including chapters relating to mobility and transportation. In Setesdal, a 210 km long valley, cars' use represents 90% of transportation along with the main road RV9. The bus is the only public transportation offer and is only available a few times per day. Due to the increasing number of electric cars in Norway, there have lately been substantial efforts to establish charging stations for e-cars. Currently, there are 14 public charging stations in Setesdal. The Regional Action Plan from the MARA project will be attempted integrated into all the plans mentioned above.

As can be seen only in Norway and Sweden, integrated mobility focuses on rural areas. In other project Partners regions, the main focus is on the cities.

3. New mobility solutions for remote areas in the BSR based on the partner cases

In this section, we present case studies that were performed during project implementation.

3.1. Case 3 Concept for e-bike sharing in Norway and Latvia

Two cases are presented the first one was performed in Norway, the second in Latvia.

3.1.1. INTRODUCTION OF THE CASE STUDY (NORWAY)

Norway partners performed a pilot in the municipality of Evje and Hornnes. This is a municipality with 3,600 inhabitants and an area of 587 square kilometres. 60% of

the municipality inhabitants live in densely populated areas, whilst the rest live in scattered areas. There is one town centre in the municipality with shops, restaurants and health services.

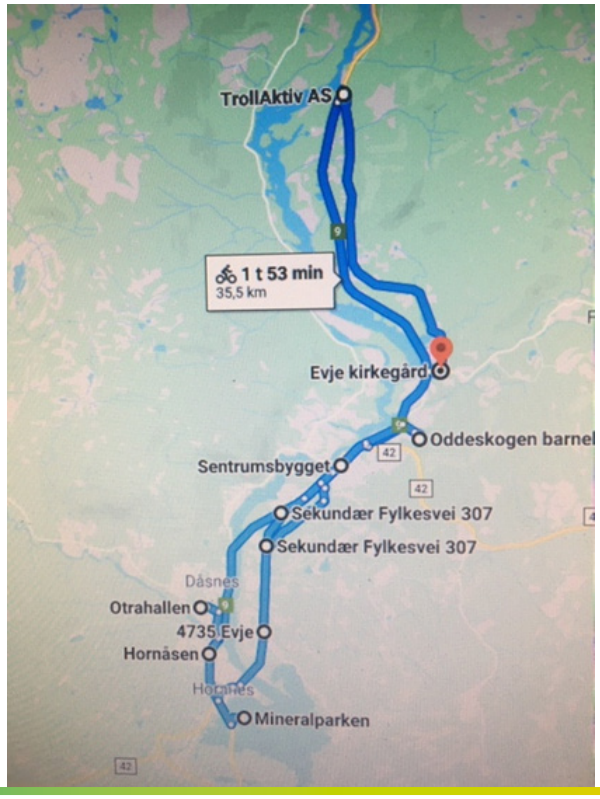


FIGURE 3. Overview of the area covered by the pilot case with routes.

Public offices are located 3.5 kilometres from the town centre, where there also is a boarding college with students **(FIGURE 3)**. The pilot includes 6–9 charging stations placed close to natural traffic hubs and centres of interest, and 15–20 bikes (to be considered).

The pilot will use the mobile app system developed by one of the regional providers of public transportation. Still, deciding what system one can use is pending the choice of bikes and the setup of bikes and charging stations. The plan is to use an already existing system available, i.e. at public transportation provider Kolumbus in the Stavanger region of Norway. This system will also include a possibility to be integrated with the ticketing system for the public transportation provider in Setesdal. The system used in Stavanger is a system provided by CityBike. Cloud through the company Masterloop AS (Masterloop) the following elements: E-bikes with a mobile communication; Charging stations; Cloud based services with open interfaces; Open mobility interface with ticketing system; Web service portal for support and operation; End-user app.

Financing the system is crucial for the success of the project. The municipalities in Setesdal have already applied for financial support to purchase bikes and equipment through the “Grants for climate adaptation in municipalities and county municipalities” managed by the Norwegian Environment Agency. Further financing is necessary, and this is an important task to be carried out before the project’s physical start-up.

3.1.2. SWOT ANALYSIS

TABLE 2. SWOT E-bikes in Setesdal

STRENGTHS	WEAKNESSES
→ Innovative concept → Increases mobility for different user groups → Sustainable concept → Engage inhabitants → Public health benefits → Existing and well proved system	→ High operation and maintenance cost → Risk of introduction failure → Vulnerable for vandalism → Depending on connectivity → Dependant on supplier → Depending on a change in mentality in different user groups
OPPORTUNITIES	**THREATS**
→ Expanding system to other regions → The market advantage for tourism businesses	→ Lack of financing → Market failure

3.1.3. THE TARGET GROUP OF USERS

Different stakeholders and partners are involved in this project in different ways.

The four municipalities in Setesdal are involved as owners of the project and meet regularly to develop the project and evaluate progress. They also are responsible for the applications sent to Klimasats (**APPENDIX 1, 2, AND 3**), an arrangement for developing sustainability in different Norwegian regions. The four municipalities will also be crucial in new applications for funds. Through the planning department in each municipality, we aim to secure charging stations' placement and plan to increase the network of biking trails and ensure the dialogue with inhabitants. The inhabitants in Setesdal have been asked about different aspects of mobility, including biking trails and the possibility of introducing a scheme including e-bikes. The result of the survey is expected to be ready by the end of August 2020.

Midtre Agder Friluftsråd (Board for development of outdoor activities for inhabitants in the region) is, together with the municipalities, working with developing Sykkelrute 3 and is responsible for signage and information for inhabitants and tourists

Other stakeholders that are involved in the project: Agder Fylkeskommune (regional authorities); Visit Setesdal (Destination Management Company); Travel and Tourism businesses; Innovation Norway (governmental body for business development in Norway, also the owner of the brand for Sustainable Destinations in Norway); Agder Kollektiv Transport (AKT) – regional public transportation provider in Agder county; Kolumbus – regional public transportation provider in Stavanger county; Statens Vegvesen (National responsible for road system and owner of Sykkelrute 3).

In different ways, these stakeholders and partners have given important input to this case and will be included in the work. By cooperating with stakeholders and partners in this project, we have identified different user groups in this project. The identified users of the eBSS are residents and tourists. Residents will hopefully use the system for transportation to and from public transportation, as a means to get around within the towns and centres and for recreational purposes.

3.1.4. SURVEY

The survey was conducted in spring 2020 from the 20th of May to the 18th of June. It consisted of 11 main questions accompanied by 43 secondary questions and assessment choices. The survey had three main parts: *i)* what means of transportation are in use today; *ii)* what are the areas of improvement within the current provision; *iii)* what new solutions may work in Setesdal and Åseral.

The survey was translated and adapted based on a Bialystok University of Technology survey in Poland. Some questions and response alternatives concerning means of transport that are non-existent in Setesdal and Åseral were removed, i.e. questions regarding boats, aeroplanes and rail. The survey was compiled by the project management

of Setesdal inter-municipal political council, then worked out by the software (QuestBack) with resource help from Visit Setesdal, which also owns access to this internet-based tool. The survey consisted solely of pre-set reply alternatives. The invitation to participate in the survey was communicated via SMS to all citizens above the age of 15 within Setesdal and Åseral. The SMS invitation contained a link to the survey. Three manual surveys were sent on request.

No private or personal information was collected during the survey, and all replies remain anonymous following the GDPR (General Data Protection Regulation). Information about the ongoing survey was published on the five municipalities' websites and via other municipal communication channels. Furthermore, information about the survey was conveyed in a press announcement and broadcasted in an interview with the NRK Sørlandet Radio project manager. Answers were collected from five different municipals, and the respondent shares varied in terms of population. The municipalities Valle and Bygland had the highest response frequency with replies from 20% of all the inhabitants. Åseral scored the lowest with only 12% of their inhabitants responding. This may produce an imbalanced estimation of the total picture, considering differences in the transportation provision and the municipalities' infrastructure. More responses were collected from women than from men. Setesdal has a larger portion of men (51,6%) than women (48,4%) (Statistisk Sentralbyrå, 2020). The 35–75 age group was also overrepresented compared to the actual age distribution in Setesdal, while the group over 75 was underrepresented. The latter may have been affected by the tool that was applied to collect the answers. Question 7 in the survey concerned whether innovative transport solutions could improve the prospects of mobility in the vicinity. Given the shape of the survey, an issue could be a lack of explanation of what the various innovative solutions entail in terms of use and advantage. That may have produced a larger share of neutral responses, despite possible sources of error that may have affected the survey results, in our view that the survey succeeded in encapsulating the prevailing opinions and views regarding the questions that were raised, and that it constitutes a solid foundation in further analyses, discussion, and conclusion.

Altogether, 1.220 replies were obtained, which is equivalent to 15,5% of the total population of the five municipalities that were able to participate in the survey. The survey results were analysed with assistance opportunities that lie within the web-based tool, among them cross-references and groupings. Preliminary results and analyses were relayed to the Setesdal inter-municipal political council and included in a project description of an el-bike system in Setesdal. The age distribution in the survey is visualised in **FIGURE 4**.

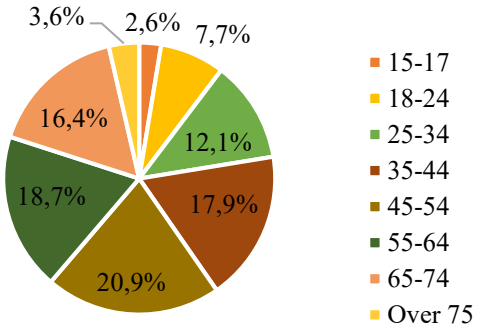


FIGURE 4. 'Age distribution' of respondents in the survey on transport and accessibility in Setesdal and Åseral, summer of 2020. Setesdal Regionråd.

The response distribution provides a similar picture in terms of age distribution in Setesdal, yet, as previously mentioned, an overrepresentation of the age group 35–75 is present. Simultaneously, there is an underrepresentation among those older than 75 (3.6% of the population compared with 8.5% of the population).

The respondents were categorised according to their status in the labour market, and their distribution is seen in **FIGURE 5**.

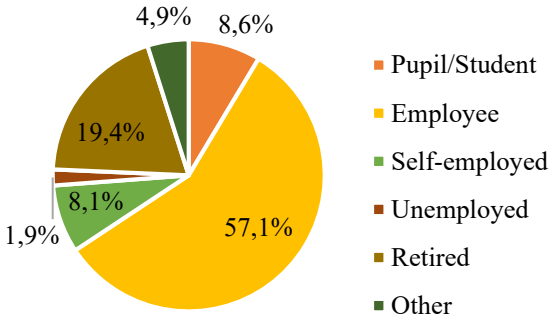


FIGURE 5. 'Status on the labour market' from responses in a survey on transport and accessibility in Setesdal and Åseral, summer of 2020. Setesdal Regionråd

When the respondents were asked what kind of domicile they considered themselves living in, their answers were divided into three categories **(FIGURE 6)**.

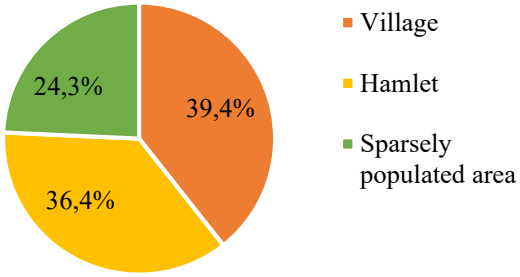


FIGURE 6. 'Type of domicile' in the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd.

Compared to SSB numbers (Statistisk Sentralbyrå, 2020), 45% of the inhabitants of the Setesdal and Åseral municipalities reside in densely populated areas, and the responses distributed in three categories do roughly equal the actual settlement pattern within the region.

In questions 3 and 4, the respondents were asked what transport means they use, and how often they use these, and for what purpose. The distribution of daily use of various means of transport for the whole region is shown in **FIGURE 7**.

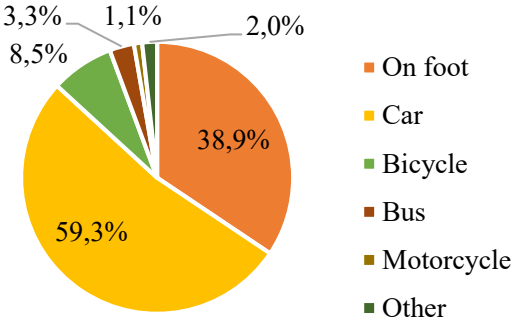


FIGURE 7. 'Daily means of transport' from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

Car is the most prevalent means of transport among the Setesdal inhabitants. 59.3% of the inhabitants say they avail themselves of the car daily, and, further, 28.2% use the car several times a week **(FIGURE 8)**. Most of people use car either daily or several times a week. Those who reply that they never use a car, or do so less than once a month, make up 4.5% of the population. If we look at car use in terms of status on the labour market, age, and sex, a male employee in Åseral appear to be the most frequent car driver. Car is most frequently used for all travel purposes, both regarding time spent and purpose.

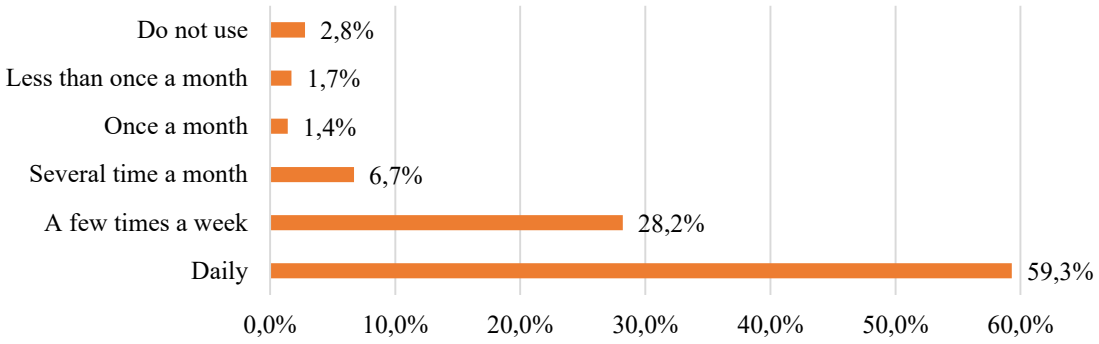


FIGURE 8. 'Use of car' from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

The daily use of cars increases concerning the degree of a sparsely populated area where the respondent resides **(TABLE 3)**.

TABLE 3. 'Use of car and types of domicile' from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

	TOTAL	VILLAGE	HAMLET	SPARSELY POPULATED AREA
Daily	59.3%	54.1%	61.5%	65.5%
A few times a week	28.2%	28.2%	29.0%	26.2%
Several time a month	6.7%	9.2%	5.1%	5.2%
Once a month	1.4%	2.1%	1.2%	0.7%
Less than once a month	1.7%	3.0%	1.2%	0.3%
Do not use	2.8%	3.4%	2.1%	2.1%
Number of responses	1200	468	431	290

The inhabitants' feet were the means of transport that were second most frequently used in the survey. 38.9% of the respondents say they make avail of their feet as daily means of transport **(FIGURE 9)**, and that it occurs most frequently on travels that last less than half an hour, and when visiting family and doing their shopping. There are relatively significant differences between the municipalities, represented by the disparities of Åseral and Bykle. In Bykle, 74.2% of the inhabitants say they travel on foot daily or several times a week, while 56.6% of the inhabitants of Åseral give a similar reply. The youngest spends most time travelling on foot (53.1% in the age group 15–17) while the retired spend the least (28.6%).

Bicycle is the third most preferred means of transport in Setesdal **(FIGURE 10)**, and 30.5% of the respondents answer that they cycle daily or several times a week. There is a tendency towards most cyclists being female, while more women say they never bike

(never bike: 23.1% men, 32% women). Evje and Hornnes is the municipality in which most people respond that they cycle daily or several times a week (34.5%). Åseral is where fewest people cycle daily or several times a week.

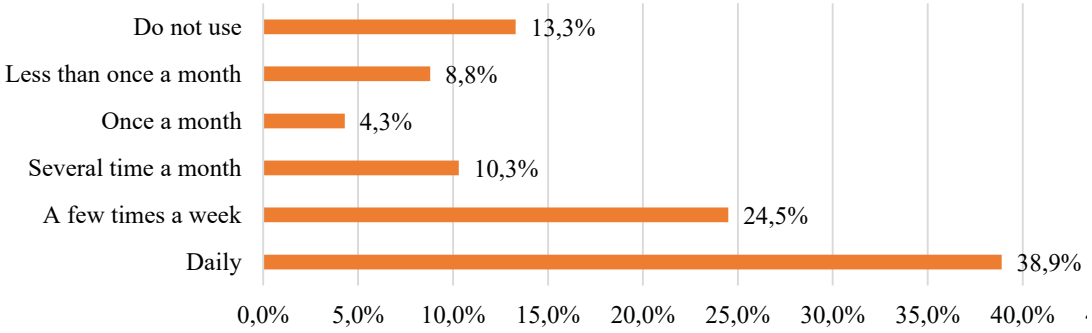


FIGURE 9. 'Transport on foot' from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

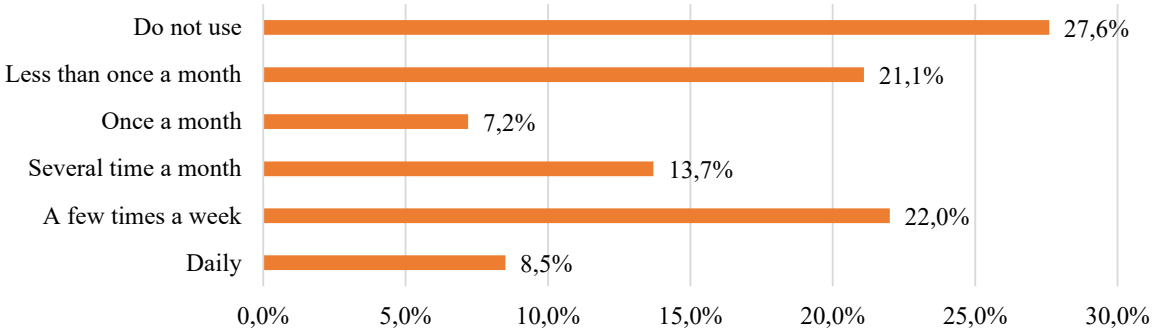


FIGURE 10. 'Use of bike' from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

The bus is the fourth most availed means of transport in Setesdal and remains the only accessible public means of transport. 7.9% of the respondents answer that they use the bus daily or several times a week.

The age group, 15–17 sticks out by that 56.3% of them, respond that they use the bus daily or several times a week **(TABLE 4)**. No exceptions or specifications regarding school bus driving were made, and we must assume that the high response rate is following this. The next group using bus most often is the age group 18–24 (16.3%), and, subsequently, the rate is declining with higher age. In reply to the question, if they never or rarely use a bus, those from the age 25 and upwards confirm most frequently.

Evje and Hornnes is the municipality with the highest bussing rates, where 11% reply that they use bus daily or several times a week. In contrast, the municipality with the lowest bus use is Bykle, with 3,1% of the inhabitants using bus daily or several times a week. To the degree that the bus is used, it is usually reserved for extended tours, and family visits are the most quoted purpose.

The use of bus declines in correspondence to where the respondents live **(TABLE 5)**.

Those who live in the most sparsely populated areas use the bus the least.

In response to the alternatives motorbike/moped, taxi, and other means of transport, they indicated such an infrequent use that they hardly comprise proper material for any analysis. However, taxi as a means of transport will be discussed and conclusions drawn from it.

Question 5 concerned whether the respondents were happy or not with six different factors related to public transport. The response alternatives were content, somewhat content, neither, somewhat discontent nor very discontent. **TABLE 6** shows that the factors causing the most dissatisfaction are indicated with the colour red, while the factors receiving the most positive answers are marked with green. The survey reveals

that the respondents from Evje and Hornnes were remarkably more content than the other municipalities' inhabitants regarding accessibility and public transport departures. If the respondents belonging to Evje and Hornnes were excluded, 56.3% would be somewhat, or very discontent with accessibility to public transport, and 66.8% would say they are somewhat or very discontent with departures' frequency on public transport.

TABLE 4. "Use of bus and age" from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd.

		AGE								
	Total	Under 15	15–17	18–24	25–34	35–44	45–54	55–64	65–74	Over 75
Daily	3.3%	0.0%	18.8%	9.8%	4.2%	0.5%	3.0%	1.5%	1.7%	0.0%
A few times a week	4.6%	100.0%	37.5%	6.5%	2.8%	4.0%	3.0%	3.6%	2.8%	2.9%
Several time a month	6.7%	0.0%	15.6%	17.4%	4.2%	2.5%	7.0%	3.6%	6.8%	20.0%
Once a month	5.8%	0.0%	3.1%	9.8%	4.9%	4.5%	2.2%	7.2%	8.5%	11.4%
Less than once a month	42.1%	0.0%	18.8%	27.2%	38.0%	41.9%	43.0%	49.2%	46.9%	54.3%
Do not use	37.5%	0.0%	6.3%	29.3%	45.8%	46.5%	41.7%	34.9%	33.3%	11.4%
Number of responses	1106	1	32	92	142	198	230	195	177	35

TABLE 5. "Use of bus and settlement" from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

	TOTAL	VILLAGE	HAMLET	SPARSELY POPULATED AREA
Daily	3.3%	4.3%	2.3%	2.7%
A few times a week	4.6%	5.9%	3.3%	3.8%
Several time a month	6.7%	7.7%	6.6%	5.0%
Once a month	5.8%	7.9%	5.1%	3.4%
Less than once a month	42.1%	42.8%	41.4%	43.1%
Do not use	37.5%	31.5%	41.2%	42.0%
Number of responses	1106	444	391	262

TABLE 6. "Rating content/discontent with public transport"„ from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020; Setesdal Regionråd

QUESTION	VERY OR SOMEWHAT CONTENT	SOMEWHAT OR VERY DISCONTENT
Access to public transport	26.9%	44.7%
Number of departures	22.7%	53.0%
Fares on public transport	30.6%	26.6%
Information on public transport	37.3%	22.6%
Safety on public transport	59.3%	4.0%
Accessibility for the disabled on public transport	19.1%	15.6%

Question 6 requested the rankings of possible improvements of the existing mobility offer from the respondents, graded from Absolutely Necessary, Somewhat Necessary, Neither, Somewhat Unnecessary, and Absolutely Unnecessary. Three items were viewed by more than 60% of the respondents as absolutely or somewhat necessary **(TABLE 7)**. The answer which most people considered having the potential for improvement, was an increase in bus departures. This item was also viewed as necessary to change by the fewest. Improvement of roads and cycle roads were the next two items that the respondents believed needed the most necessary improvements. The item that did not require improvement was the punctuality of public transport. Question 5 inquired into how content the respondent was with public transport fares. The answer to this question was that the respondents were neither content nor discontent. Question 6 grappled with the necessity of reducing public transport fares, and to this, the answers mostly tended towards somewhat or absolutely necessary. The call for fare reduction is most robust in the municipalities in which most use of bus occurs.

