

Modern Mobility OÜ

**Developing and piloting the demand responsive transport service  
model in Saaremaa as part of the Interreg BSR “RESPONSE”  
project**



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## SUMMARY

The Interreg BSR "RESPONSE" project seeks to develop and coordinate existing publicly funded transport services. The project addresses the transport challenges in sparsely populated areas. One of the tasks of the RESPONSE project (GoA 4.3) is to create and implement an innovation process in areas where there is currently no satisfactory demand driven public transport. The aim of this paper is to develop a DRT service model based on the pilot carried out on the Sõrve peninsula in Saaremaa that would best meet the needs of the local population and local public transport organizer (PTO). The business model helps to prepare and later analyze the DRT pilot project in Saaremaa, as well implement the innovation process in other sparsely populated areas in the Baltic Sea region. The author, Modern Mobility, uses its expert knowhow to develop the model. Also feedback from the users, local PTO and other participants in the pilot project was used. Among the 120 registered users of the VEDAS service a Google Forms based survey during 20.08 - 25.09.2021 was organised. 50 (47.1%) responses were received. Statistical data concerning the service provision was obtained from the VEDAS DRT service data repository.

The following three research questions were posed to reach the research objective:

1. Which characteristics must the DRT service model meet?
2. What does the DRT model look like in Saaremaa?
3. What are the conclusions and recommendations derived from the Saaremaa pilot project to introduce DRT service in other sparsely populated areas?

The results obtained from the service model development process are:

- 1. Which characteristics must the DRT service model meet?**
  - a. The transport operator and local population must be willing to use DRT service.
  - b. Clear business rules for operating the service: 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher.
  - c. Ordering the service must be as flexible to the client as possible.

- d. Establish a steering group responsible for the development of the service model.
- e. Establish key performance indicators in the steering group to evaluate the service delivery and improve it.
- f. The service must be aimed at continuous improvement, to meet the expectations of the clients.

## **2. What does the DRT model look like in Saaremaa?**

- a. The inhabitants of the Sõrve peninsula in Saaremaa would gladly continue to use DRT. Out of 50 respondents 49 (98%) confirmed this. The service received a very high rating of 6.62 on a 7-grade scale (1-weak, 7-excellent). 43 out of 50 respondents are willing to contribute also using co-financing (86%).
- b. In order to sustain DRT in Saaremaa:
  - i. There is a need for the inhabitants of the Sõrve peninsula to move and the willingness of the transport operator to provide DRT in sparsely populated areas.
  - ii. The business rules have been defined: 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher.
  - iii. In order to develop the service model: 1) Steering group has been established, 2) Mechanism for obtaining continuous feedback has been established and 3) Key performance indicators have been established to monitor DRT service, analysed and assessed monthly whether the service model should be altered.

## **3. What are the conclusions and recommendations derived from the Saaremaa pilot project to introduce DRT service in other sparsely populated areas?**

The following five aspects for transport operators and local governments that are interested in introducing the DRT service model in sparsely populated areas:

- a. While planning the DRT service, think through the business rules concerning its planning and implementation.
- b. Test DRT service model in the community.
- c. Conduct a survey to find out the mobility needs.

- d. For launching DRT, areas that are not covered sufficiently with the current public transport routes suit well.
- e. Allowing various target groups to use DRT ensures a sustainable number of passengers and fulfillment of the vehicles.

**Key words:** DRT, “last mile”, public transport, service model

## INTRODUCTION

The concept of demand responsive transport has been in a wider use since 1960 when the client notified the dispatcher about his/her riding request, who then passed the information onto the bus driver. The developments of digital solutions have created a new era in needs-based transport, as the client can notify about his/her riding request using a mobile app or web-page and the digital system forwards it into delivery. Uber, Bolt and Yandex are just some examples that do not need further introduction, but in principle it is based on ordering a vehicle to wherever you need, if you are in the service area of the vehicles and the provided service. These services are often concentrated in densely populated areas and do not offer the possibility to share a ride that is crucial while providing demand responsive transport in sparsely populated areas.