TABLE 7. "Necessary/ unnecessary to make improvements" from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020 (Summary survey inhabitants)

QUESTION	ABSOLUTELY OF SOMEWHAT NECESSARY	SOMEWHAT OR ABSOLUTELY UNNECESSARY
Road improvement	63.9%	12.6%
Safety improvement	43.0%	14.3%
Reduction of fares on public transport	43.2%	12.1%
Increase of departures	66.9%	5.5%
Quality improvement of bus stops	30.1%	23.6%
Improvement of bus quality	36.9%	13.6%
Increase the number of bus stops	19.8%	30.2%
Improvement of information on bus transport	42.9%	17.4%
Improvement of punctuality on bus transport	14.0%	29.5%

QUESTION	ABSOLUTELY OF SOMEWHAT NECESSARY	SOMEWHAT OR ABSOLUTELY UNNECESSARY
Improvement of accessibility for the disabled	29.6%	7.2%
Increase the number of cycle paths	60.3%	14.9%
Increase the number of bicycle parking lots	31.7%	26.9%
Increase the number of car parking lots	29.0%	32.7%

There are rather significant disparities from municipality to municipality regarding demands to increase the number of cycle roads. In Åseral municipality the portion of respondents seeing this as absolutely or somewhat necessary is 48.6%, while in Bykle municipality have 67.1% of them, and in Valle municipality, there are 66.5%. Those who use the bicycle most frequently believe a strong need to increase the number of cycle roads **(TABLE 8)**.

In reply to the question as to whether improving the roads is necessary, Åseral distinguishes itself from the other municipalities in the survey. 81.6% responds that it is absolutely necessary or somewhat necessary to improve the roads. Simultaneously, the other municipalities diverged no more than 2.9 points from the average response based on all the respondents, 63.9%.

Whether bus punctuality improvement is necessary, the respondents say that the least improvement is required, and 29.5% say that it is somewhat or absolutely unnecessary.

Question 7 asked the respondents to assess whether innovative solutions would improve their locomotion chances in their vicinity. The various solutions were explained in a relatively straightforward manner. This may explain why a large portion of the responses (37.3%) was "Hard to say". More replied that the suggested solutions would fail to produce improvement in total (35,1%) than those who believed that the suggested solutions probably would induce improvement.

The suggestion that most of the respondents explicitly say will cause improvement is related transport services with single tickets (45,2% explicitly expects excellent improvements, and 23% presume little or no improvement) **(TABLE 9)**.

TABLE 8. "Use of bike and the necessity of more cycle roads" from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020 (Summary survey inhabitants)

	TOTAL	DAILY	A FEW TIMES A WEEK	SEVERAL TIMES A MONTH	ONCE A MONTH	LESS THAN ONCE A MONTH	DO NOT USE
Absolutely necessary	29.7%	42.7%	36.3%	32.2%	20.3%	29.3%	23.9%
Somewhat necessary	30.6%	27.0%	32.1%	34.2%	36.7%	27.5%	29.4%
Neither nor	24.8%	21.3%	18.4%	24.8%	30.4%	27.9%	26.0%
Somewhat unnecessary	9.3%	6.7%	9.4%	6.7%	11.4%	8.7%	10.4%
Absolutely unnecessary	5.6%	2.2%	3.8%	2.0%	1.3%	6.6%	10.4%
Number of responses	1178	89	234	149	79	229	289

TABLE 9. "Improvement/ non-improvement of possible future solutions" from the survey on transport and accessibility in Setesdal and Åseral. summer of 2020 (Summary survey inhabitants)

QUESTION	NONE OR INSIGNIFICANT IMPROVEMENT	SIGNIFICANT OR GREAT IMPROVEMENT
A local system for bike-sharing handled via a cell phone app (and improved cycle paths/roads)	41.4%	20.3%
A local system to share e-cars (bases with charging stations) operated with the cell phone	40.9%	20.8%
A local system for e-bike sharing operated with the mobile phone (pick-up stations and improved cycle paths)	39.1%	23.9%
A local system for carpooling operated with the cell phone	39.6%	21.9%
A local system that connects the sharing process of individual means of transport (bike, e-bike, e-car, carpooling) to public transport	34.5%	23.3%
A "bus on reques" service	27.1%	38.0%
Corresponding transport services (single ticket/fare)	23.0%	45.2%

To the question "bus on request", 38% answer that it will create clear or significant improvement, while 27,1% say it will give little or no improvement. Those who avail themselves of a bus the least, most frequently answer that it is hard to say **(TABLE 10)**.

The third highest ranked solution expected to prompt improvement was an el-bike system managed via the cell phone. 23.9% say that it would induce an exact or very significant improvement. Analogously do 39.1% answer that it would provide little or no improvement.

3.1.5. EVALUATION AND TESTING

Car is the absolute prevalent means of transportation in Setesdal and Åseral. Only 2,8% of the respondents say they do not use the car at all, and most of those are found in densely populated areas. The use of a car is widespread compared to all other travel modes, and time spent. Over the last ten years, the number of passenger cars in Setesdal has increased by 13% (Car fleet in Norway, 2020). The growth was most considerable in Åseral (26%) and lesser in Bykle (1%). Setesdal and Åseral have a car population density per inhabitant equivalent to 0,56, while 0,5 for the rest of the country. The fleet of cars in Setesdal and Åseral distinguishes itself from the rest of the country by containing significantly fewer electric cars in our region, 2.7% of the fleet of cars is made up of electric cars. In comparison, the national average is 9%.

TABLE 10. "Improvements with a bus on request regarding the use of bus" from the survey on transport and accessibility in Setesdal and Åseral, summer of 2020 (Summary survey inhabitants)

	TOTAL	DAILY	A FEW TIMES A WEEK	SEVERAL TIMES A MONTH	ONCE A MONTH	LESS THAN ONCE A MONTH	DO NOT USE
No improvement	12.6%	31.3%	17.0%	9.2%	8.3%	9.2%	14.3%
Little improvement	14.5%	18.8%	14.9%	16.9%	8.3%	16.6%	14.1%
Significant improvement	21.9%	28.1%	19.1%	21.5%	18.3%	23.8%	19.8%

	TOTAL	DAILY	A FEW TIMES A WEEK	SEVERAL TIMES A MONTH	ONCE A MONTH	LESS THAN ONCE A MONTH	DO NOT USE
Very great improvement	16.1%	6.3%	23.4%	26.2%	13.3%	17.0%	13.8%
Hard to say	34.9%	15.6%	25.5%	26.2%	51.7%	33.4%	37.9%
Number of responses	1142	32	47	65	60	446	398

The most extensive car use is connected to settlement and access to public transport. They who live most scattered, use the car the most and have the narrowest access to a slim public transport provision. A significant increase in car traffic is manifest during recent years. In the traffic census station of Norwegian Public Road Administration (NPRA) by Classified Road 9 (RV9 S11D1 m5105) (Statistics road count Bygland, 2020) an increase of 32% was registered from 2014 to 2019. Several factors, among them, cause the increase:

- More leisure homes in Setesdal (increase by 7% in 2014–2019); (Increase in holiday homes in Setesdal) and a general increase in the use of leisure homes, from 54 to 77 nights spent annually; (Survey holiday homes Midt-Gudbrandsdal)
- The increased amount of driving among the inhabitants.
- Road conditions are improved.
- The decline in bus transport.

The increased use of cars in Setesdal causes elevated greenhouse emissions levels and runs counter to the various municipal councils' climate and environmental politics. Transport extending over more extensive areas is likely to increase, though the effort to reduce shorter car rides and replace it with alternative transport opportunities is present. A local bus on request service is an alternative that many respondents view as a definite improvement of transport within the region.

Many in Setesdal and Åseral rely on foot or bike as means of transport, particularly for stretches that last less than one hour. The respondents wish more bike roads were available, and point to an el-bike system to improve the existing transport alternatives. There are significant variations between the five different municipals included in the survey. Evje and Hornnes have the highest degree of cycling, while the inhabitants of Bykle most frequently turn to their own feet as a mode of transportation. This may be related to topography, demography, and climate. Evje and Hornnes are predominantly flat in the landscape, a more defined centre, and fewer days with snow and ice than the other municipals. Both Evje and Hornnes and Bykle have more inhabitants who live in densely populated areas (Summary survey inhabitants) and more efficiently can reach various activities and tasks on foot or with a bike. The hamlets of both Evje and Hornnes and Bykle are situated near the newly upgraded Classified Road 9.

Bykle municipality has accommodated a vastly extended network of walking and cycling paths compared to the other municipalities **(TABLE 11)**. This might be a decisive factor regarding the fact that 74,2% of the Bykle inhabitants walking daily or several times a week as a means of transport.

TABLE 11. Kilometres of walking and cycling paths in Åseral and the Setesdal municipalities. (Number of cycling and walking paths in the municipalities)

	NUMBER OF WALKING AND CYCLING PATHS	METERS PER INHABITANT	METER PER KILOMETRE PUBLIC ROAD
Evje og Hornnes	11	3.03	55
Åseral	1	1.06	7
Bygland	2	1.66	13
Valle	4	3.27	28
Bykle	20	20.88	204
Totalt	38	5.98	61,4

Åseral is the municipal with the least use of bicycle and the least use of feet as a means of transport. The municipal has a more scattered settlement pattern and inferior road standards than the other municipalities. This is evident also when the respondents were asked whether road improvements are required, and 81.6% believed that it was absolutely or somewhat necessary.

A bus is relatively infrequently used as means of transport in Setesdal and Åseral. Evje and Hornnes are the municipalities with the highest use of bus transport. One apparent reason for this is significantly more departures from Evje bus station than any other bus stops in Setesdal (Routeinformation AKT). The selection of destinations is more varied, too. Evje and Hornnes have considerably more inhabitants than the other municipals and are geographically situated nearer to the larger town Kristiansand. This allows students and commuters to use a bus as an alternative transport more easily.

Taxi is a lesser used means of transport compared to the answers of the respondents. This may be explained by the fact that there are very few taxis available in Setesdal (6 permissions on the whole), and that an outstretched valley makes it expensive to use a cab. There is a higher density of cars in Setesdal and Åseral than the average in Norway, and it may also keep the taxi market small. On the 1st of November 2020, the taxi permission rules were altered, allowing for an easier move into the taxi business. In Setesdal and Åseral, it is still uncertain how the effects of such change will unfold since small municipals with few taxi companies still maintain the right to offer monopoly, due to contracts that involve emergency transport.

Following an offer where e-bikes serve as an extension of the public transportation service, the provider of these services will benefit from this project regarding reduced costs and improved service offers followed by higher customer ratings.

This system can cover: transportation within the town centre; to/from bus stops to housing areas, to/from the bus stop and town centre to the town hall; to/from the bus stop to college; to/from the town centre to touristic activities; between touristic activities. Also, it can be used for leisure and recreational purposes.

The tourism businesses will also benefit from this project by offering a better service on public transportation, increased transportability within the destination, and a particular offer where the e-bikes are used for recreational activities such as visiting sites or using trials for trips in wild nature.

The task was to establish a pilot case testing out a solution for e-bikes in the region. Following this, our long term goal is to plan and design an integrated system for e-bikes for inhabitants and tourists in the entire valley. This system is planned to cooperate with local councils, residents, and partners from the tourist businesses. The long term goal includes Sykkelrute 3 in our region, a biking route from Kristiansand to Kristiansund and about 1,000 km long. The part in Setesdal is 210 km long. The full project is planned in 5 steps:

Step 1: Describe pilot projects, establish and send out tender and preparations for future financing;
Step 2: Executing of pilot described in step 1 in one (or several) of the municipalities in Setesdal (includes 20 bikes). Establish routines for operation and maintenance;
Step 3: Evaluating Step 2 and further development and securing and expanding system (increasing system with 20 bikes);
Step 4: Expand the tested project to all municipalities and villages in Setesdal and establish a network of bikes and charging stations following Sykkelrute 3 (national biking route partly established in Setesdal) Increase system with 40 + bikes and adequate number of charging, evaluation;
Step 5: Secure operation and maintenance, develop and expand if needed, evaluation.

Benefits we see come out of this project are:

- Social, by increasing mobility for inhabitants and tourist
- Environmental, by more climate friendly use of transportation
- Improved health and fitness by increasing the use of e-bikes
- New offers for travel and tourism businesses

To test the viability of this plan, we will first do a pilot. The pilot will take place in one of the centres in the valley and consist of bikes, charging stations, logistic plans, and intelligent digital solutions to manage the bikes' whereabouts and technical conditions. We will also monitor the user's behaviour and movement patterns to create an efficient and user-oriented product.

During the process and after start-up, we will monitor and evaluate the pilot and full project according to the activity plan and the success of the services we aim to provide. This evaluation will be the foundation for further execution/development of the plan.

3.1.6. INTRODUCTION OF THE CASE STUDY (LATVIA)

Currently, in Vidzeme Planning Region there are two public transport modes: bus and train. In some larger cities, taxi services are available. However, most people use a bus service for their journeys. New transport on-demand solution was piloted in two municipalities while implementing the MAMBA project. Residents were provided with the opportunity to use the passenger transport service by announcing the desired time and destination 24 hours in advance. The service was designed as a complementary service to regular public transport and was available when the public bus was not running. Latvian Ministry of Transportation has plans to make some rural bus routes free of charge. There is no government-owned enterprise that provides bicycles, car rental, and car sharing services in Vidzeme Planning Region. These services are available and are provided by private companies. Bicycles are usually rented out by companies that provide tourism services or by bike shops. Rent services are available only in the largest cities; most of the population does not have such an opportunity. The current transportation system is designed, considering only residents as the main end-users. As a result, national and foreign tourists find it difficult to use this system and prefer using privately owned vehicles.

There are no legal limitations for developing and operating an eBSS by private companies or in a Private-Public partnership. If public bodies would create such services, they should avoid distortion of competition in theory, but there is nothing to distort as there is currently no competition.

3.1.7. SWOT ANALYSIS

Two scenarios are under investigation. Scenario 1 – private development of bike and eBSS. *Strengths* – more options to source financing for such a project. More sustainable business plan. *Weaknesses* – may not happen because private businesses, even in larger

cities, have not followed similar opportunities. The target group is most likely not big enough, or service users will choose other solutions instead of e-bike. *Opportunities* – a system developed by a private company can change and adapt more rapidly to follow the trends and needs of clients. *Threats* – such a system will be for-profit only so less populated or more remote communities most likely will not have access. Also, there is no guarantee for such a system; it could disappear after one or two years.

Scenario 2 – development of bike and eBSS in private-public partnership. *Strengths* – potential to attract EU financing or government grant for improving mobility. A better understanding of city planning and places where dock stations should be located. More aligned with cities long term development goals. *Weaknesses* – slower adaptation to changes, less ambitious, more bureaucratic restrictions. *Opportunities* – option to copy this solution to neighbouring cities or municipalities if they are interested and have resources for implementation. Collaboration with private companies could make the system more profitable, more result-oriented. *Threats* – lower profitability, the potential that residents do not approve such investment in taxpayer money, and other more urgent priorities.

3.1.8. THE TARGET GROUP OF USERS

Different stakeholder groups were defined during project implementation. The first group is residents who need or want to use a service instead of walking or cycling using a regular bicycle. The second group is national and foreign tourists who wish to visit many attractions with a significant distance between them (in Vidzeme many natural sightseeing objects and cultural heritage objects fall in this category). The third group, are cyclists who want to travel longer distances with less physical effort, especially in areas with pronounced terrain (or as it is in Vidzeme – with challenging gravel roads combined with inclines). Fourth group, curious locals, and visitors who want to test e-bikes as a new transport mode, when the ride is the main aim, not the destination.

Cēsis and Valmiera do not have SUMPs. In local and regional planning documents piloting of e-bikes has not been specified. Planning documents have general visions for more sustainable mobility which includes more walking and cycling. The tourism development perspective aims to expand and improve tourism product offers and emphasise active tourism.

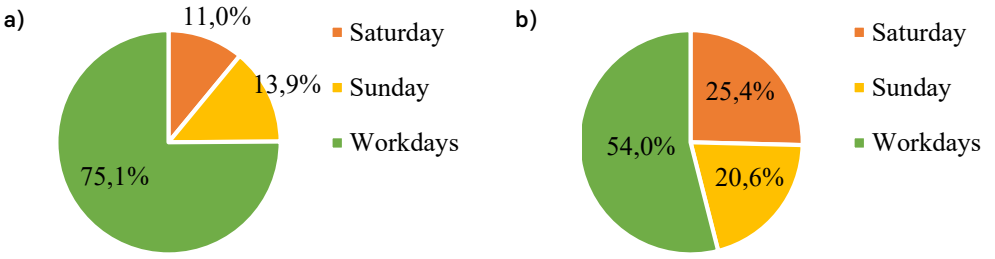
3.1.9. PILOT CASE

eBSS for tourists and residents was provided as a pilot in two locations (municipalities) in the Vidzeme Planning Region (population 189 thousand, almost half of whom live in rural areas). Selected locations have a population of 23,000 and 15,000, respectively.

Each pilot location consisted of 5 E-bikes, an outdoor stand for them, and a trained service representative who could instruct and assist service users who took an e-bike for a ride (free of charge). A big emphasis was put on user feedback to be latter used if there is a chance for long term implementation of the system in the future. The pilot duration was 15 consecutive days in each of 2 locations with an operational time of 8 hours each day. The pilot took place during the second half of August.

Feedback from e-bike users was received during their participation in the pilot. During registration to take e-bike users filled registration form. This form consisted of contact information, age, place of residence, user employment status, information about kids under 12 years who will join them on a ride, planned route. Service usage by weekdays is presented in **FIGURE 11**. In different areas results vary, in Valmiera service was popular during working days; however, in Cēsis almost half of the cases were on the weekend.

FIGURE 11. Servise usage by day of the week: a) Valmiera; b) Cēsis



Analysing the time when service was used, it can be seen **(FIGURE 12)** that in all the cases majority of cases electric bicycles were used in the afternoon. Gender distribution can be seen in **FIGURE 13**; other data **FIGURE 14 AND 15**.

FIGURE 12. The time when the service was used: a) Valmiera; b) Cēsis

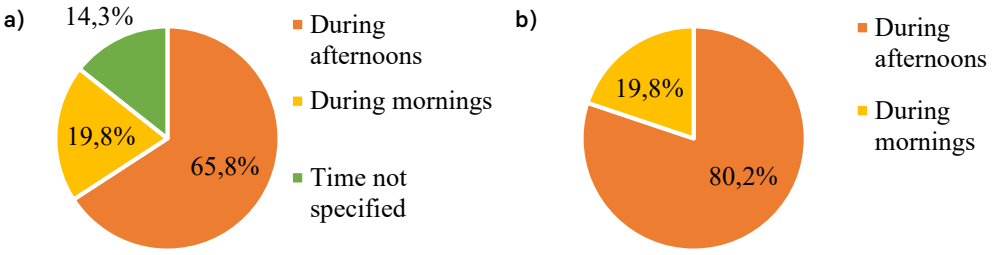


FIGURE 13. Gender distribution: a) Valmiera; b) Cēsis

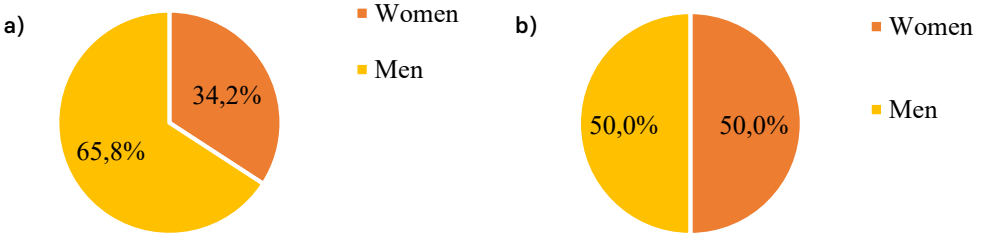


FIGURE 14. Status on the labour market: a) Valmiera; b) Cēsis

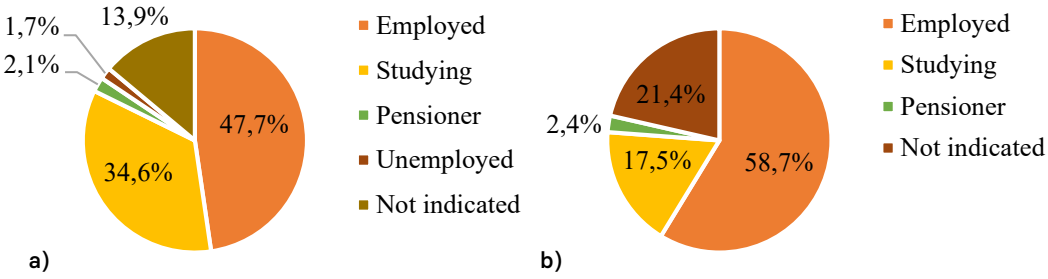
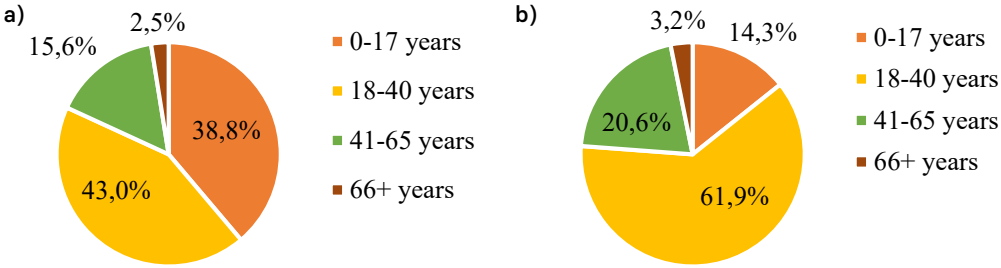


FIGURE 15. Age group: a) Valmiera; b) Cēsis



3.1.10. EVALUATION AND TESTING

After the ride users filled feedback form (237 in Valmiera and 126 in Cēsis), the survey combined 11 questions (see **ANNEX A**).