The research problem has insofar not been studied sufficiently in Estonian context, but which was addressed in the Interreg BSR “RESPONSE” project is as follows: what kind of demand responsive transport (DRT) service model suits to be deployed in sparsely populated areas?

The objective of the current research is to develop a DRT-based service model that meets the needs of the local population and the public transport organization. The research is based on the results of the practical pilot carried out in Saaremaa, on Sõrve peninsula. The following three research questions have been posed to reach the research objective:

1. Which characteristics must the DRT service model meet?
2. What does the DRT model look like in Saaremaa?
3. What are the conclusions and recommendations derived from the Saaremaa pilot project to introduce DRT service in other sparsely populated areas?

Modern Mobility uses its expert know-how and feedback obtained during the practical piloting from the clients, local PTO and other stakeholders in the frames of the defined research questions.

In developing the service model, the experience of Norwegian transport operator RUTER in implementing innovation processes is taken into consideration. The applicability of the solution to be used in other local governments on a wider scale is also paid attention to.

The current paper consists of three chapters. The first subchapter of the first chapter studies the different terminology used in the DRT concept, principles of DRT performance and tackles components characterising DRT. The second subchapter in the first chapter explains how to implement the DRT service model and gives 20 recommendations for its delivery. The third subchapter describes the DRT service model implementation in Saaremaa. The fourth subchapter includes the business logic for both transport operators and local governments to be considered while implementing the DRT service model. The fifth subchapter contains a PESTEL analysis on the implementation of DRT service in Saaremaa.

The first subchapter of the second chapter focuses on how the research was conducted. In the following subchapter, sampling and how data was collected is described. The chapter gives an overview of how the data was obtained and information collected.

In the last chapter conclusions on the piloted DRT service model and implemented research will be formulated, together with interpretation and analysis. The chapter answers the posed research questions.

The paper is composed both in Estonian and English so that a large number of local governments could access and understand the service model.

APA methodology is used in citing.

# **1. DEMAND RESPONSIVE TRANSPORT MODEL**

In this part of the paper, Modern Mobility describes how the definition of the DRT model has been used in different research papers and which preconditions must be met to deliver DRT service. Implementing the DRT service model requires a certain type of maturity in the society. Therefore also the preconditions and requirements necessary for a functioning solution are described.

## **1.1. DRT service model**

The concept of demand responsive transport (DRT) has been in use for five decades. It became widespread in the 1970s in the USA and later in Europe when the “dial a bus” service was introduced: the client notified the dispatcher about his/her riding request, who then passed the information onto the bus driver (Coutinho et al., 2020, 2). In the contemporary rapidly developing digital environment DRT can be considered as a branch of public transport that enables people to move from locations or in times where or when the regular route-based bus transport is not accessible. It is an innovative solution, where people are not dependent on the fixed bus schedules, but can organise rides when necessary, in terms of location and time. The local PTO can use the DRT model and the software necessary for its launch and deployment also in areas where the traditional public transport did not reach.

The current DRT platforms enable to order a ride either using a dispatcher or client application, offering thus different target groups the most suitable form of ordering. DRT platforms provide optimization at individual level, taking into consideration the needs of the client. Besides the need to improve the effectiveness of transport and the related environmental and societal benefits, DRT improves commuting experience that currently is considered one of the least enjoyable daily practices. Various authors define DRT differently, the following is a selection of them:



- DRT can be defined as a public transport service that uses taxis, minibuses or small buses that travel flexible / semi-flexible routes following a given schedule or fixed / semi-fixed routes (Grieco, 2021, 87-93)
- DRT is a road-based alternative to public transport that uses minibuses or pick-up vans that do not follow a fixed schedule. DRT uses flexible routes that allows it to cover geographically large sparsely populated areas. The system is based on pre-booking schemes that combine new and old technologies (such as ordering rides by landline). (International Bank for Reconstruction and Development / The World Bank, 2019, 26)
- DRT offers the passengers “on demand” transport using a vehicle fleet that registers the time of picking up and laying down the passenger. DRT is a means of transport in between a bus and a taxi that covers a wide range of transport services, from less official communal transport to service networks covering the whole area. (Mageean & Nelson, 2003, 1)
- DRT system is a combination of route based public transport and taxi services, ensuring flexibility between the transport services to be ordered (Gorev et al., 2020, 1)

The wide-spread deployment of DRT based on digital solutions has been enhanced by the rapid technological development and increased use of smart devices with constantly available Internet access during the last decade. The main daily mobility needs - to work, school, shop, travel, social occasions, attend cultural activities or social services etc - demand faster, convenient and more accessible public transport to compete with the increasing use of private cars. One solution to this problem are software platforms that help to bring together mobility, demand and offer and to change the prevalent paradigm of public transport through automatization. See Figure 1:

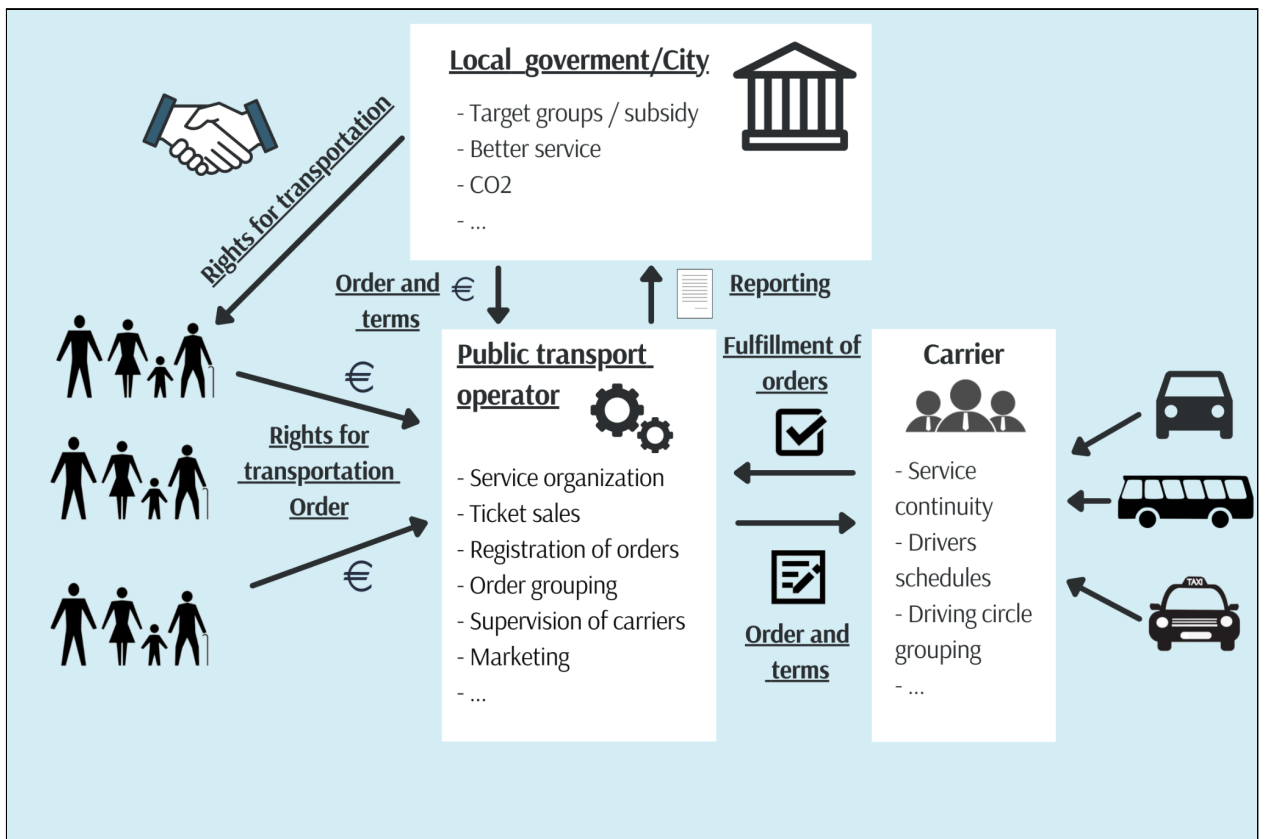


Figure 1. DRT service model (Modern Mobility, 2021)