The first question was if the service user enjoyed the ride on an electric bike? We were expecting, Yes, or No answer. List of the questions:

1) How a large group of people went on a trip?
2) What was the length of the trip (km) and/or the duration (h)?
3) Did you experience any difficulties during the trip due to the use of an electric bicycle?
4) Have you used an electric bike before? (Yes / No)
5) What was it used for in the past?
6) Do you own an electric bike?
7) Why haven't you bought an electric bike?
8) If you were to name the benefits of using an electric bike, what would you name?
9) Do you ever want to go on an electric bike trip again?
10) If you do not yet have an electric bicycle, but would have the opportunity to buy one, would you do so to use it for everyday travel?

Summarising, people who marked that they experienced difficulties during the trip due to electric bicycle use mentioned factory speed limitation, battery discharge, technical issues, bicycle size and manoeuvring, and road conditions.

As answers to the question "If you were to name the benefits of using an electric bike, what would you name?" people mostly named speed benefits and ease of use.

From an organisational perspective, a pilot in both locations was well carried out. This pilot could be considered a marketing and dissemination activity that freely provided people with options to test e-bicycles. If the e-bicycle sharing system were implemented, there would have to be many organisational and technical differences to make the system more user friendly, less costly, and maintenance-free (relatively).

3.2. Case 4 Electric cars and bikes sharing between strategic points in Hajnowka

3.2.1. INTRODUCTION OF CASE STUDY

The border location of Hajnowka makes it a remote county from communication routes connecting the main centres of the country. The basic transport infrastructure of the county comprises National Road No. 66. That transits through the area of the county connecting the National Road No. 19, which is a basic national road for eastern Poland, with the road border crossing with Belarus (Polowce – Pieszczatka) and four voivodship roads (No. 685, 687, 693 and 689) with a total length of 131 km. The road network also comprises county roads (510 km) and municipal roads (427 km).

Hajnowka Region is characterized by a low percentage of the density of county and municipal roads. The length of hardened surfaces is 39.5 km per 1 km². This is much less compared to analogous indices for Podlaskie Voivodship (65.1 km per 1 km²) and Poland (94.1 km per 1 km²). The low density of roads in Hajnowka Region results mainly from the large area of forest complexes (50.6%) and low population density, which is 27 people per 1 km² compared to 124 people per 1 km² in Poland (US 2019, CSO (Central Statistical Office of Poland) 2019). Under these conditions, the public transport organisation is quite a challenge, primarily since the county is inhabited by approx. 150,000 inhabitants in 244 localities, 21,000 of which live in Hajnowka **(FIGURE 16)**.

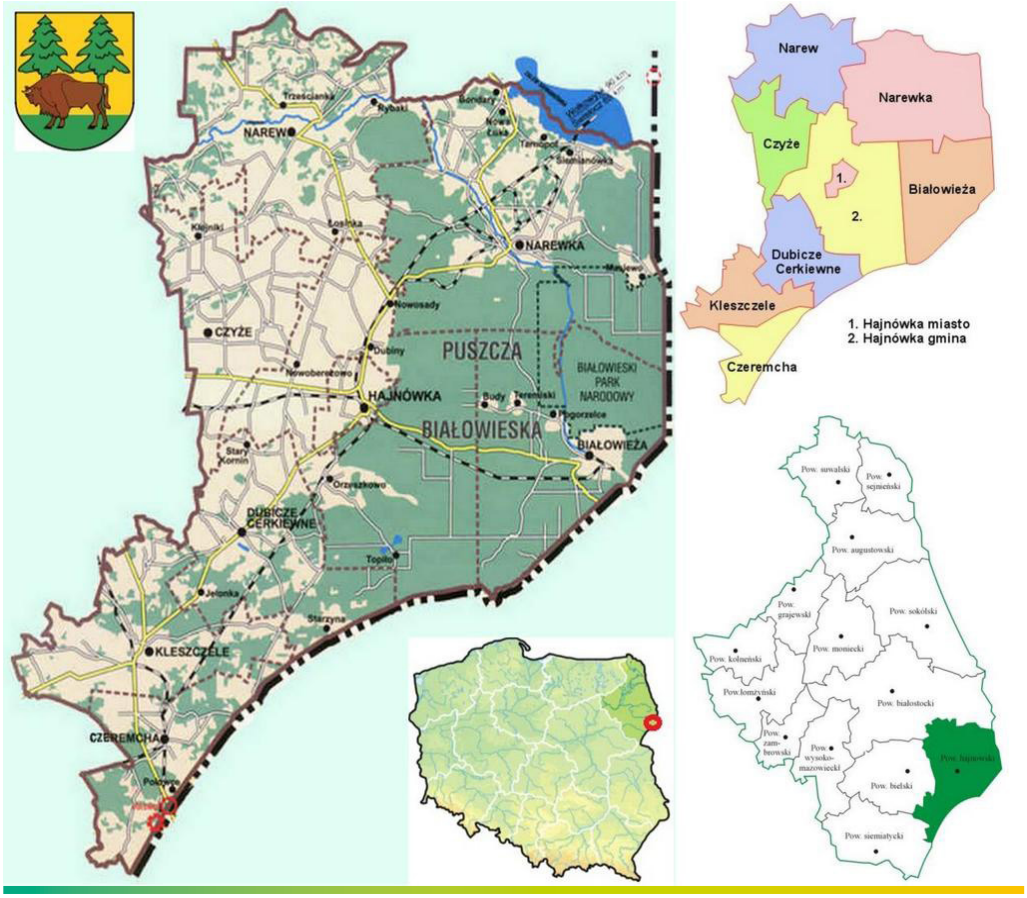


FIGURE 16. Hajnowka region

The following railway lines supplement the transport infrastructure: No. 31 Hajnowka-Siedlce; No. 31 currently modernized on the Voivodship border – Czeremcha-Hajnowka; No. 52 currently modernized on Hajnowka-Lewki section; No. 59 currently modernized on State border – Chryzanów section.

The nearest airport is in Warsaw, about 220 km from Hajnowka. The international bus station is located in Bialystok (80 km). Connections are made to the Baltic States (Lithuania, Latvia, Estonia) and Western Europe (Germany, France, the Netherlands).

Four road transport companies (including three private ones) currently provide transport services in the rural area. Two of them provide connections with the voivodship city; the other two provide mainly local connections. However, there are large disparities in the frequency of buses on particular routes. Most bus connections are provided on working days, or only on school days. Such an organisation of services means that part of the town is deprived of public transport on weekends and the remaining days during school days. There are even localities where public transport is not provided at all. This is the most significant shortage of public road transport in the county.

Bicycle paths are an alternative to motorised transport in rural areas. They connect the commune seats and lead to places attractive for tourists. On Hajnowka county's territory, there are 14 bicycle paths with a length of over 500 km. Four of them have a loop route, one, 58 km long, runs in Poland and Belarus using the border crossing for pedestrians and cyclists in Bialowieza.

The ongoing reconstruction of voivodeship road will increase the potential of bicycle touring No. 685, connecting Hajnowka with Bialystok. The investment involves the construction of bicycle paths running parallel to the road lane. Works on the construction of a bicycle path on the Hajnowka–Bialowieza route are also underway. Currently, bicycle paths are used mainly for tourist purposes, but they can also be adapted for residents' everyday use.

The innovation proposed in the case study comprises electric cars and electric bikes as a sharing solution supplementing and integrating available means of transportation: conventional cars, coaches, buses and minibuses, and trains **(FIGURE 17)**. The Hajnowka Region selected for implementing this concept includes rural areas in Bialowieza Forest, designated by UNESCO as a World Heritage site. It is one of the key regions considered as "green lungs" of Poland, consisting of several primaeval forests remnants. Many species of plants and animals present in Bialowieza Forest can be identified only in few places worldwide. Bialowieza Forest is a habitat of the largest free-living population of European bison in the world. The residents and tourists transport is characterized by dispersion of communication routes and a need for careful protection of the environment. The region comprises rural areas where means of transport are not sufficiently developed; however, the demand for moving around these specially protected areas is significant. Therefore, transport should be organized to minimise the environment's impact, but the demand for transport services is satisfied. Since electric vehicles provide a substitute for traditional transport offering less noise and emissions, implementing this kind of transport in a sparsely populated, environmentally precious and tourism-oriented area is substantiated. The proposed solution is also in line with the EU policy of increasing means of electric mobility.

The pilot case (innovation) idea embraces a transportation system with a rental of e-cars and e-bikes available by registering in the application designed for this purpose and using a special card. The e-cars and e-bikes pick-up/delivery zones would be located in the points traversing different communication routes and serving as links in the intermodal passenger transportation network, near bus and train stations and often used routes, enabling the seamless continuation of transportation. An efficient charging infrastructure would facilitate tourists, in particular, to move further inland to explore the remote areas of the region. Especially e-bikes provide an excellent means of transportation into the Bialowieza Forest. Each pick-up/delivery zone would be equipped with a charging station. The charging stations would also be distributed among the routes enabling charging an e-car or e-bike when necessary. The optimal distribution of the charging station and pick-up and delivery zones has to be designed. A user-friendly application would be used to book an e-car or e-bike, and a rental code would be sent to a user on a smartphone. E-cars rental would require the usage of a card and a select box serving for picking-up an e-car would be located in the pick-up/delivery zone.

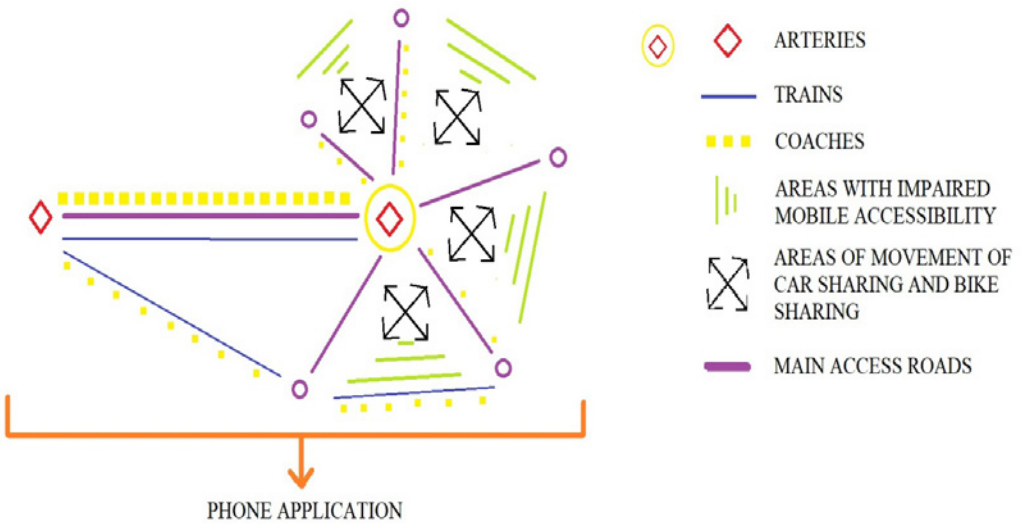


FIGURE 17. The idea of the e-car and e-bike sharing innovation system

Performing a feasibility study in the Hajnowka Region following aspects need to be taken into account:

1) Research of the demand for such mobility solutions;
2) Verification of the feasibility of provision of e-cars and e-bikes;
3) Verification of the possibility to build an intelligent structure of electric energy charging in the rural area;
4) Analysis of bicycle routes, e-bike traffic, should be separated from other road users;
5) Analysing projects related to rural area mobility;
6) Analysis of the legal provisions of the e-mibility organization.

The proposed innovation can also be applied in other partner countries. The partner regions could adopt mobile devices for the system of e-cars and e-bikes sharing to their needs.

Implementing a mobile application can be treated as an introduction to the design of different solutions to improve mobility model. The application will undoubtedly contribute to the increase in the popularity of the bicycle as a means of transport, which will affect the image of the region as an environmentally friendly place and levelling of white communication spots. In turn, the compatibility of the route network with other forms of transport – will give the routes the status of an alternative means of communication. The application is also an easy tool to update data, which is essential to access information. This app will encourage tourists to use the bicycle as a means of transport, and the demand for bicycle services may contribute to the development of cycling tourism. It can be a stage to expand this mobility model in the future, designed using municipalities and private businesses (in the form of city bikes, electric bikes). It is also an excellent tool for developing and implementing a tourism management system in the Białowieża Forest region. Implementation of the application to improve the region's communication accessibility to solutions that fall within the county self-government's institutional and financial capabilities.

3.2.2. SWOT ANALYSIS

As part of the MARA project, in the short term, the Hajnowka Region will take up actions to increase the promotion of alternative means of transport (e-bike in particular), promote a network of bicycle routes on the Internet and directly at IT spots in the region. A new digital tool will be created, a mobile application supported on smartphones and tablet devices, that will be the first source of information about the region. The mobile application will link the network of routes in the region, promoting bicycle transport. It will be a promotional tool in the development of e-bike for potential investor's interests.

The application's graphical concept should be prepared in the form of a region map with a marked network of routes. The application should contain information about the route, its length, coordinates of bicycle stops. Furthermore, it should be compatible with GPS navigation, which will allow you to select routes freely. To congruence the application with other means of transport, the principle of parity, a departure from thinking about routes only as a form of recreation, the application should contain data coordinates of buses and trains stops available on a given bicycle path along with information about the timetable, routes served and contact to the carrier.

Implementing a mobile application can be treated as an introduction to different solutions to improve the mobility model. The application will undoubtedly contribute to the increase in the popularity of the bicycle as a means of transport, which will affect the image of the region as an environmentally friendly place and the levelling of white communication spots. In turn, the compatibility of the route network with other forms of transport – will give the routes the status of an alternative means of communication. The application is also an easy tool to update data, which is essential for information access. This app will encourage tourists to use the bicycle as a means of transport, and the demand for bicycle services may contribute to the development of cycling

tourism. It can be a stage to expand this mobility model in the future, designed using municipalities and private businesses (in the form of city bikes, electric bikes). It is also an excellent tool for developing and implementing a tourism management system in the Bialowieza Forest region.

TABLE 12. SWOT analysis of the development of e-bikes in the Hajnowka county (Source: Own research)

STRENGTHS	WEAKNESSES
→ The large potential of bicycle routes (over 500 km of bicycle routes, 14 paths); → Compatibility of bicycle routes (the routes connect, connect the seats of the communes of the Hajnowka Region, lead to the most important tourist attractions, as well as places that cannot be reached by other means of transport); → Great tourist attractions of the region (UNESCO site) – bicycle routes lead to the main natural and cultural attractions of the region; → Bialowieza Cross-border Trail running through Poland and Belarus (as a tourist product); → Border crossing for pedestrians and cyclists in Bialowieza; → The Green Velo Eastern Bicycle Trail runs through the region (it is the longest bicycle route in Poland, which runs through 5 provinces in the North-Eastern part of the country); → No air pollutant emissions by e-bikes	→ Insufficient development of bicycle infrastructure (including roofed car parking, self-service bicycle repair stations); → No city bike system; → No tourist base in the form of bicycle rentals in the largest tourist resorts (Hajnowka, Narewka); → No electric vehicle charging stations; → Limitations in the implementation of new infrastructure investments related to the protection regime of this area; → Limited budgets of local governments for the organization of public transport
OPPORTUNITIES	**THREATS**
→ High demand from tourists for environmentally friendly means of transport; → Increasing residents' demand for bicycles related to the low mobility of traditional means of transport; → Reconstruction of the provincial road No. 685 connecting Hajnowka with Bialystok, which also includes the construction of bicycle paths running parallel to the road lane; → Construction of a bicycle path on the Hajnowka-Bialowieza route	→ Limited possibilities of acquiring external sources, funding for infrastructure development; → Insufficient funds transferred from the state budget

TABLE 13. SWOT analysis of the development of e-cars in the Hajnowka county (Source: Own research)

STRENGTHS	WEAKNESSES
→ No air pollutant emissions by e-car in local sense.	→ Low quality of road infrastructure in the region; → No electric car charging stations; → Very high investments of the project implementation; → High costs of recharging batteries at commercial stations; → Lack of institutional possibilities of the poviat self-government to implement this type of project; → Low expenditure of local governments on road maintenance; → Remoteness from the expressway and motorway network; → Lack of funds in the budget of the Hajnowka Region for new investments
OPPORTUNITIES	**THREATS**
→ Increased demand for environmentally friendly means of transport; → Government policy for the development of e-cars (the possibility of pro-ecological subsidies)	→ Limited possibilities of acquiring external sources, funding for infrastructure development; → Insufficient funds transferred from the state budget

3.2.3. THE TARGET GROUP OF USERS

Residents and visitors are the beneficiaries of new mobility solutions. The e-bike system has not functioned in the county self-government's strategic documents and the communes remaining in the area. Work-related to e-bike and e-cars sharing will be an innovative undertaking in the region and may increase the region's attractiveness.

3.2.4. SURVEY

The respondents were asked about which of the following innovative solutions would increase their mobility frequency around the region. The results of the survey of the best innovative mobility solutions are presented in **TABLE 14**. Respondents evaluated the solutions on a 5-point scale.

Analysis of the indications of residents and tourists on innovative solutions that would increase the mobility intensity in the region, it should be noted that the solution which would have the greatest impact is the integration of transport systems (one standard ticket for all means of transport). 79.4% of the tourists that participated in the survey indicated it is significant. The interest of residents is slightly lower, for 59.5% of respondents it was necessary.

Other solutions that may significantly or very significantly contribute to the increase in travelling within the region were a municipal / county bike system with a mobile application (70% visitors and only 31,6% residents), a mobile application for travel planning and integrating various means of transport available in the county (e.g. e-bike system, e-cars, etc. with buses and trains) integrated with the internet payment system (69,1% tourists and 48% residents), a mobile application for travel planning and integrating various means of transport available in the county (e.g. e-bike system, e-scooters, etc. with buses and trains) (67,7% tourists and 51,8% residents) and a system of guaranteed connections between individual means of transport (e.g. the possibility of one vehicle a waiting another late) (68% tourists and 57,8% residents), a mobile application that allows you to search for transport in ridesharing system (66,8% tourists and 51,6% residents), e-bike / scooter system with mobile application

and infrastructure (basestations, bicycle paths)(63.4% of tourists and only 37.3% of residents). The solution: e-car system with mobile application and infrastructure (base stations, charging modules) was the least popular among tourists and residents.

To check whether the indications of the importance of individual solutions depending on the inhabitants' age, due to the nominal nature of the data, a **chi-square** independence test was carried out, analysing the relationship between the answers and age. The test showed no significant dependencies for most of the questions, both for tourists and residents. They were observed only to a few questions. However, here they were small relationships, which mainly resulted from a more significant lack of decisiveness among the elderly (over 55 years) than younger people, who were also more likely to indicate that the given innovations did not have meaning. Nevertheless, these differences in the percentages of indications in individual age groups are small, and the obtained V-Cramer's dependency coefficients are low (close to the level of 0.2 or lower).

A similar analysis was performed for the inhabitants of large cities, towns and villages. Again, no clear dependencies were generally observed here. In particular questions, only the residents' responses were slightly more conservative (they more often indicated the answer "hard to say" compared to other groups), but the differences are small.

On the other hand, comparing the answers of women and men, apart from a few questions, no significant relationships were observed. These correlations mainly consisted of the fact that women more often chose the "hard to say" answer, while men more often indicated that these technologies would not impact their travel frequency. However, as in the case of other features, the relationships are relatively small.

TABLE 14. Survey results of Case 4

WHICH OF THE FOLLOWING INNOVATIVE SOLUTIONS WOULD INCREASE THE FREQUENCY OF YOUR MOVEMENT AROUND THE REGION?	RESULTS (IN %)					
	RESPONDENTS	NO IMPACT	LITTLE IMPACT	SIGNIFICANT IMPACT	AFFECTS TO A VERY HIGH DEGREE	HARD TO SAY
a municipal / county bike system with a mobile application	tourists	10.6	11.3	34.1w	36.0	8.2
	residents	29.6	24.4	19.1	12.5	14.4
e-car system with mobile application and infrastructure (basestations, charging modules)	tourists	29.2	19.3	22	15.9	13.5
	residents	36	24.1	15	8.8	16.1
e-bike / scooter system with mobile application and infrastructure (basestations, bicycle paths)	tourists	15.2	10.6	26.7	36.6	10.8
	residents	31.1	18.5	24.8	12.5	13.1
a mobile application that allows you to search for transport in the ridesharing system	tourists	9.6	13	36.1	30.8	10.6
	residents	21.3	15.6	36	15.6	11.5
a mobile application for travel planning and integrating various means of transport available in the county (e.g. e-bike system, e-scooters, e-cars, etc. with buses and trains)	tourists	11.3	10.4	35.9	31.8	10.6
	residents	22.9	14.2	31.4	20.4	11
a mobile application for travel planning and integrating various means of transport available in the county (e.g. e-bike system, e-cars, etc. with buses and trains) integrated with the internet payment system	tourists	8.9	13.3	35.5	33.6	8.7
	inhabitants	21.7	15.9	33.3	14.7	14.4
"bus – on-request" service with a call center	tourists	19.8	19	23.4	21.7	16.1
	inhabitants	22.8	21.5	24.8	7.9	23.1

WHICH OF THE FOLLOWING INNOVATIVE SOLUTIONS WOULD INCREASE THE FREQUENCY OF YOUR MOVEMENT AROUND THE REGION?	RESULTS (IN %)					
	RESPON-DENTS	NO IMPACT	LITTLE IMPACT	SIGNIF-ICANT IMPACT	AFFECTS TO A VERY HIGH DEGREE	HARD TO SAY
integration of transport systems (one common ticket for all means of transport)	tourists	7.2	6.7	23.1	56.3	6.7
	inhabitants	17.9	14.2	33	26.5	8.3
a system of guaranteed connections between individual means of transport (e.g. the possibility of one vehicle waiting for another late)	tourists	7.5	14.2	29.9	38.1	10.4
	inhabitants	15.6	13.6	33.1	24.6	13

The need to develop new, alternative mobility solutions in the Hajnowka Region was strongly emphasized during two focus meetings conducted by researchers of the Bialystok University of Technology with stakeholders groups, which took place on October 21, 2019, and November 4, 2019, in Hajnowka. Representatives of local governments, the tourism and transport industry, as well as residents, indicated that in the county it is needed in particular to:

- construct new bicycle paths (Hajnowka-Bialowieza, Kleszczele-Siemiatycze, Kleszczele-Jelonka),
- create an integrated bicycle rental system, including electric bikes (ultimately also electric scooters or electric cars),
- purchase electric buses,
- create a mobile application combining information about the transport and tourism industry,
- create an integrated and updated source of comprehensive information on transport services – stationary and on-line.

Summarizing the results of both survey (quantitative) and focus (qualitative) studies, it was found that there is a great demand in the Hajnowka Region to search for sustainable and innovative mobile solutions, including e-mobility.

3.2.5. EVALUATION AND TESTING

Currently, the e-bike system does not function in the county's strategic space, the starting point for implementing the task it will be established in binding documents of the local government. The main issue is to conduct a feasibility study to find out the costs of possible investment and the energy and spatial possibilities of the Hajnowka Region (locations of potential points of the parking and charging stations – legal and financial costs related to this, including bicycle paths). The implementation of a feasibility study – included in the local government's long-term activities in the newly created Strategy, will be a benchmark for the local government's future activities – including e-bike promotion in the region and potential agreements with local governments to implement the innovation.

Simultaneously, the local government should promote bicycle transport as an alternative means of transport – using interactive tools (an application including bicycle stops, enabling the future expansion of points with charging stations) to popularize this type of transport among tourists and residents.

The development and implementation of new, environmentally friendly means of transport (particularly electric vehicles, such as e-bike or electric scooter) in the Hajnowka Region will significantly enrich the existing transport system with innovative and more environmentally friendly solutions. It will increase the region's transport accessibility, both external and local, positively affecting its attractiveness and improving mobility in the region. These solutions meet tourists' expectations who report a high demand for funds and

infrastructure for bicycle transport. The development of bicycle infrastructure (including bicycle paths) may also positively impact increasing cycling frequency among residents. It will be a healthy alternative to individual car communication and traditional means of public transport. The development of e-mobility in the Hajnowka Region will allow not only to solve the mobility problems and communication accessibility of residents and tourists but also to promote pro-ecological and pro-health attitudes related to the mobile activity.

The development of electric means of transport and traditional bicycle communication, in the Hajnowka Region, will be of great importance for environmental protection. It is vital for the Bialowieza Forest region (one of the most valuable forest complexes in Europe, entered on the UNESCO list). It will make it possible to reduce exhaust emissions, including carbon dioxide and other emissions, and thus improve air quality and reduce noise-related emissions. Currently, motor vehicle traffic is one of the primary sources of air pollutant emissions in the region. Electric means of transport may in the future become one of the most important forms of transport in the region.

The development of e-mobility in the area of the Hajnowka Region requires the reparation of a detailed concept of e-mobility development, which should ultimately assume the implementation of many activities in the field of bicycle infrastructure development, in particular, such as:

1) increasing the number of marked bicycle routes and improving the technical condition of the existing ones,
2) improving the safety of cyclists,
3) improving the accessibility of trails for different groups of users with different needs (e.g. disabled or elderly);
4) developing new and improving the accessibility of existing public roads for bicycles;
5) creating a mobile application (with marked bicycle infrastructure and tourist attractions of the region) as a prelude to the development of e-mobility;
6) creating a system for renting e-bikes,
7) development of e-bike charging stations (eventually for other electric vehicles),
8) creating a city bike system in Hajnowka;
9) development of bicycle parking places;
10) creating bicycle service points;
11) development of places of rest and recreation for cyclists,
12) promoting other forms of e-mobility (e-scooter, e-car, electric means of public transport, etc.)

3.3. Case 6 Integrated mobility plan in the Sälen/Trysil area and the Åre area

3.3.1. INTRODUCTION OF CASE STUDY

The case area Sälen/Trysil is to date the largest winter tourism destination in Scandinavia based on visitation numbers. For example, the municipality in Malung-Sälen has just over 10,000 inhabitants but receives in peak weeks over 50,000 visitors. The relationship for Trysil where lives 6,500 inhabitants are similar.

The case's primary focus is to develop an integrated mobility plan for the Sälen/Trysil area where gender aspects are included. The main challenge behind the case is the Swedish Transport Administration's (Trafikverket) needs for improving methods, models and processes in the early phase of infrastructure planning for remote areas with the extensive tourism industry.

Overall, Trafikverket's approach in the case is to develop the dialogue between municipalities, other public organisations, businesses and citizens in winter resorts in the Sälen/Trysil area (main case) and the Åre area (follower case). These areas have a common

goal further to develop their tourism industry in a sustainable direction. This implies an overall goal of developing and improving public transport solutions to access these areas.

In this case, new digital tools and technologies will be tested concerning the planning process. Trafikverket will work together with the Dalarna University (DU) in the development of the case. Specifically, Dalarna University will develop a GIS-based dynamic digital tool to visualise mobility patterns and analyse gaps between mobility demand and mobility offers.

Furthermore, and concerning the integrated mobility plan, the DU researchers are involved and supported by testing how the digital approach/tool, PPGIS (public-participatory GIS), can improve planning at early stages by bringing in potential gender differences.

The generalisation of the results and their applicability to other tourist destinations will be evaluated using Åre as a follower case:

1. **Analysis of current mobility, connectivity, and accessibility situation in Sälen-Trysil**

Both Sälen-Trysil and Åre are far away from the metropolitan areas in Sweden. Once arrived in the places there are local buses that run on schedule and taxis. The most practical means to move around in both areas are by privately-owned car. This is especially true for Sälen-Trysil with its elongated structure.

2. **The aim of the case study, tasks and how it is possible to reach them**

As stated before, the main challenge behind the case is the Swedish Transport Administration's (Trafikverket) needs for improving methods, models, and processes in the early phase of infrastructure planning. The integrated mobility plan is defined as improving the dialogue at early stages in the planning process. It facilitates cross-border planning between the two regions, Sälen in Sweden and Trysil in Norway.

To achieve a consensus on strategies and plans for the development of mobility at a destination, it is, of course, a necessity that all relevant stakeholders are involved. The purpose is, therefore, to increase the engagement of all stakeholders in the planning process.

3.3.2. SWOT ANALYSIS

The Sälen-Trysil use case has dispersed geography. There are several ski areas and residential quarters, but they are rather separated from each other. The distance is about 70 km between the two endpoints. This is a weakness when it comes to organizing public transport. Car is the most popular transport mode. It is possible to go with train to Mora and then take a bus from Mora to Sälen-Trysil a distance of 100–150 km depending on where in the ski area one wants to go. There are also direct buses from Stockholm and other bigger Swedish cities. The strength from an attractiveness point of view is that the Sälen-Trysil area offers various ski experiences with pistes that cater to all types of skiers. **FIGURE 18** below shows the main points of attraction in Sälen, the ski slopes. As shown in Figure 18, they are located relatively close to each other, still forming a spread out destination.

FIGURE 18. Map showing ski slopes in Sälenfjällen (*Fritiden*, 2020)

A further look into **FIGURE 19** below shows the newly opened airport in the middle of the Sälen-Trysil area.

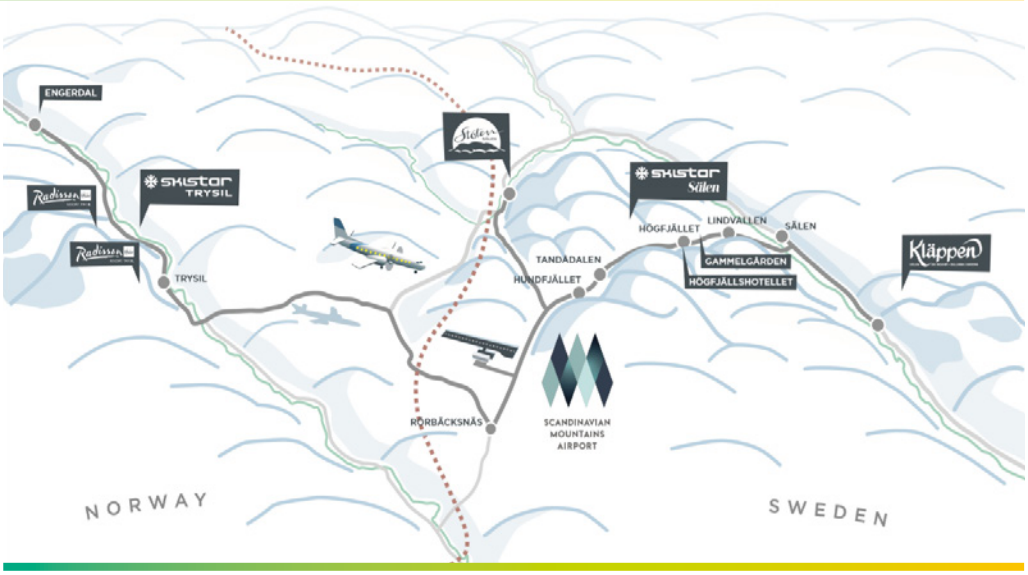


FIGURE 19. Map showing Sälen/Trysil and location of Scandinavian Mountains Airport Destination *(Sälenfjällen)*

In Åre the ski area is integrated around a central village. Åre also has a railway station which Sälen-Trysil lacks. In Åre the airport is located at Östersund some 100 km to the east. Sälen-Trysil thus offers a more convenient air transport arrangement. **FIGURE 20** below shows the layout of destination Åre and how to get to the destination with different transport modes from the nearby city of Östersund, the road via E14, railway or by using airports in either Åre-Östersund Airport, or Vaernes Airport, Norway.

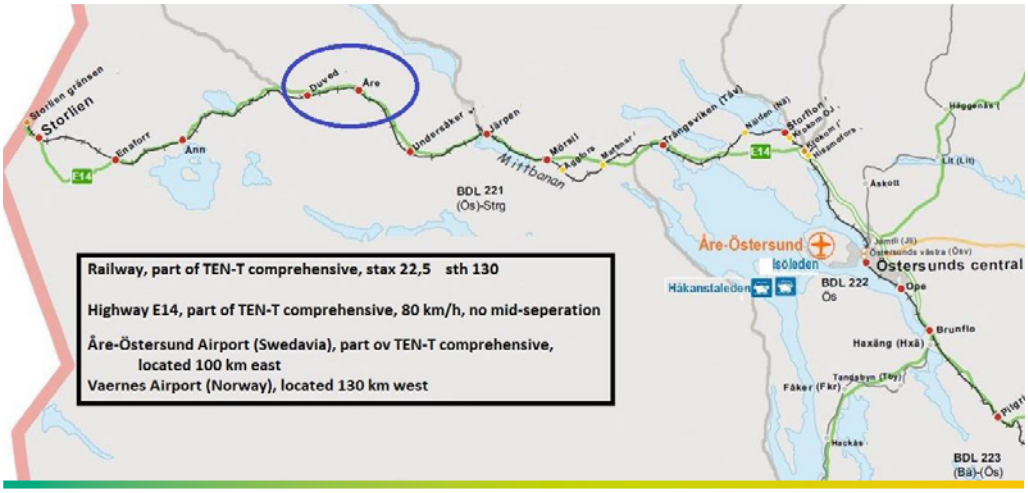


FIGURE 20. Layout of destination Åre

3.3.3. THE TARGET GROUP OF USERS

The four most important target groups are the business association "Destination Sälen-fjällen" representing hotels, restaurants, ski lift owners, suppliers, etc. The municipalities Sälen and Trysil, the regional authority for the county of Dalarna, and the local citizens live in the area. Most private businesses are SMEs. The common denominator for these stakeholders in developing the tourist industry, which is the regional economic base.

3.3.4. SURVEY

A new, better-integrated mobility plan where target groups are involved at early stages is foreseen as an end goal for the case.

In the future, alongside future development and changed practice, the SUMP could link the results. Currently, the practice in Sweden related to SUMP is that few of those exist. Instead, current results from the MARA project are integrated and linked to existing spatial planning practices.

Briefly described there are three formal administrative levels in Sweden. Namely, state (national level), county (regional level), and municipality (local level). The national parliament leads land use planning by making policies and laws such as the Planning and Building Act and Environmental Code (Johansson et al., 2017).

The actual physical and transport planning is done at the local level by municipalities. This planning is regulated in the Swedish Planning and Building Act. On the other hand, regional authorities have the primary responsibility of managing and operating public transportation (Johansson et al., 2017; Tornberg and Odhage, 2018).

Additionally, a distinctive element of the Swedish transport policy and planning is that it follows the so-called four-step principle: 1) rethink, 2) optimize, 3) rebuild, 4) build new. As Tornberg and Odhage (2018) describe below: A prominent feature of Swedish national transport policy is the so-called "four-step principle", according to which solutions to transport problems should be analysed stepwise: Measures that influence the need and demand for transport and choice of transport mode (step 1, "rethink"), and make use of existing infrastructure more efficiently (step 2, "optimize") should be considered first, before considerations of reconstruction (step 3, "rebuild") or new infrastructure (step 4, "build new") when solving transport-related problems.

Furthermore, appraising plans for transport systems in Sweden follows a fundamental Strategic Choice of Measures methodology described in the next subsection.

Strategic choice of measures

In 2013, institutional reforms occurred in the Swedish national transport planning policy. Where among others, all long-term infrastructure measures to be included in future national or regional plans were to be analyzed using the Strategic Choice of Measures (SCM) methodology. SCM is "an arena for early dialogue between main actors and stakeholders at local, regional, and national level to jointly assess transport-related problems and develop solutions" (Tornberg and Odhage, 2018 p. 416).

The SCM approach constitutes four phases **(FIGURE 21)**. At the initiating phase, a study is organized based on preliminary assumptions of the problems and possible solutions. It is also at this phase where resources are determined and actors at various planning levels engaged. The next phase is about understanding the situation where the problem is further delimited, and up-to-date information is collected about the problem.

Moreover, people with different skills and responsibilities are gathered for the process of generating alternative measures. The most efficient measures are assembled and compared in an in-depth analysis. The fourth and final phase is about forming a direction and recommending actions. Here actors proceed with action considered to be the most effective. A recommendation is drafted describing the overall impact assessment, which is then submitted to appointed decision-makers. (Waleghwa and Heldt 2020).

FIGURE 21. Four phases of Strategic Choice of Measures Methodology

There has been a paradigm shift in how stakeholders are involved in decision making processes such as planning. The use of technology-based platforms is gaining momentum in recent terms as a preferable way, or a compliment, to traditional ways of how stakeholders are involved in the planning process such as town hall meetings (Sieber, 2006). For example, web-based Public Participation Geographic Information Systems (PPGIS) is gaining popularity as a contemporary way of engaging the public in planning (Waleghwa and Heldt 2020).

The approach of PPGIS is one of the tools that will be piloted during the WP 3 in the MARA project. The chapter below briefly introduces the survey of mobility demand to visitors, including the piloting of PPGIS for the same stakeholder group.

Due to the breakout of Covid 19, it was only possible to survey the Swedish part of the case area, Sälenfjällen. Summary/ outcomes of the survey results are presented in brief. A complete description of the pilot study can be found in (Waleghwa & Heldt, 2020).

Data was collected using a map-based survey focusing on visitors to Sälenfjällen in winter 2020. Specifically, during weeks 9, 10, 11, 12, and 13 (on Thursdays, Saturdays, and Sundays). These days were selected for data collection as there were relatively more visitors than other days of the week (Destination Salefjallen, 2020). The purpose of the survey was to identify transportation preferences and place-based improvements as identified by winter visitors.

The questionnaires were distributed online during the first three weeks and on paper in the last two weeks. The online and paper-based questionnaires included common survey questions and other questions where respondents could map places they preferred for accommodation, activities, and places to be improved. Respondents were provided with the possibility to fill English or Swedish on both the online and paper-based surveys. The online questionnaire was created and shared using the Maptionnaire tool. “Maptionnaire is a cloud service that allows anyone to create, publish and analyze map-based questionnaires with an editor tool.” (Kahila-Tani, Broberg, Kyttä, & Tyger, 2016).

Sampling was done on-site where every visitor had the probability of participating. The surveys were shared with visitors in various places in Sälenfjällen. Namely, SkiStar lodge Experium and Högfjället hotel lobbies, Scandinavian Mountain airport, ski slopes in Hundfjället, Lindvallen and Stöten and finally Skistar self-checkout 7 in Tandådalen.

Visitors were presented with two possibilities for taking the online survey; an online link sent to their email address or a QR-code which they could scan on the spot or take as a printed copy. In the printed questionnaires, respondents were presented with pens to fill the questionnaires on the spot. The visitors could take the survey on the spot as they were approached at resting places between skiing activities. The next subsections provide a brief overview of the survey and map-based questions and compare online and paper-based surveys.

Survey questions

Common survey questions were included in the questionnaire. Namely, the main reason for visiting Sälenfjällen, nights spent, lodging type, frequency of visit, mode of transportation used, satisfaction with transportation, demographic information, and lastly the visitor’s overall satisfaction with their stay in Sälenfjällen.

Survey response rate and descriptive statistics

A total of 184 respondents answered the survey. Of the total responses, 44 answered online, and 140 on the paper-based surveys. Of the total surveys, 22 were excluded for analysis, and 162 included. The 22 surveys were excluded based on responses received during questionnaire testing (11), incomplete surveys (2), and respondents who were not part of the sample, i.e. non-visitors (8) and one who was 17 years hence not fulfilling the minimum 18 years required to take the survey.

In terms of representation, most respondents were female (56%) followed by a male (43%) and third gender (1%). Many of the visitors were from Sweden (94%), Denmark (3%), United Kingdom (2%), and the USA (1%) in that order. The results also

indicate 33–47 years as 45% of the total sample's modal age. 18–32 years were 28%, 48–62 years were 22% and lastly, 63–77 years were 5 %.

Some of the results above on demographics closely align with that of a study on sustainable travel to Sälen by *(Heldt & Robertson, 2017)*. It is crucial to indicate that the aim of discussing some results of this present study by Heldt and Robertson is to see any similarities or changes specifically in transportation preferences for visitors to Sälenfjällen.

The study by Heldt and Robertson was conducted in 2015 and published in 2017. In which 98% of the visitors were from Sweden. From this current study, as stated above, 94% are from Sweden. This goes to show that majority of visitors to Sälenfjällen are still from Sweden. Although from this pilot study we can see international visitors from UK, USA, and Denmark. This part might be because of international flights to Sälenfjällen since December of 2019.

Additionally, it is evident from the results that most visitors were in Sälenfjällen for alpine skiing (53%), alpine skiing and other activities (22%), owning a cottage (13%), other reasons, e.g. nightlife (12%). When it comes to frequency of visit to Sälenfjällen, there were first-time visitors (8%), more frequent than three times / year (15%), 2–3 times / year (20%), and less frequent than one time / year (57%). The average length of stay for the visitors was 6–9 days. Most visitors were enthusiastic about visiting again, as indicated by 90% of the responses.

3.3.5. EVALUATION AND TESTING

The proposed integrated mobility plan's expected impact is improved integrated planning across border Norway and Sweden and within Swedish current planning practice, i.e. integration of national, regional – and municipal planning.

As mentioned above, at the stage of collecting data on visitor mobility demand we also did a pilot of the PPGIS method on collecting data on visitor mobility preferences that potentially are relevant to include in planning for the case area. Evaluation of survey results during the remainder of the MARA project will be done.

The data collection in Sälenfjällen was planned and carried out jointly with the DMO Destination Sälenfjällen after consultation and discussions with the municipality of Malung/Sälen as well as with the project SITE III (Sälen-Idre-Trysil-Engerdal). All levels of planning were engaged. However, project SITE III was launched in March 2020, so their engagement was just on an information level. Future data collection of residents will be done with more engagement from their side.

There has been a transnational exchange preceding this study. The idea to pilot PPGIS was taken from partner SYKE and their study using PPGIS to collect data to understand mobility in Kymenlaakso/Kovola. Their study targeted mainly second home-owners and their mobility demand but included a survey also to residents.

Innovative solutions to improve mobility in the region

One ambition with the integrated action plan was to guide the parties in establishing a constructive arena and dialogue. The project's common objective was to improve accessibility to sparsely populated areas and reduce the tourism industry's climate impact. The project also contributes to this goal by developing conditions for stakeholders to include and integrate social and gender aspects through an integrated and constructive dialogue in the early planning process.

The dialogue with relevant stakeholders vill gradually lead to new knowledge and new measures to be integrated with their work. It seems vital that this dialogue is part of an ongoing process as critical circumstances change all the time. Which organizations and which individuals are relevant stakeholders also shift from time to time. The importance of this flexible way of working is identified as a crucial factor for success.

Our regional action plan shows how each stakeholder's responsibilities and contributions are determined and how they contribute to sustainable destinations and activities. The strategy shall understand shortcomings and problems arising from the dialogue when

stakeholders meet to discuss needs, problems, conditions, desired function, and objectives. The Regional Action plan will describe the agreed establishment plan (where and how the dialogue begins). Furthermore agreed plan of constructive dialogue in the early stages of the Sälen/Trysil and agreed action plan, gender-integrated process/processes.

Innovative solutions to improve mobility in the region – Study of choice of measures
As has been described above, Sälen-Trysil has very dispersed geography. There are several ski areas and residential quarters, but they are rather separated from each other. The distance is about 70 km between the two endpoints. As a consequence, the majority of visitors chose to bring their car to the resort. That means the national roads leading to Sälen Trysil from time to time are heavily used with repeated traffic jams. The two major roads leading to the area are in rather an inferior condition. They are narrow, passing through many small villages. The standard of these two roads is a significant problem.

The Swedish Transport Administration has, in cooperation with stakeholders and other groups of interest, conducted a study on the choice of measures. Among the recommended measures proposed in this study, a number will form the basis for actions with funding from the Regional Transport Infrastructure. The Swedish Transport Administration Region Mitt is a project manager and carries out the selection study in collaboration with Malung-Sälens municipality. The purpose of the action selection study is to understand the situation, test possible solutions, and shape the future's vulnerable road users' direction. They move along and across road 66 between Sälen´s village and Hundfjället. The study also aims to create consensus and develop a common target for the action selection study. The idea is that the result provides a common planning basis for the different actors' future work. (Trafikverket, **Åtgärdsvalsstudie**, Trafiksäkerhetsbrister,väg 66, Sälens by-Hundfjället 2017–03–16. : TRV 2016/58851).

Innovative solutions to improve mobility in the region – the decision making process
Identifying key actors with increased accessibility and those involved in the project, several actors are related to the MARA project's purpose and objectives. Some of them have already been in contact with the project partners. Some others have been more indirectly involved and are not always aware of their involvement. Furthermore, there are probably actors who could be significant in various ways through participation for a successful project. Mapping all of these is an essential initial task in the project. The work to identify actors who are necessary but not so for the projectile requires unique methods. One such is the so-called snowball method. That is to say, to make use of the contacts you already have to be piloted on through them. Moreover, these can pilot further and so on until you see feedback and the so-called saturation effect occurs.

3.4. Case 7 Car sharing solutions to remote touristic areas in Lithuania

3.4.1. INTRODUCTION OF CASE STUDY

The feasibility study on the possibility to extend urban car-sharing solutions to remote touristic areas in Lithuania aims to develop new mobility concepts in Lithuania, with the possibility to extend it to the BSR level. The analysis of the current situation was provided, the stakeholders were identified, and initial social surveys were prepared to identify user needs. Before preparing questionnaires, initial social surveys were prepared. The aim was to improve accessibility and provide possibilities for using the new transport modes such as car sharing in remote/touristic regions. During the initial stage, two resort towns Birštonas and Druskininkai were selected. VGTU research team decided to compare the possibilities of implementing a car sharing system in both chosen resorts and identify which one is more suitable for implementing a new transport mode. In the

end, it was decided to focus on Birštonas. Birštonas is a small spa town located in the central part of Lithuania. The distance from the capital Vilnius is about 100 km, 46 km from the second biggest city Kaunas, 45 km from Marijampolė, and 35 km from Alytus. There are five sanatoriums in Birštonas, which operate the whole year. According to the Lithuanian Department of Statistics data, there were 2,369 inhabitants in Birštonas in 2019. Location of Birštonas resort is presented in **FIGURE 22**.

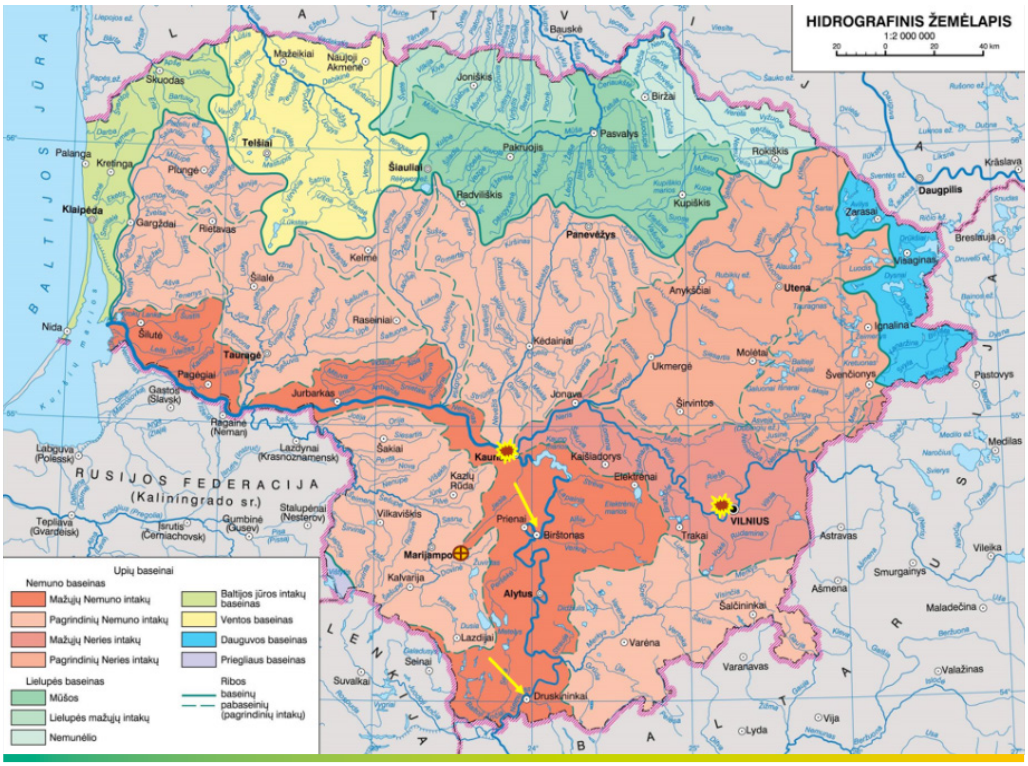


FIGURE 22. Location of Birštonas and Druskininkai resorts

The territory of Birštonas municipality is located in the eastern part of the regional park Nemunas Loops. Birštonas is oriented on a tourism service and is the regional significance centre. The development of Birštonas regional park of river Nemunas Loops and Birštonas Resort City is closely interlinked. Perspective provisions and specified solutions for their improvement should be harmonized mutually. The view of the surroundings of Birštonas Regional Park is presented in **FIGURE 23**.

FIGURE 23. Surroundings of Birštonas Regional Park (*author Vaidotas Grigas*)

Birštonas resort specializes in health treatment, cognitive tourism, and recreational tourism in nature. Spa treatment and leisure tourism are envisaged as the dominant sector in the local economy. Birštonas municipality territory includes 13 natural and 33 cultural landscape objects of the regional park Nemunas Loops. Due to the improvement of the district municipal centre's infrastructure, a significant increase in visitors' number is observed. The total number of overnight guests increased by more than 20,000 people from 2013 to 2015, and the number of foreigners increased 1.5 times.

Passenger mobility functions in Birštonas and its related territory are non-motorized (walking and cycling) and road (public transport and private cars) transport. The attractiveness of individual modes of transport depends on the distance travelled during the journey. As cars and public transport perform passengers' transportation over longer distances than non-motorized transport, these modes of transport are competitive. When the distance travelled is less than 3 km, bicycles become a more attractive alternative to cars and public transport for some people. Walking trips usually are chosen when the length of the trip does not exceed 1 km. The modal split in Birštonas is presented in **FIGURE 24**.

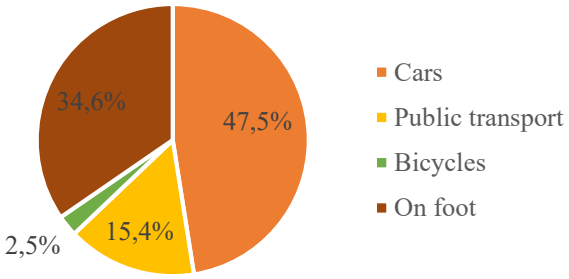


FIGURE 24. The modal split in Birštonas (Data source: SUMPs' of the chosen towns)

Based on complex studies of traffic intensity, passengers carried by public transport and cars, monitoring of non-motorized transport infrastructure, population, and a number of visitors, the number of trips between different modes of transport has been defined.

In Birštonas resort, about 47.5% of the residents use privately owned cars for daily trips, 34.6% make daily trips by foot, 15.4% by public transport, and 2.5% by bicycle. Such modal split is determined by the relatively small area of the resort and the short distances between the residents' daily travel destinations. The SUMP) in Birštonas town (Darnaus judumo ... 2017) states that most residents make 2–4 trips per day with a distance of up to 5 km. This facilitates the development and promotion of non-motorized transport (cycling and walking).

It is essential to mention that there is no local public transport, which would serve only the territory of Birštonas. Birštonas municipality is served only by intercity public transport buses, ensuring communication with Prienai (Kaunas), Vilnius, and other areas. On average, 28 buses depart from Birštonas to Kaunas city, 9 to Vilnius, 4 to Marijampolė every day. Therefore, this type of transport does not meet the internal transport needs of the town.

There is no railway connection. It should be emphasized that both considered resorts do not have a railway connection with Vilnius and Kaunas. The use of non-motorized transport means it is attractive because of the accessibility possibilities. The walking and cycling paths in Birštonas are relatively well-developed as a tourism or leisure infrastructure rather than daily transportation needs. Although both resorts do not have the bike sharing infrastructure, the number of bicycle rental services provided by local businesses is mostly sufficient to meet the needs.

The VGTU research team's idea is to evaluate the possibilities to implement the car sharing system in Birštonas for better connectivity with the Lithuanian largest cities Vilnius and Kaunas. Currently, in Lithuania, there are two car-sharing companies.

The first one is CityBee; the company was established in 2012 as part of the Modus Group. In 2019 the fleet consisted of 810 cars and 50 light freight vehicles. Also, the company develops business in the field of micro-mobility. Currently, it is bicycles and electric scooters. CityBee cars are available in the most prominent Lithuanian cities: Vilnius, Kaunas, Klaipėda, and Palanga. The company uses a free-floating business model, with CityBee cars (cargo). It is possible to travel between cities, for example, to pick up a car in Vilnius and leave it in any CityBee area in Kaunas. International journeys are also available; for example, it is also possible to travel to Riga or Tallinn, as the company has representative offices.

The second company operating in Lithuania is SPARK; it is a car-sharing company established in 2016, with a free floating business model. The main difference, compared to CityBee, is that all fleet consists of electric vehicles. This is an environmentally friendly company, however, performing with some limitations. Right now, service is available only in Vilnius, the biggest Lithuanian city. In other areas, the company is not working, as charging station infrastructure is not sufficient. Currently, there are 136 charging stations in Vilnius, where Spark cars can be charged.

The car sharing business model canvas is presented in **TABLE 15**. Most service users are men; the number of women among service users is a little less than 25%. The driver's average age is 28 years, with the majority between 20 and 34 years old. The typical duration of the journey is less than one hour; they make up 92,3% of all the trips. The length of 75% of the journeys is 5–15 km.

TABLE 15. Car sharing business model canvas in Lithuania

KEY PARTNERSHIP	KEY ACTIVITIES	VALUE PROPOSITION	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
→ The municipality (parking lots) → Car manufacturers → Fuel distributors → Insurance companies → Car maintenance companies	→ Car sharing → Fleet management → Customer service → Taxi service → Food delivery → Vehicle maintenance **KEY RESOURCES** → Vehicle fleet → Service team → Platform (website and application) → Parking slots	→ Mobility alternative, integrated with micro mobility modes → Short and long term rent → Economical, accessible and environmentally friendly service → Free floating service → Different cars for different needs → Light freight transport	→ Automated service through the app → Automated service through the webpage **CHANNELS** → Website → Mobile app → Customer service	→ Public users → Corporate clients

COST STRUCTURE	REVENUES
→ Vehicle fleet acquisition → Maintenance → Vehicle fuelling, charging, cleaning → Personnel costs → Insurance → Additional equipment for vehicles → Investments in developments	→ Fees per travelled kilometre → Fees per travelled minutes → Fess per vehicle class → Fees for entering/parking in particular territories (like airport...)

All CityBee cars are insured with compulsory third-party liability (CityBee, 2020). Therefore, a Client does not need to take care of the insurance. The car is equipped with an insurer-compliant satellite-based security system that protects CityBee from potential theft.

In the event of a car accident that was not caused by Client (e. g. the car that Client drove was hit by another person who had violated the road traffic rules), the insurance will cover the losses incurred. Client will not need to pay any extra charges. If when using a CityBee car client causes an accident, Client will be subject to €500 unconditional deductible (i. e. Client will not pay more than €500, even if Client suffers bigger losses). In the case of non-insured events (e.g. if Client drives drunken or is affected by narcotic or psychotropic drugs, violates road traffic rules, etc.), the Client will have to cover all losses.

The main competitor of car sharing companies is not the drivers with privately owned vehicles, but services when a passenger is hiring a vehicle and a car with a driver. Examples of this type of business model available in Lithuania are Uber, Bolt, and Yandex taxi.

3.4.2. SWOT ANALYSIS

The main strength of implementing car sharing service in Birštonas is reducing the number of trips with private cars. Also, freeing up of parking spaces and the increase of availability of alternative mobility solutions and mobility increase mobility itself. Such a change will positively affect the environment, as in car-sharing fleet is relatively new. The main weakness is that with the current business model, this activity is unprofitable. To make the system work involvement of business and municipality is needed. The main advantage of implementing such a solution would be the competitive advantage of Birštonas over other cities. Increasing mobility between rural and urban areas. Such a solution may raise tourists number, as they become independent of intercity and public transport. Besides, this solution may increase profit for other businesses and services as tourist flows will increase. The percentage of the population living in rural areas in Lithuania is more than 50%; it is much higher than average in the EU. For last years residents are leaving these territories and moves to the cities. In rural areas the population is ageing, and the leading target group for car sharing service is younger than 35 years.

The SWOT analysis of the next generation vehicles – automated ones in car sharing has been done. Based on AV technology investigation, the SWOT analysis has been carried out and is presented in **TABLE 16**. Full vehicle automation will solve the problem of the non-effective public transport system in rural areas. The whole sector engaged in driver management, and other activities will be significantly reduced. It is a threat public authorities will need to deal with. For business, it will be beneficial in cost reduction. It is also a positive aspect for end-users in the long-term, as the price of the service will potentially decrease. In a short time and transfer period, the price may be higher due to equipment costs. Substantial infrastructure investments are also required, as V2X (Vehicle to Everything) communication is an integral part of the AV.

TABLE 16. SWOT analysis of automated vehicles in rural areas

STRENGTHS	WEAKNESSES
→ Increase in mobility for non drivers → Increase in safety → The decrease in the emission level → The decrease in fuel consumption → The decrease in travel time, using a call on demand function → Possibility of using optional travel time → The decrease in parking demand	→ Lack of statistical data for quantitative analysis → Need for continuous research in new areas → User acceptance and Human-Robot interaction → Lagging law and regulation → Cybersecurity → High price → Lower operational speed

OPPORTUNITIES	THREATS
→ New markets → Development of new technologies → New high value-added jobs → Development of smart cities → Sharing economy implementation	→ The decrease in the need for traditional specialists/ drivers → Investments in infrastructure are required → Increase in personal privacy vulnerability → New forms of crimes

Technology will be expanded globally, and plenty of new opportunities will appear. Huge demand for new technologies is faced, which means that highly qualified professionals will be required. This will provide prospects for the emergence of new companies. The car sharing model has already become popular all over the world. However, the AV can flip the ratio between privately owned and shared vehicles in the fleet, which contributes to the implementation of the sharing economy.

The main strength of AV technology is the possibility of solving the transport sector's problems, which are difficult or even impossible to be solved, taking into consideration conventional vehicles. Due to the elimination of the human factor, an increase in safety is of ulmost importance. The other strength is an increase in mobility and a decrease in parking demand, which can be achieved through optimised control strategies. Furthermore, it may decrease fuel consumption, emission levels, and noise (in electric vehicle case). The main effect will be reached when internal combustion engines are replaced with electric ones. In this case, the AV will not have significant influence but may create a slight impact due to new control strategies. The transition from the vehicles powered by internal combustion engines to electric motors is not as fast as expected previously. Thus the employment of a new kind of transport will be even more complicated because of many challenges and difficulties faced nowadays. Moreover, some of the ongoing issues could be hardly predicted from the present point of view.

3.4.3. THE TARGET GROUP OF USERS

During the project implementation, we defined the stakeholders. The first group is service users; it may be residents living in the region and national/foreign tourists; the second group is regional or national service providers. The third group is the local authorities, which can improve business conditions for companies.

The involvement started with an initial meeting with the administration of municipalities. They provided current situations and their expectations about possibilities to improve mobility in the region. As Birštonas is very small, the mobility problem is not in the town itself, but rather in connection with suburban areas and connection with main Lithuanian towns. After that, with the help of authorities survey of residents and tourists was performed. When we analysed the additional data meeting with service providers were organised, the results were also presented to authorities.

3.4.4. SURVEY

Before the research, meetings with the municipality was performed, and existing gaps were identified. After that, we organised meetings with hotel representatives, where open-ended questions were asked. Only after that final questionnaire was prepared, we used a questionary prepared by project partners as background. A survey of residents and tourists was provided to identify mobility needs in Birštonas. The study was launched in December 2019 and finished in June 2020. In total, 218 respondents took part in it. 73% of the respondents were residents; the rest 27% were tourists. The survey results are presented below.

The survey involved 159 residents who associate their work and life with Birštonas resort. The majority of respondents were Birštonas city and Birštonas municipality residents (92%), while residents of other places accounted for a small 8% share. The majority

of respondents who participated in a survey were women (65%) and only 35% male. The distribution by occupation and age is presented in **FIGURE 25**. Most of the respondents travel every day to get to work and for other purposes. They need to ensure a smooth and comfortable journey and accessibility of objects by various means of transport.

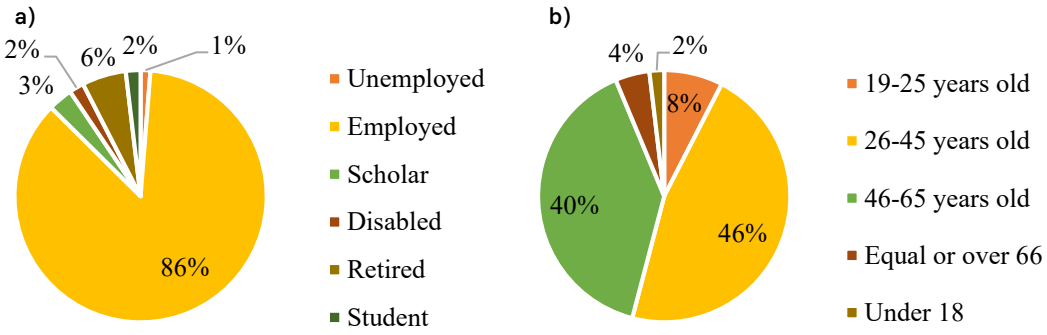


FIGURE 25. Distribution of respondents by occupation (a) and age (b). (Source: Population and Tourist Survey, 2019–2020)

Residents were asked to evaluate the transport system within and outside the Birštonas. Here, the opinions of the respondents differed. The answers show that within the town limits, the community evaluates the transport system more favourably (62%) than in the suburbs (42%), and the number of those who assess rural transport negatively is twice as high as in the town, 18% and 9%, respectively.

The survey results also revealed that the people of Birštonas are sufficiently motorized **(FIGURE 26)**. The most popular vehicle among the population remains the private car. The majority of respondents have at least one or more of them. A popular transport mode in Birštonas is also a bicycle. More than 80% of the survey participants have at least one or more of them. As in larger Lithuanian cities and resorts, the popularity of scooters is also noticeable in Birštonas. At least one scooter is in every third household of the surveyed Birštonas resident. Other vehicles, such as motorcycles, rollers, skateboards, etc., are less popular among the residents.

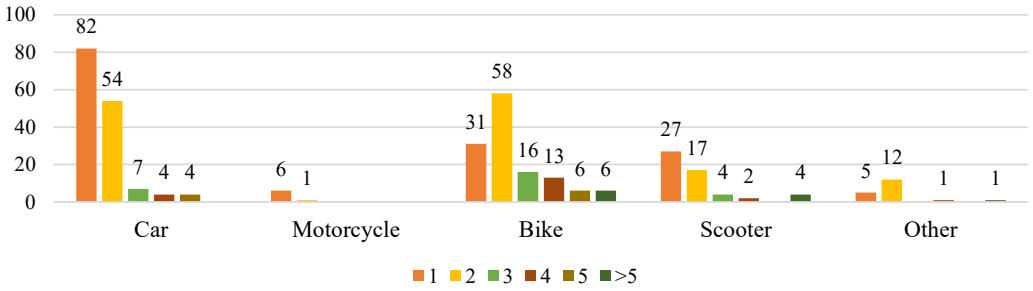


FIGURE 26. Number of vehicles in residents households. (Source: Population and Tourist Survey, 2019–2020)

The most popular daily way to travel in Birstonas is on foot. 75% of respondents travel in this way **(FIGURE 27)**. It is due to the compact size of the resort, relatively small distances between objects of attraction. Depending on the length, seasonality, and purpose, the mode of travel may vary. As an alternative, residents choose to travel by car (58%), bicycle (38%). The growing popularity of scooters also stands out as an attractive alternative to travelling in the city.

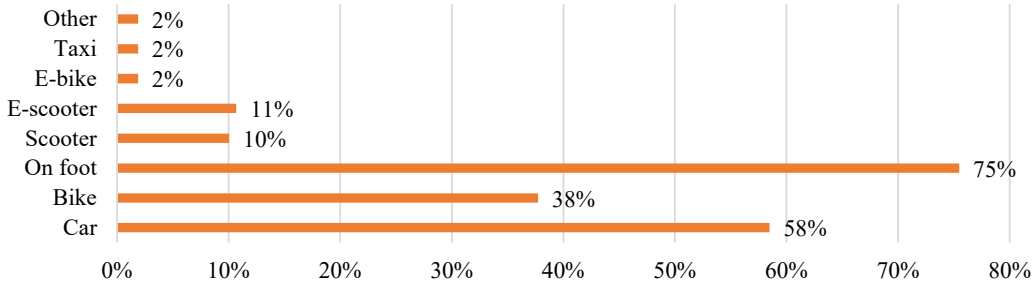


FIGURE 27. Ways of daily travel within the city limits. (Source: Population and Tourist Survey, 2019–2020)

Comparing travel modes within the town and outside the city, it becomes clear that other modes of travel to the suburbs are not very competitive, compared to the privately owned car. Up to 90% of respondents choose the method of travelling by car **(FIGURE 28)**. Up to 37% of the population uses public transport. Excluding respondents who chose both modes of travel, i. both by car and public transport and counting those who chose only public transport, this number could fall to 9% of travellers. Cycling (17%) and walking (9%) travel options selected by respondents are also quite popular in the suburban context. However, it is vital to assess how these modes of travel are most likely to be used for recreation or to cover nearby distances.

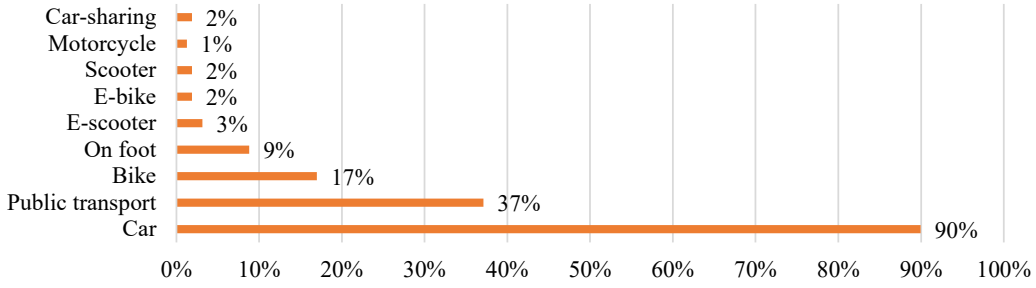


FIGURE 28. Ways of daily travel outside the town for residents. (Source: Population and Tourist Survey, 2019–2020)

Tourist survey was performed at the same time. The 59 tourists participated in and completed the questionnaire. The vast majority of them (86%) were Lithuanians and 14% foreigners. Birštonas is popular among neighbouring countries such as Belarus, Latvia, and further afield such as Germany, Russia, etc. However, it is essential to mention that due to the COVID-19 pandemic, tourists' flow was significantly decreased. This prevented the collection of more data to obtain more objective results. The majority of respondents were women (76%) **(FIGURE 29)**.

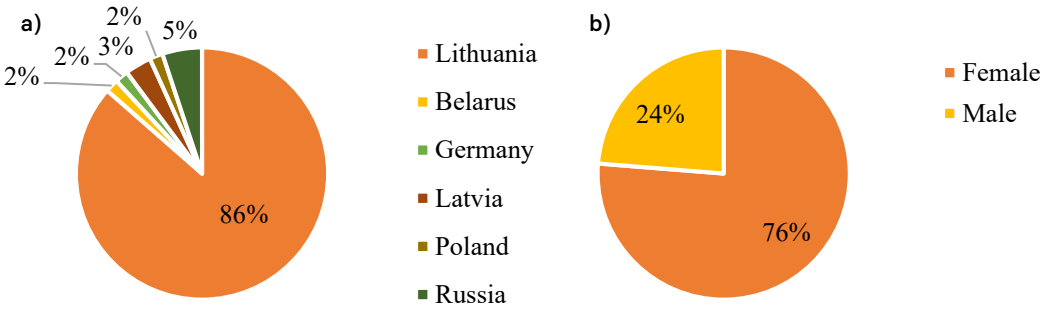


FIGURE 29. Distribution of tourists by country of origin (a) and by sex (b). (Source: Population and Tourist Survey, 2019–2020)

The majority of respondents were 26–65 years old, and 81% were working people. Birštonas resort is also popular among the elderly, retirees, who often come here for health purposes. Their share in the tourist survey was 17% **(FIGURE 30)**.

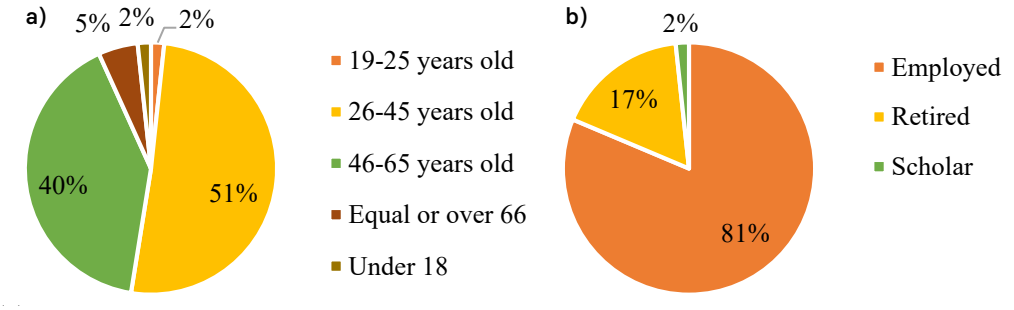


FIGURE 30. Distributioı of tourists by age (a) and by occupation (b). (Source: Population and Tourist Survey, 2019–2020)

The travel patterns analysis shows that 63% of foreign respondents used privately owned car to get to the resort. An international bus, train, or plane remains an alternative of similar attractiveness at 12–13% each. Due to the small number of respondents, it is not easy to objectively assess the true extent of travel from abroad by specific modes of transport.

The survey showed that the most popular way to travel to a resort within the country limits is also a private car. As many as 4/5 of the respondents choose this mode of travel **(FIGURE 31)**. It is not surprising, as the country's level of motorization is high enough and residents often choose to travel by private car. Public transportation is mostly chosen by people arriving at the resort for health purposes without a driver's license or not owning a car. A rented car is selected by 5% of respondents, and a car-sharing service could be an alternative option for them to reach the resort conveniently.

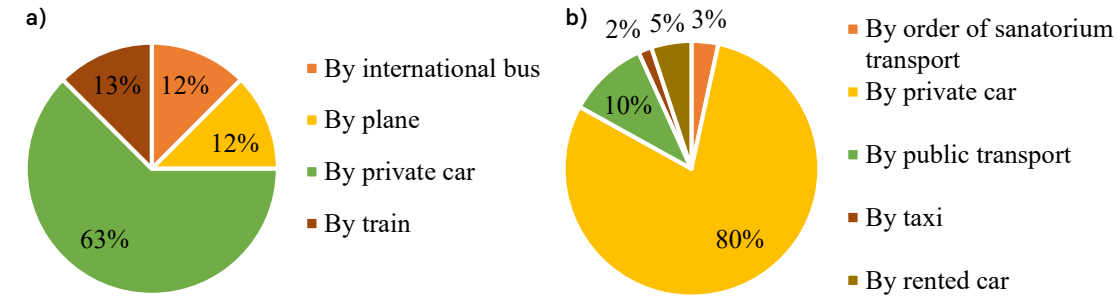


FIGURE 31. Distribution of tourists according to how they came to the country (a) and how to the resort (b). (Source: Population and Tourist Survey, 2019–2020)

Tourists usually come to the resort in pairs or alone **(FIGURE 32)** and sometimes in larger groups. The most popular lengths of stay are 2–3 days and 4–7 days, 46% and 30% of respondents choose trips of this duration, respectively. It is essential to mention that incoming tourists from abroad usually prefer longer-term vacations at the resort, while weekend-long ones are more popular with local tourists.

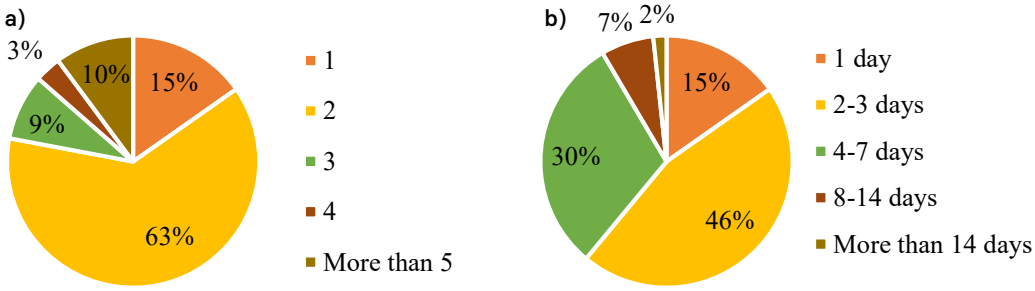


FIGURE 32. Distribution of tourists according to how many they arrived at the resort (a) and how long they plan to stay there (b). (Source: Population and Tourist Survey, 2019–2020)

According to the chart presented below, tourists mostly choose Birštonas for leisure tourism purposes (71%), while other purposes only supplement it. Almost half of the respondents also come here to improve their health together, and about a fifth for cultural and recreational purposes **(FIGURE 33)**, so it may be relevant for them to reach nearby objects of attraction.

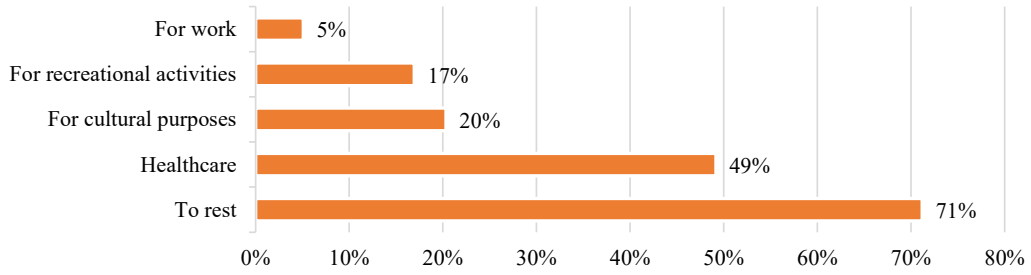


FIGURE 33. The purpose of the tourist trip. (Source: Population and Tourist Survey, 2019–2020)

The accessibility of the resort is rated well by more than 4/5 of arriving tourists from various directions, and on average – 15%. Most incoming tourists have a driver's license – 88% of respondents **(FIGURE 34)**.

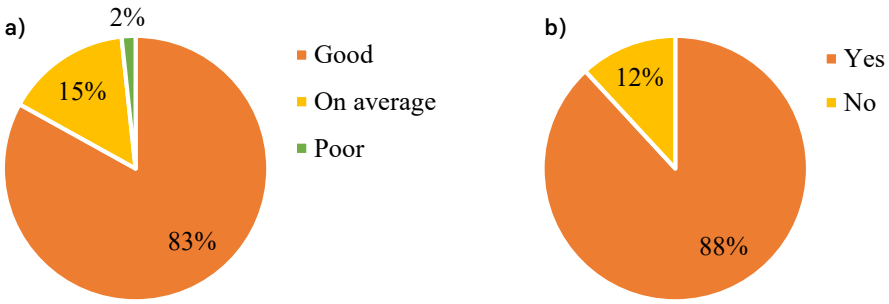


FIGURE 34. Distribution of tourists according to how they assess the accessibility of the resort (a) and whether they have a driver's license (b). (Source: Population and Tourist Survey, 2019–2020)

Vehicle driving in Lithuania does not seem to be a problem for most of the tourists. 75% of respondents would actually or possibly consider driving **(FIGURE 35)**. For most of them, commuting daily is natural, and in a small country, travelling in this way is quick and convenient. 25% would not drive because some of them do not have a driving license or for other objective or personal reasons.

Meanwhile, the vast majority of respondents, about 90%, would like to travel more around Lithuania. Assessing only foreign tourists' responses, 100% of them answered

that they would or might want to travel. Vilnius, Kaunas, Trakai, and seaside cities were mentioned more often among the named areas.

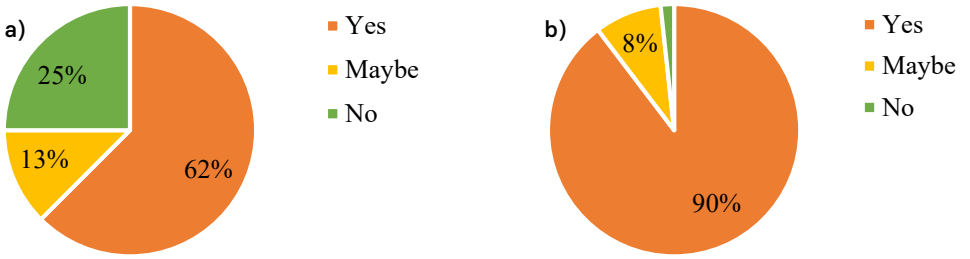


FIGURE 35. Distribution of tourists according to whether they would drive (a) and whether they would like to visit other places in Lithuania (b). (Source: Population and Tourist Survey, 2019–2020)

Both residents and tourists were asked if they are familiar with the vehicle sharing system and how they rate such a system. About ¾ of the respondents know or at least have heard about vehicle sharing, and 25% heard about it for the first time.

This survey aimed to find out the residents' mobility habits and identify the gaps in the current transport system. Moreover, to provide possibilities to improve it. One of the possible innovations to improve the accessibility of the Birštonas resort is the introduction of a car-sharing, bike-sharing, scooter-sharing system in the city.

3.4.5. EVALUATION AND TESTING

VGTU team's goal was an investigation of the possibility of implementation of car-sharing service in the rural area. Initially, the aim was to determine whether the resort residents are familiar with the vehicle sharing system and how they evaluate such a system. The majority of respondents (80%) know or at least have heard what it is, and 20% have not heard of it **(FIGURE 36 (A))**. Vehicle sharing is observed positively by more than half of the community (56%), about a third have no opinion, and only 8% have a negative judgment **(FIGURE 36 (B))**.

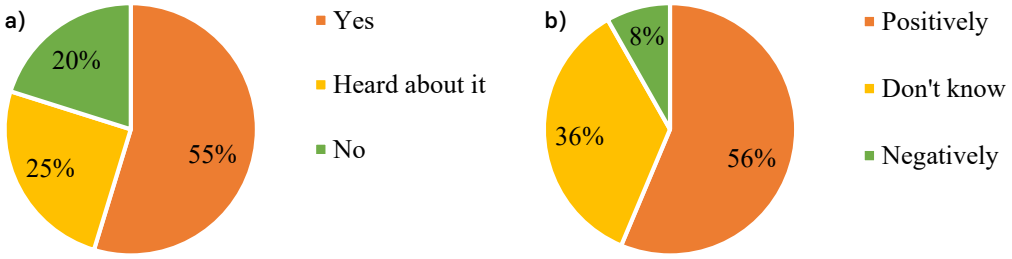


FIGURE 36. Distribution of respondents' answers to whether they know what a vehicle sharing system (a) is and how they evaluate this system (b). (Source: Population and Tourist Survey, 2019–2020)

According to the distribution of the population's responses, several of them had used the vehicle-sharing system in any city. The share of about 15% of respondents tested each type of sharing-transport means **(FIGURE 37)**.

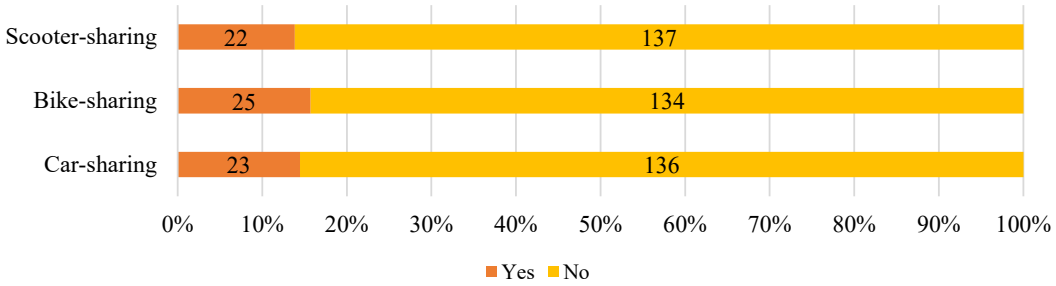


FIGURE 37. Distribution of respondents' answers to whether they had to use the vehicle-sharing system by type of vehicle. (Source: Population and Tourist Survey, 2019–2020)

Assessing the distribution of respondents according to whether they plan to use the vehicle-sharing system if it appears at the resort next month, it can be seen that the most positive attitude is towards bicycles and scooters sharing **(FIGURE 38)**. About a third of the population would use such modes of transport. With people potentially interested in the sharing system, the percentage is almost 60% in both cases.

More than half of the respondents are not interested in the car-sharing system, and about 20% of respondents would like to use it. This distribution of responses may be due to the high number of private cars in households. Up to 45% of respondents are potential car-sharing users.

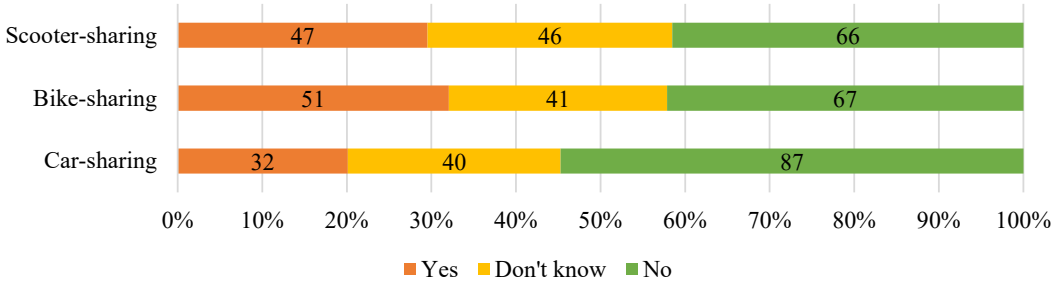


FIGURE 38. Distribution of respondents' answers to whether they would use the vehicle sharing system if it appeared next month by type of vehicle. (Source: Population and Tourist Survey, 2019–2020)

Analysing the textual explanations of why the respondents chose one or another answer about using the sharing system, several tendentious answers can be distinguished. Most respondents understand and accept car-sharing as a system that works within the city. Therefore, a negative attitude towards it is being formed as a potential load on the town streets and parking lots and growing pollution in the resort. Others view the system positively as a possible service for tourists, as well as the possibility of more convenient access to Kaunas, Vilnius, the airport, and the possibility to give up a second car, which is often much less used, thus saving money on repairs, insurance, and other costs.

Most respondents see the vehicle-sharing system as a positive phenomenon. 18% of respondents do not have an opinion and are mostly those who have not heard of this transportation mode **(FIGURE 39 (B))**. Compared to the residents, it can be seen that tourists value this system much more favourably than the residents.

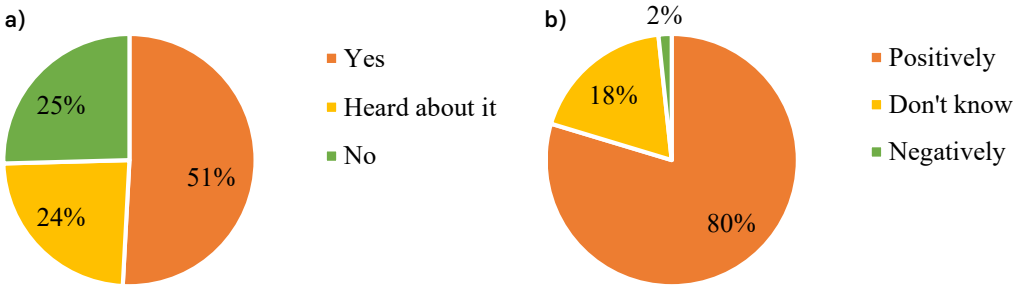


FIGURE 39. Distribution of tourists' answers to whether they know what a vehicle sharing system is (a) and how they evaluate this system (b). (Source: Population and Tourist Survey, 2019–2020)

When asked which of the two modes of travel (car-sharing system or a coach) tourists would give priority to reach the resort, the majority of respondents would prefer a car-sharing (63%) **(FIGURE 40)**. Of course, having a personal car will infrequently replace it with a bus or the same car-sharing.

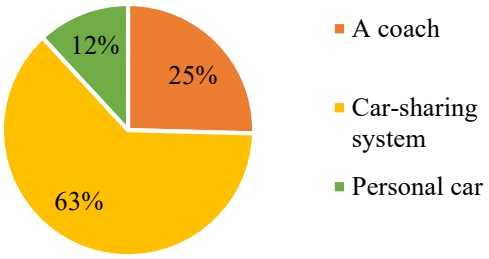


FIGURE 40. Priority distribution of tourists to reach the resort. (Source: Population and Tourist Survey, 2019–2020)

From 22% to 33% of respondents, among tourists, have tried one of the sharing transport modes. Most of them have used bicycles and cars, and the least – scooters **(FIGURE 41)**.

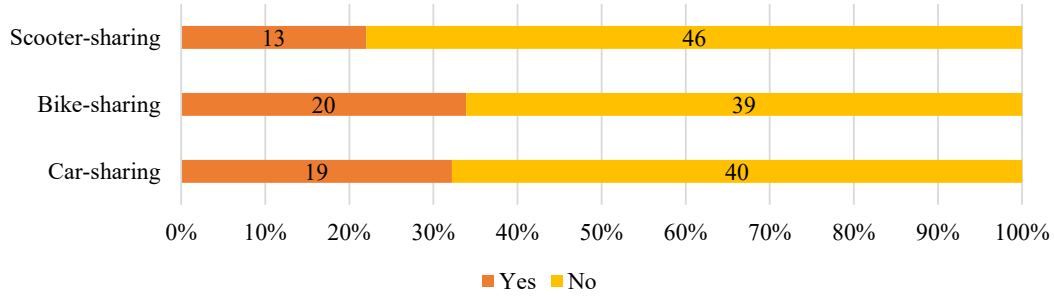


FIGURE 41. Distribution of tourists' answers to whether they had to use the vehicle sharing system by type of vehicle. (Source: Population and Tourist Survey, 2019–2020)

The survey results showed that tourists are mostly interested and would like to use the bike-sharing service at the resort. More than 50% of the respondents said "Yes" to such a service. Respectively, scooters over 40%, and cars about a third of respondents. According to those who answered "Maybe", optimistically, the number of potential users in this system could rise to ~68 to 86%.

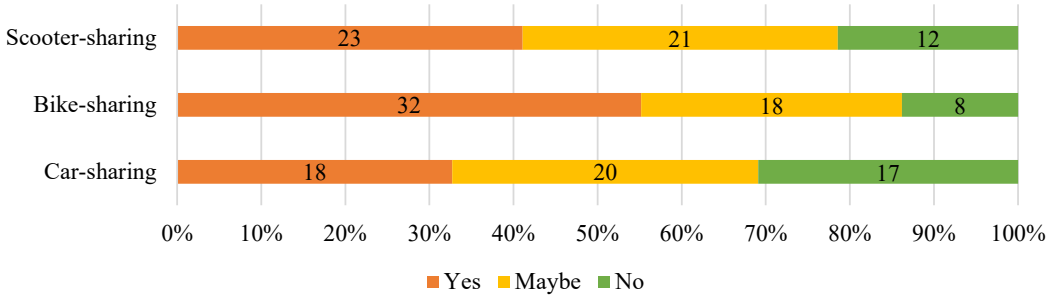


FIGURE 41-2. Distribution of tourist answers to whether they would use a vehicle-sharing system at the resort by type of transport mode. (Source: Population and Tourist Survey, 2019–2020)

The resort is more convenient for short distances to cover trips on foot, by bike, or by low-power electric vehicles. The car becomes essential when it comes to reaching places outside the town. A car-sharing system could improve the resort's accessibility to guests, while also serving locals. Compared to the residents, tourists prefer a transport-sharing system, regardless of the mode of transport, but such a system could benefit those locals, who are unable and unwilling.

Transport modal split goals for the 2030 year of Birštonas and Druskininkai are presented in **FIGURE 42**.

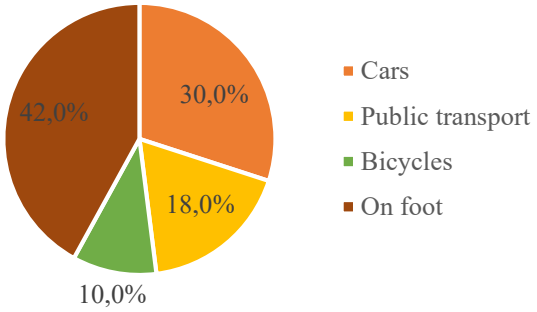


FIGURE 42. Prognosis for 2030 of the modal split of Birštonas (SUMP of Birštonas. The Sustainable Urban mobility plan of Birštonas resort. , 2017)

As shown in **FIGURE 42**, by the year 2030, the number of trips carried by private cars should decrease from 47.5 % to 42.0% (diminish in 5.5%). The number of bicycle journeys should grow from 2.5 % up to 10.0 % (an increase of 7.5%).

It should be emphasized that more than 100,000 guests visit Birštonas town every year, while the population of Birštonas is only 2,369 inhabitants. The tourism amount depends on seasonality, with the peaks on Easter, Christmas, New Year and other holiday celebrations.

The survey results were presented to the municipality and car-sharing service providers. After that, discussions with stakeholders were performed. The municipality was ready to provide parking slots for car-sharing vehicles. However, without charging stations, as there are none to this day. Business representatives confirmed that car-sharing vehicles could be used to drive to Birštonas from Vilnius, Kaunas and all other towns where service is provided. However, the user will need to pay for all the time he spends in the resort, and another user cannot use the vehicle. The company already performed an initial investigation in different towns, and found that currently, service is profitable in cities with a population of about 150,000; in a town where the population is 100,000 business model did not prove. It should be mentioned that the population is not the only driver that impacts the result, also the standard of living; the average age will have an impact. There are a few possible solutions, how to attract business companies. The first is to subsidize this transport mode, as it is done for public transport and railway transport in Lithuania. If municipalities can offer such a contract business may come

to the region. The second opportunity is to define an additional fee for the service user; however, to define this value pilot case is needed. The third opportunity, companies provide access to their platform for peer-to-peer service when people or small renting companies can share their vehicles using the well-known platform. However, the car sharing company is not ready for this, for fear of possible reputational risks. There is no clear vision of how to check the offered cars, their cleanliness, technical condition, etc. At the same time, the company is ready to share the platform for micro-mobility solutions. As in Birštonas, there are many renting spaces where bicycles and scooters can be rented, only with the limitations you need to return the vehicle at the same place and after the scheduled time. The technological solutions company currently may increase the attractiveness of such a service in the resort.

3.5. Case 8 Development of 1–3 safe water routes on the Onega Lake

3.5.1. INTRODUCTION OF CASE STUDY

The study aims to evaluate the accessibility and mobility of the Zaonezhye territory and the accessibility of transport services and the services in demand for further tourism development and providing better services for residents.

The MARA study covers the Zaonezhye area, which includes the large Zaonezhsky peninsula and the adjacent archipelago of the Kizhi skerries (about 500 islands) the area of 560 km². The northern border passes through a natural watershed north of the Zaonezhsky peninsula. It is a single unique historical and cultural complex with a historically established settlement system, which is administratively part of the Medvezh'egorsk municipal district of the Republic of Karelia. A large number of shallow rivers and deep-water lakes characterises Zaonezhye relief. The frequent alternation of elongated bays, lakes and long narrow rocky ridges with strict orientation from north-west to south-east. Historical transport routes for the Zaonezhye area are inland waterways (Lake Onega). Residents of Zaonezhye have created a particular type of boat – "kizhanka", popular on Lake Onega even nowadays. The road network is poorly developed due to the complex relief and water obstacles.

There are three rural settlements within the Zaonezhsky peninsula territory: Velikaya Guba; Tolvuya and Shun'ga. Each consists of many small villages (about 90 altogether); in some of them, residents live only during the summer season. The total population of the peninsula is about 3500 persons. The population has been declining for over the past ten years. Another trend is the population's ageing; young people leave mainly for the district centre Medvezh'egorsk and the regional capital Petrozavodsk.

The territory of Zaonezhye is famous by its' wonderful nature, historical and architectural monuments, the pearl of which is the UNESCO monument Kizhi island.

The State Historical, Architectural and Ethnographic Museum-Reserve "Kizhi" was established in 1966. In 1990 Kizhi was included into the UNESCO World Heritage List (Unesco).

The Kizhi State Nature Reserve of federal subordination includes the protection zone of the Kizhi Museum-Reserve. The protected area of the Kizhi Museum-Reserve is located within the 50,000-hectare; it was created to protect rare species of flora and fauna and waterfowl reproduction sites. The museum-reserve is also located close to the planned national park Kizhi Skerries (the second option is Zaonezhsky Nature Park) with 115,000 hectares, whose primary purpose is to preserve the natural and cultural values of the northern part of Zaonezhye.

There are several transport options for tourists and residents coming to Zaonezhye and Kizhi island. By railway: Oktyabr'skaya railway connects Moscow, St. Petersburg and Murmansk. People can come to Medvezh'egorsk station and then by local bus and car

travel to Zaonezhye. Automobile: one of the main roads is highway R-17 – the asphalted road of regional importance. It starts in Medvezh'egorsk, passes through several villages (Lavasguba, Perguba, Fedotovo, Sigovo, Keftenitsy, Shunga, Bor Pudantsev, Padmosero, Tolvuya, Purgino, Velikaya Niva) and ends in Velikaya Guba settlement. The length of the route is 120 km, low traffic, not developed infrastructure. There is only one petrol station located in Medvezh'egorsk. The road to Velikaya Guba through Kazhma, Uzkie and Kosmosero is becoming popular among tourists travelling by cars. This route to Velikaya Guba is shorter by 27 kilometres, runs through picturesque places, but the road is not designed for buses and other more oversized vehicles. A regular bus runs on the routes: 1. Petrozavodsk – Medvezh'egorsk – Velikaya Guba (Karelavtotrans state company); 2. Medvezh'egorsk – Velikaya Guba (IE Vinogradov V.V., LLC Petrotransport); 3. Medvezh'egorsk – Tolvuya (IE Vinogradov V.V.); 4. Medvezh'egorsk – Lambasruchey (IE Vinogradov V.V.).

The waterways of Zaonezhye have distinct features: i) Seasonality in operation (usually from mid-May to mid-November, about 180 days per year); ii) The need for construction and maintenance of appropriate infrastructure (including dredging) and maintenance of the navigation environment; iii) Inland waterways transportation of passengers is subject to licensing; iv) The waterways are non-alternative for residents of the Kizhi skerries as well as tourists visiting the Kizhi Museum-Reserve.

The Federal Maritime and River Transport Agency (Rosmorrechflot), establishes the categories of inland waterways defining the dimensions of ship's runs and navigational and hydrographic provision of navigation conditions for inland waterway sections, as well as the operating time of navigation equipment and hydraulic navigational structures. By order of Rosmorrechflot (December 17, 2018, № юц-455-р) in the period from May 15 to November 15, 2019, the following categories are established on inland waterways sections of Lake Onega:

- from Kizhi passenger berth to Velikaya Guba berth – the first category – with the fixed guaranteed overall size of the ship's sailing and the illuminated navigation situation;
- from the Garnitsky lighthouse to Velikaya Guba berth – 3rd category, the fixed guaranteed overall size of the ship's sailing and not illuminated navigation situation.

Simultaneously, during the inter-navigation period – before the beginning of displaying navigation equipment and after their removal and before the ice break, the 7th category of inland waterway maintenance is established (without guaranteed ship's passage dimensions and without navigation equipment).

Movement on the waterways of the White Sea-Onega basin has some restrictions. In particular, sailing vessels are prohibited in the Kizhi skerries, the speed of tourist's vessels shall not exceed 16 km/h, and in the section of the Longas strait – the northern tip of Kovylnik Island – 14 km/h. Movement of small and sailing vessels is prohibited on the territory of the ports. Movement of small size and sailing vessels in the Petrozavodsk ports area is allowed at least 500 meters from them.

Inland waterways of the White Sea-Baltic Canal, Lake Onega, and the Vodla River are serviced by the Federal Budget Institution "Administration of the White Sea-Onega Basin" in Medvezh'egorsk. During the navigation period: 1. Regular transport voyages on the route Petrozavodsk – Sennaya Guba – Kizhi Island – Velikaya Guba settlement – Petrozavodsk high-speed motorboats Kometa and Meteor types ("Hotel Karelia Tour Holding" LLC, the voyages are subsidised from the budget of the Republic of Karelia). During the navigation period of 2018, from May to October, 41 voyages were performed, and 5043 passengers were carried; 2. Regular and charter excursion and tourist voyages on the route Petrozavodsk – Kizhi – Petrozavodsk ("Hotel Karelia Tour Holding" LLC and "Karelia Excursion Bureau" LLC). During navigation in 2018 – 422 voyages of "Kometa" and "Meteor" vessels were performed to Kizhi Island; 3. Charter voyages for tourists and sightseers on the route Kondopoga – Kizhi – Kondopoga on 12 local boats of "Hitec-85C" type ("Tourist Company "Karelia Tour" LLC); 4. Charter voyages for tourists and sightseers

on the route Velikaya Guba – Kizhi – Velikaya Guba and other routes on 12 local boats of "Hitec-85C Taxi II" type (IE Bagaev S.V., "V Kizhi"); 5. The State Historical, Architectural and Ethnographic Museum-Reserve "Kizhi" has a license to carry passengers by six local boats "Nord Silver"; 6. More than 500 cruise ships arrive on Kizhi Island during navigation. Museum-Reserve "Kizhi" notes a trend of 5–10% annual growth of ship calls for the last five years (except 2020 when the number of boats visiting Kizhi island decreased due to corona crisis limits); 7. During the navigation 2018 period, more than 330 small vessels with passengers arrived in Kizhi Island; 8. Also, cargo and passenger transportation is carried out by private carriers on individual requests. In the water area of Zaonezhye, there are passenger berths on Kizhi Island (in the operational management of the Kizhi Museum-reserve), municipal berths in the village of Sennaya Guba and Velikaya Guba settlement (Velikogubskoye rural settlement). Passenger ships on the route Petrozavodsk – Kizhi – Velikaya Guba – Petrozavodsk and Petrozavodsk – Kizhi – Petrozavodsk are dispatched from the state berth in Petrozavodsk (tenant – Petrozavodsk Shipping Company).

Due to vehicles' limited capacity in the winter, tourist attendance on Kizhi Island from November to April (6 months) does not exceed 6 thousand people. While in the navigation period from May to October (6 months) the number of visitors and tourists reaches 200 000 people. There are no ice-class vessels for passenger transportation in winter in the Onega Lake water area. In the inter-navigation period:

1. Regular communication with Kizhi and Bolshoy Klimenetsky islands (Sennaya Guba village) is provided once a week by Mi-8 helicopter. The helicopter's passenger capacity is 20 people, the flights are subsidised from the budget of the Republic of Karelia.
2. "Hivus 10" Hovercrafts are used on the routes of Petrozavodsk – Kizhi Island – Petrozavodsk, Petrozavodsk – Bolshoy Klimenetsky Island – Petrozavodsk, Velikaya Guba – Kizhi Island – Velikaya Guba. The Kizhi Museum-Reserve has 6 "Hivus 10" Hovercrafts, four private carriers have 5 Hovercrafts. 3. Tourist companies carry out organised tours to Zaonezhye on snowmobiles, cross-country vehicles, motorcycles, dog sledges, skis.

In the inter-navigation period 2018–2019, the Kizhi Museum-Reserve performed 262 voyages on the route Petrozavodsk – Kizhi Island – Petrozavodsk and 128 voyages on the route Velikaya Guba – Kizhi Island – Velikaya Guba settlement. Private carriers have performed about 200 voyages on the same routes. The number of passengers is not considered because the voyages are off-schedule and may be related to the transportation of goods and residents or tourists' transportation.

There are transport helicopter flights on the route Petrozavodsk – Sennaya Guba – Kizhi Island – Petrozavodsk that is subsidised from the Republic of Karelia's budget. At the same time, there is no possibility to purchase tickets remotely – tickets are sold only at the ticket office in Petrozavodsk and not earlier than two weeks before the flight. These flights can be changed by the Rosgvardiya personnel and EMERCOM (rescue service) units located on Kizhi Island, limiting seats availability on board for the local population.

The main problems of transport accessibility in Zaonezhye region are i) Decreasing the water level of Lake Onega, which affects the possibility of passing passenger ships such as "Kometa" and "Meteor" to Velikaya Guba; ii) Classification of the waterway from the Garnitsky lighthouse to the Velikaya Guba berth as 3d category, which does not provide an illuminated navigation environment and makes it challenging to navigate in the dark from August to November; iii) The fact that the berths in Velikaya Guba village and Sennaya Guba village belong to Velikogubsky Rural Settlement does not provide the necessary funding for the maintenance and operation of the berths; IV) Construction of the road Velikaya Guba – Oyatevshchina village is not completed; V) The problem of garbage removal from the settlements of Kizhi skerries has not been solved; VI) There is no infrastructure for the operation of the small fleet in the territory of the Kizhi skerries (guest berthing facilities, material and technical supply and sanitary services for

ships, etc.); VII) Roadside infrastructure is not developed on the R-17 Medvezh'egorsk – Velikaya Guba roadway.

The current legislation seriously limits-development of private microbusiness in passenger and freight transportation. For example, more than 40,000 small fleet units are registered with the State Inspection of Small Fleet in the Republic of Karelia. To date, this small fleet (which is traditionally the primary mode of transport in Zaonezhye) is completely excluded from the legal sphere of commercial services. Except for the system problems, in transport availability of Zaonezhye, some essential organisational defects are noted:

- Petrozavodsk are subsidised from the budget of the Republic of Karelia. Simultaneously, the schedule (Friday evening and Sunday evening) is made so that the main category of passengers of these runs are seasonal summer houses' dwellers. Residents permanently residing in the territory of the Kizhi skerries do not have the opportunity to apply for public services, medical care, etc. during the working hours of the institutions during the working week except by purchasing tickets at the price of 2300 rubles one way (the price of the 2019 season). An additional factor that had a negative impact on transport accessibility was the cancellation of voyages to the Velikaya Guba during the navigation period 2019. Residents of Kizhi skerries, which are territorially part of Medvezh'egorsky District, cannot get to Velikaya Guba, from where there is a transport connection with Medvezh'egorsk;
- Residents of Kizhi skerries pay attention to the peculiarity of transport routes – it is easier to get to Petrozavodsk than to Medvezh'egorsk. But they need medical care and public services at the place of registration, i.e. in Medvezh'egorsk;
- Information on transport accessibility, routes and schedule of public transport flights is presented on the official website of Medvezh'egorsk District Administration in the section "Information on bus traffic organisation" and is displayed in an unreadable form.

So, all means of transportation to the area have restrictions and difficulties. Simultaneously, meetings and interviews with Shun'ga, Tolvuya, and Velikaya Guba residents believe that residents of mainland Zaonezhye evaluate transport accessibility as satisfactory.

Tourists assess the transport accessibility of Zaonezhye as unsatisfactory under the following circumstances: 1. High cost of transport services by water during navigation (2950 rubles, during the 2019 summer season it was about 42 Euro/person travel "back and forth" Petrozavodsk – Kizhi Island – Petrozavodsk with a 4-hour stay on Kizhi Island; or 2300 rubles, about 33 Euro/person one way when buying tickets for different dates). 2. There are no alternative transport and excursion routes by water transport in Zaonezhye; 3. Tourism infrastructure along the route R-17 Medvezh'egorsk – Velikaya Guba is not developed.

3.5.2. SWOT ANALYSIS

STRENGTHS	WEAKNESSES
→ Tourism potential of the territory: remarkable nature, fascinating and attractive tourists' destinations in the Zaonezhsky peninsula as well as the Kizhi museum; → Geographical location on the Lake Onega offers the advantage of water access to the White Sea and the world ocean via the White Sea-Baltic Canal. There is also some water-related infrastructure (transport, tourism) which are to be developed in Zaonezhye. → Relatively few industrial facilities that pollute the environment. The Zaonezhye area has a relatively small number of polluting industrial facilities (operating quarries for shungite, crushed stone, sand and trout farms). → There are also several historical villages in Zaonezhye currently uninhabited and could be used for tourism and recreational infrastructure. → An extensive network of roads forming the "big" and "small" rings of the Zaonezhye region is projected to be repaired and/or rehabilitated in the area. Construction of the 31.3 km Velikaya Guba – Oyatevshchina road should be completed by June 30, 2023. → A series of berths for small vessels, cargo and passenger vessels, and cruise ships are planned for repair and/or construction in the area, which will help take full advantage of the peninsular's potential and advantages skerry location of Zaonezhye.	→ Some isolation from overland transport routes. The nearest federal highway ("Kola") is 55 km away from the village of Shunga (the closest major population centre to the route). This creates traffic speed limitations and eliminates tourists' transit flow by road, contributing to the isolation from logistics flows. → Low quality of roads and road network at present. Poor roads complicate travel, increase travel times, and contribute to increased wear and tear on vehicles. This significantly affects the flow of visitors, reducing the mobility of the local population. Another adverse effect is the reduction of tourist attraction: bad roads create negative attitudes towards settlements and tourists, guided by them, do not repeat their trip. → The low quality of the current engineering infrastructure makes it challenging to provide quality services to the local population and tourists, reducing comfort and quality of life. → Littering of the area. Currently, there are no landfills on the territory that meet modern requirements. There is no effective scheme for the collection and removal of waste from the Zaonezhsky peninsula. This leads to gradual littering of the territory and increases the severity of this problem, reducing its recreational attractiveness. → Low availability of medical services to the population and tourists at present. This is significantly negative in the island part of Zaonezhye. → Lack of qualified personnel in the settlements. In the absence of local personnel, there is a need to import them from outside the settlement, which increases the investor's costs and makes the process longer. → Unattractive aesthetic appearance of settlements. Lack of street lighting, pavements, a large number of ruined buildings. Poor technical condition of many monuments of wooden architecture. New houses are built based on (or without any) design, often inconsistent with the cultural and historical context.

OPPORTUNITIES	THREATS
→ Increasing interest in the Russian waterway and ecological tourism by foreign and Russian tourists. The interest is caused by Russia's unexplored territory, while in Europe, water tourism (yachting) is most widespread. Foreign ship owners and tourists show their willingness and readiness to organise water tourism in Russia. This is especially important for the north-west of Russia, which has convenient water exits to the world ocean. We can see a trend of development of yachting and tourism among Russian tourists. → Changes in legislation related to the use of small vessels and foreign vessels' passage in the Russian Federation. → Implementation of major tourism projects in Karelia. Projects related to the development of tourism in Karelia are being developed at the federal and regional levels.	→ Degradation of landscapes, reducing their attractiveness. The current plans for using the territory will lead to the destruction of valuable natural areas and, consequently, to the loss of its stabilising functions' existing natural framework. → Suppose disruption or insufficient allocation of further deterioration of the road network will lead to increased isolation of the area, reduce attractiveness for overland travellers, and have a negative impact on the settlement's image. In that case, it will significantly reduce the quality of life of the population. → The increased outflow of the population, especially young professionals and school graduates. In addition to reducing the attractiveness of Zaonezhye for investors in attracting local labour force, the decreasing population leads to a lower level of budget financing, which directly depends on the number of residents.

3.5.3. THE TARGET GROUP OF USERS

During the initial project implementation stage, service users were identified. They are residents, tourists, and seasonal summer cottages' dwellers.

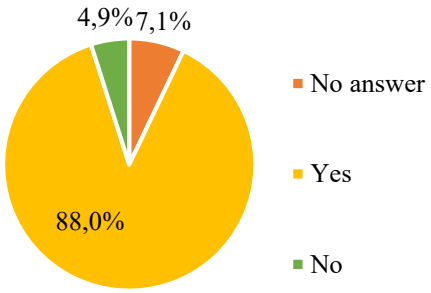
3.5.4. SURVEY

In June – mid-September 2020, the Tourist Information Centre of the Republic of Karelia organised a sociological survey to assess the accessibility and mobility of the Zaonezhye territory and identify people's motivation to visit this area. This research will improve the accessibility of the territories and identify and solve the problems of remote areas of the Republic of Karelia. The research is conducted within the international MARA project framework by the Autonomous Non-profit Organization "Centre for Social Tourism Development". This work continues research done in 2019: mostly, it aimed to ask tourists about visiting Kizhi island.

In 2020, the interviewers were interested in travel, the accessibility of transport services, the services in demand in the remote areas of Zaonezhye. The Survey was conducted in Oyatevshchina, Velikaya Guba and on the islands of the Kizhi skerries. This is the first time such work has been done in the territory of Zaonezhye in the last few decades.

This study involved 2,500 people who live in Russia and the Republic of Karelia. In total, the respondents included representatives of 84 cities and regions (apart from Karelia). The most significant flow of tourists was observed from Moscow (20.7%), Petrozavodsk (19.3%), and St. Petersburg (13.6%). Only two foreign guests were recorded due to the coronavirus restrictions in 2020, Kyiv (Ukraine) and Brest (Belarus). The Survey showed that the primary purpose of visiting Zaonezhye is tourism for most respondents (74.7%), while one in ten respondents (8.8%) is a resident. The most important reasons for visiting Zaonezhye: enjoy the beauty of Karelian nature (77%); visit Kizhi Island (67%); learn about the cultural and historical heritage of the country (47%); escape from the city bustle (40%) and spend time with family (34%). The overwhelming majority of respondents (88.0%) had expectations after visiting the territory of Zaonezhye that was justified **(FIGURE 43)**.

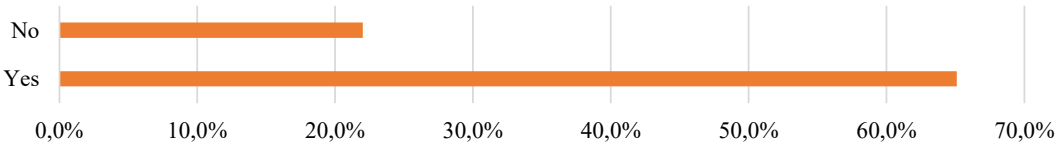
FIGURE 43. Were your expectations after visiting Zaonezhye fulfilled?



61.9% of the respondents, visited the territory of Zaonezhye, for the first time; almost 30% of the respondents had visited the territory before **(FIGURE 44)**. This year, the vast majority of respondents (86.2%) are independent travellers.

More than half of the respondents (65.1%) are willing to come to the territory of Zaonezhye to an equipped paid car park with all the amenities (catering facility, rubbish collection, toilet, etc.).

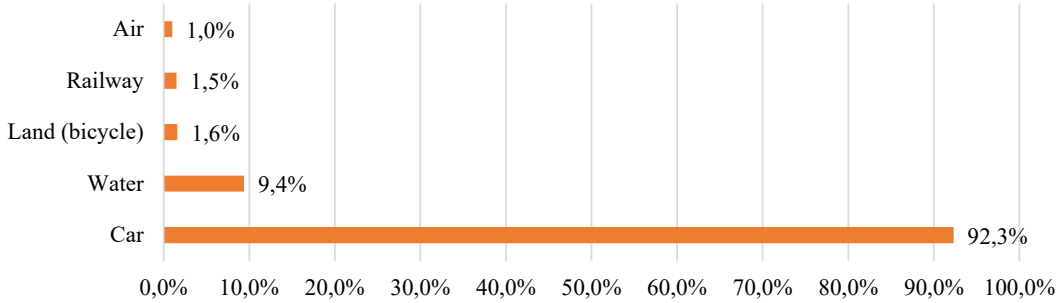
FIGURE 44. Are you willing to come to a paid car park to rest with all the amenities?



The highest score for accessibility in Zaonezhye was given to the cashless payment service in shops, petrol stations, etc. (the average score for this service was 7.86). The lowest score was given to the catering service (the average score was 5.24).

The priority mode of transport for the vast majority of respondents (92.3%) when travelling to Zaonezhye is road transport **(FIGURE 45)**. Every tenth respondent (9.4%) chooses water transport. 1.6% of respondents chose land transport (bicycles) and 1.5% rail transport. Only 1% of respondents chose air transport.

FIGURE 45. How did you get to Zaonezhye?



The average score in assessing the accessibility of transport services between Petrozavodsk and Zaonezhye was 5.67.

Most respondents mentioned problems affecting the accessibility and mobility of the area. The first group includes travelling issues to Zaonezhye (low road quality, lack of petrol stations, tire service, insufficient number of information signs along the way). The second group of problems is related to roadside services for tourists (need for free

equipped parking places, campsites, toilets, shops and cafes along the road, availability of waste disposal service). Residents draw attention to the importance of resuming social flights from Petrozavodsk by water transport, solving electricity outages, low availability of medical, and social services.

3.5.5. EVALUATION AND TESTING

Based on the preliminary analysis, some recommendations can be considered to improve mobility and accessibility situation in Zaonezhye:

1. Road infrastructure development, including road construction, parking places, petrol stations, etc.
2. Reconstruction/construction of the berths
3. Development of pedestrian and bike routes and infrastructure in Zaonezhye
4. Change of helicopter ticket sales' system by organising the online sale.
5. Development of information resources, both on the Internet and installing a number of information and navigation signs in the territory, can provide tourists and residents with adequate and timely information concerning transport possibilities and means.

3.6. New business models for mobility in rural areas

Mobility management is not a new topic in the EU, but all the problems and solutions are still analysed and prepared just for the biggest towns and cities. It's often been assumed during the last fifty years that passenger cars were the primary transportation mode. However, in some smaller towns or resorts, this is not reflecting the actual situation. Some countries like western parts of central Europe (Netherlands, Belgium) and Scandinavian countries have long traditions for non-motorized vehicles use.

Existing mobility solutions are commonly fragmented and oriented mostly towards service providers but not towards end users. A system or platform that will combine different transport modes and even propose different choices is needed. Technological solutions with distribution between price, service level, and environmental impact are needed to reach this goal. Such solutions may be created by developing all in one mobility ecosystem, where mobility in rural areas will be a part of the whole system.

Analysing business models of companies such as Uber, Amazon, and others, there is a very high possibility that a new platform that will combine different transport modes performing in urban areas with possible extension to the rural ones will emerge soon. Solutions in IoT will connect vehicles and infrastructure to such a system as well.

A business model's definition can be formulated as the design or architecture of the value creation, delivery, and capture mechanisms employed (Teece, 2010). The value creation dimension refers to the mechanisms that describe 'what the company does' by expressing the firm's essential resources, activities, and processes. For platforms, this includes the central architectural technology and how the platform integrates supply-side participants. The value delivery dimension describes elements that define what, how, and to whom value is generated, including the type of customer segments that the marketplace primarily connects (Consumer-to-Consumer (C2C); Business-to-Consumer (B2C); Business-to-Business (B2B)). The value capture dimension describes how the firm intends to transform the created and delivered value into revenues and profits (Rothe, Taeuscher, & Basole, 2018).

In **TABLE 17**, possible ways of value creation, delivery, and capture for mobility services are presented.

TABLE 17. Value in business models for mobility (crated by authors based on (Curtis & Mont, 2020)

	ATTRIBUTES	ALTERNATE CONDITIONS					
Value Creation	Key activity	Platform mediation allowing increase effectiveness of existing mobility system					
	Platform type	Peer-to-peer	Business-to-business	Business to peer	Crowd/ cooperative	Not-for-profit	
	Usage model	Round trip		Point to point		The free-floating	
	Users	Residents		National tourists		International tourists	
	Field	Car sharing	Public transport	Micro mobility	Privately owned cars	By foot	
	Intellectual property	Open source		Communal		Proprietary	
	Governance model	Cooperative		Collaborative		Corporate	
	Price discovery	Free	Pay what you can	Negotiation/ bargaining	Set by user	Set by a service provider	Set by platform
Value Delivery	Key value proposition	Cost reduction			Increase in service level		
	Mediating interface	Smartphone app	Website	Third-party app (Facebook)		Offline information board	
	Venue for interaction	Offline		Online		Hybrid	
	Feedback system	Provider review	User review	Platform review		None	
	Geographical scale	Community	Local	Regional	National	International	
Value Capture	Value orientation	Societal/Public	Social	Environmental		Commercial	
	Revenue streams	None	Commission	Membership	Sponsorship	Project funding	
		Transaction fee	Subscription fee	Advertisement		Donations	
	Pricing mechanisms	None	Static pricing	Dynamics pricing		Differential pricing	
	Price discrimination	None	Feature-based	Location-based		Quantity-based	
	Revenue source	None	Volunteer	Other	Resource owner	Resource user	3rd-party

The platform itself leads to an increase in transport management's effectiveness via the digitalisation of processes, such as vehicle monitoring in real-time, demand prognosis. The mobile app may simplify service usage for residents and tourists. There are five platform types, but most attractive in rural areas would be peer-to-peer and not for

profit. In the first case, service providers could be individuals renting vehicles, with a round trip usage model. In the second case service providers may be companies that main business is not transportation. However, where car sharing could increase their primary activities' service level, such an example could be hotels. Companies with B2C business models may be interested only if service will be part of a whole system. The service may be on demand, for tourists and residents when they need to get from the airport to rural areas. However, to launch a B2C business in rural areas with a small population and low density, it is economically unreasonable for the company. Business companies may enter the market if their losses are subsidized. Governance models, as well as intellectual property issues, must be addressed individually. Price discovery may be organized differently, but car sharing most likely is two: set by the service provider, or by the platform.

The value orientation of new services in rural areas should improve the living standards of residents and tourists. Therefore orientation should be societal/public, taking into account business interests and environmental requirements. There are different possible revenue streams showed in **TABLE 17**, and they may change during different implementation stages. In the beginning, it may be project funding to test the idea and launch the pilot case; later, it may be a transaction fee or commission. Different pricing is used in current mobility platforms; such a scheme means what final price will depend on demand, destination, and other parameters. It may be a solution for new services in rural areas as well. Sometimes in platforms, price discrimination may be used; for example, if drivers of a particular age group are more likely to break the rules or cause accidents, price discrimination may be applied. The penalty can be applied if the user will leave a vehicle where it will not be rented, and the company will need to return it to the main area. However, it is not possible to go beyond the point at which unjustified discrimination begins.

Implementing the idea of a platform that will combine different transport modes in urban and rural areas cost reduction may be one of the KPI; it may be reached by optimising the fleet management system. The second point increases in service level, it may be reached having real-time data about demand, available vehicles, and ordering service with a mobile application. Other mediating interfaces as an offline information board and third-party apps (for example, Facebook) are not needed. Additionally, for smartphone app website may be used. Ass in all platforms feedback system may be used for a service provider to rank the user, and for a user to rank the service provider (for example if the car was prepared for the trip, has been washed, etc.). Such a system may be launched in the local area or region. To test the idea of the all in one mobility system, it is better to have a pilot case on a national level, by creating a new platform, or extending existing ones' functionality.

There are different possibilities for app development. First of all, an app for the selected rural area may be developed. However, the effectiveness of such a solution needs to be investigated before the developing stage. The main risk is that the project will be unprofitable, as the population in a rural area is low, and tourists may not be interested in installing a new app just for single usage. The solution may be renting existing software solutions, for example, Atom Mobility, or others. The next solution is cooperation with existing service providers in the market. For example, companies providing micro-mobility services may be interested in giving their app access to renting companies working in the region. Theis apps are well known in bigger cities, so many potential users already have them; they can also make money. For conventional renting companies, it is upgraded to their service and possibilities to attract new users. The situation in car sharing is somewhat different. Car sharing business representatives see many risks and are not willing to access their app to third parties such as conventional renting companies or individuals. The car sharing company's primary risk is that they cannot ensure the rented vehicle's technical condition. If the accident happens, everybody will associate it with car sharing company but not the individual who provided a vehicle.

The application's visual concept should be prepared in the form of a region map with a marked network of routes. It would be great if traction objects are provided in the app;

such an option will help tourists. The application should contain information about the route, length, coordinates of cars, or bicycle stops. Furthermore, it should be compatible with GPS navigation, which will allow connecting routes freely. Besides, to congruence the application with other means of transport (the principle of parity, a departure from thinking about routes only as a form of recreation), the application should contain data coordinates of buses and trains stops available on a given path along with information about the timetable, routes served and contact to the carrier.

4. Conclusions and discussion

With negative population changes in rural areas, implementing the new connectivity achievements, people's mobility must be ensured inside the regions and with other country's administrative units. Alternative and innovative solutions are needed without restricting people's mobility in such areas. New solutions will increase the attractiveness of the regions for the residents and tourists. In the long term, these decisions will change the mobility habits or even stabilise the migration trend.

Sustainable Urban Mobility Plans are developed all over the BSR countries. At the same time, connectivity issues between the cities, resorts and other attraction locations in rural areas are commonly not taken into account. Integrated mobility plan may be the necessary tool used from the early phase of infrastructure planning. Such a case study was investigated concerning Sälen/Trysil area in Sweden.

Currently, the most popular transport mode in rural areas is privately owned cars. Such a solution has a high comfort level, regardless of high price and negative environmental impact. Different micro-mobility solutions, such as e-bicycles, scooters, etc. can change existing distribution and decrease number of cars. Reviewing recent solutions in the field of micro-mobility popularity of e-scooters is continuously increasing in urban areas. However, for rural areas, electric bicycles have some advantages; the most significant is driving on uneven road surfaces. Existing infrastructure elements may be used for bike paths; at the same time road roughness is critical for e-scooters. During pilot implementation, some participant noted that they experienced difficulties during the trip due to electric bicycle speed limitation, battery discharge, other technical issues. Therefore, bicycle specifications should be selected depending on the region; existing infrastructure; and other aspects specific to the area.

It is impossible to refuse car usage; however, we need to improve their usage effectiveness. Such a solution may be car-sharing services. The car-sharing service advance comparing with the ride sharing and taxi-sharing is absolute privacy in journeys. Analysis of existing solutions showed that car sharing services are widespread in urban areas, with more than 100,000 inhabitants. Some service operators are working in areas with low people density; however, they are focused on the increase in market share, not profitability.

Sharing mobility providers working in urban areas do not expand to rural areas as the existing business model is not profitable. There are a few possible solutions, how to attract business companies to remote areas. The first is to subsidise this transport mode, as it is done for public transport and railway transport. If municipalities can offer such kind of a contract, a business may come to the region. The second opportunity is to define an additional fee for the service user. If the vehicle is left in a rural area, and there are no other orders, additional costs for companies appear during returning vehicles from such an area. Automated driving technology can solve the problem of returning the vehicle from such area or relocating it autonomously. Also, it will increase mobility for the elderly or disabled people. The third opportunity, companies provide access to their platform for peer-to-peer service when people or small renting companies can share their vehicles using the well-known platform.

A Flexible Transport System may be one solution to emerging challenges of transport accessibility in rural areas, which have a low population density. A new business model is needed, where the central part will be the platform that aims to provide passengers with flexibility in choosing transport modes, including conventional solutions, sharing services, micro-mobility solutions, public transport on demand, inland water transport; times; routes; etc. The solution should be person-oriented. Currently, primary attention is given to urban territory; mobility is not practical without a privately owned car for many people leaving in rural areas. Usually, the platform does not work properly without including micro-mobility possibilities for the first-last mile of the journey.

The best practices were identified during project implementation; few of them are presented below.

During the Project implementation for the case studies, different kind of surveys were performed. The case of Norway may be discussed separately. The invitation to participate in the survey was communicated via SMS to all citizens within the area. The SMS invitation contained a link to the survey. Such a system allows to involve a large part of the population into the survey, and results are reliable. Together no private or personal data are collected during the survey, and all replies remain anonymous following the General Data Protection Regulation.

The Strategic Choice of Measures Methodology constitutes four phases and maybe a useful tool. At the initiating phase, a study is organised based on preliminary assumptions of the problems and possible solutions. It is also at this phase where resources are determined and actors at various planning levels engaged. The next phase is about understanding the situation where the problem is further delimited, and up-to-date information is collected about the problem. In the third phase, people with different skills, habits and responsibilities are testing possible solutions. The most efficient measures are assembled and compared in an in-depth analysis. The fourth and final phase is about forming a direction and recommending actions. Here actors proceed with action considered to be the most effective. Such a methodology can allow rational use of available resources and during the decision making.

Digitalisation is becoming a central figure for developing new mobility solutions. There are different possibilities for the development of Apps that can be used for mobility purposes. One of the possible solutions is renting of existing software instead of developing original one. There are advanced solutions for hotels and guest houses that want to operate a small fleet of scooters or bikes as an additional service dor tourists. Platform's website or App can provide additional information about journey options and prices and help a user choose the best existing service for a particular case.

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Annex A

Feedback form result summary from Valmiera pilot location (results from a second location show similar findings)

DID YOU ENJOY THE RIDE ON AN ELECTRIC BICYCLE?

yes	no	not specified
195	0	42

HOW A LARGE GROUP OF PEOPLE WENT ON A TRIP?

1	2	3	4	5	6	not specified
28	105	29	23	4	1	47

WHAT WAS THE LENGTH OF THE TRIP (KM) AND / OR THE DURATION (H)?

average distance (km)	min distance (km)	max distance (km)
15	1	50
average duration (min)	min duration (min)	max duration (min)
84	10	180

DID YOU EXPERIENCE ANY DIFFICULTIES DURING THE TRIP DUE TO THE USE OF AN ELECTRIC BICYCLE?

no	yes	not specified
175	18	44

HAVE YOU USED AN ELECTRIC BICYCLE BEFORE?

yes	no	not specified
49	162	26

WHAT WAS IT USED FOR IN THE PAST?

For tourism/ leisure trips	For daily travel needs	Work mobility	Shopping	For short distances, replacing trips by car	Other
29	8	2	2	6	2

DO YOU OWN AN ELECTRIC BICYCLE?

yes	no	not specified
3	69	165

WHY HAVEN'T YOU BOUGHT AN ELECTRIC BIKE?

I haven't tried it – I feel insecure	Expensive purchase	There is nowhere to store	No need in everyday life	I haven't considered buying	Other
5	45	2	11	17	7

DO YOU EVER WANT TO GO ON AN ELECTRIC BIKE TRIP AGAIN?

yes	no	maybe	not specified
183	1	5	48

IF YOU DO NOT YET HAVE AN ELECTRIC BICYCLE, BUT WOULD HAVE THE OPPORTUNITY TO BUY ONE, WOULD YOU DO SO TO USE IT FOR EVERYDAY TRAVEL?

yes	no	maybe	not specified
134	6	46	51