The following is an overview of the main characteristics and elements of DRT that should be put into practice as follows (expressed not in hierarchical sequence):

1. **Single platform** - DRT management application based on digital solutions that enables:
  - a. **For the passenger** - registering as a client and managing your profile, ordering rides by phone with the help of the dispatcher or directly using the client application that enables to use all services necessary for one's rides: planning and booking the ride, paying for the ticket, information in real-time (changes in ride, availability of rides etc.). The users also have access to other additional services on the platform, such as history of rides, billing, feedback.
  - b. **For the operator** - launching and delivery of DRT service.
  - c. **For the dispatcher** - registering passengers and drivers into the system and their respective management, filling in the orders, developing routes for the drivers, providing overview of orders completed and informing clients or drivers (e-mail, sms, by phone).

- d. **For the drivers** - managing the routes allocated by the dispatcher (viewing the tasks, starting, finishing and stopping the orders).
2. **Various stakeholders** - the platform brings together different stakeholders:
    - a. **Software provider** of DRT software.
    - b. **Operator** that provides transport solutions following the business rules in force and who sells the tickets.
    - c. **Local government** that wishes to offer improved mobility possibilities in densely populated areas. Acts also as a regulator.
    - d. **Service provider** that compiles the fleet and selects the drivers. The service provider is in contractual relationship with the operator or local government.
    - e. **Driver**, who delivers the service. Could be self-employed in a contractual relationship with the service provider.
    - f. **Client**, who follows the regulations prescribed by the operator and the local government.
3. **Business rules** - main rules necessary for delivering the service that guarantee its functionality:
    - a. Which is the target group for whom the service is provided?
    - b. Who are the drivers and whose fleet is used?
    - c. What is the pricing model for the passengers (free of charge, paid service)?
    - d. Working schedule of the drivers and dispatcher.
    - e. Time of operations.
    - f. Service provision regulations for the client as an explanatory how DRT is organised. For a detailed example, see Appendix 1 “Standard terms and conditions of service for public demand-response passenger transport in Saaremaa municipality (pilot project)”. The document explains the legal regulations on how to organize DRT services. The standard conditions could be used also in other countries, by adjusting them to the country-specific legal settings.

4. **Pricing possibilities** - allows transport operators to set fixed and dynamic pricing policies according to the target group and subsidy, enabling better management of local government's budget. Subsidies by the operator allow cheaper rides for the clients.
5. **Demand driven** - DRT is customer oriented that takes into consideration the needs-based rides of the client. The client notifies about his/her need using the DRT platform and a ride is generated for the client respectively.
6. **Combining different technologies** - digital solutions based DRT service combines landlines, mobile and smartphones, reliable mobile Internet network, sms services, e-ticketing and paying system. The digital platform interconnects ticket selling systems, IT systems of bodies responsible for transport organization / operators, webmaps application software and software bringing DRT together as a single digital solution.
7. **Registration possibility** - following the business rules set by the operator, registering on the platform may be obligatory in order to access DRT services.
8. **Personalization** - a DRT service personalised to the needs of the user will ensure that the end-user's requirements and expectations are effectively met, taking into account the uniqueness of each customer, whether he or she is a person in need of regular transport, a person in need of social transport, a schoolchild, or any of the four focus groups where, within the framework of business rules, the local authority or the operator has decided that such a target group should be served.
  - a. In case of social transport the special needs of the clients must be taken into consideration. The service should be "from door to door", the drivers must have passed specific training and the vehicles must meet the specific needs (e.g. wheel-chair accessible). The DRT software must have a specific functionality that would allow the client a flexible time for returning. The majority of "social drives" are for the client from home to visit a doctor. It is very difficult to estimate how long a visit to the doctor might last and the business rules of the service and corresponding software must be adjusted accordingly.

- b. In case of school transport the DRT software must include an automatic notification module to the parent that informs when the child was picked up or reached his/her destination in order to ensure the confidence of the parents that the child is safe.
- 9. **Adaptation** - the adaptive software platform enables local government / transport operator to adjust the digital DRT platform to meet the needs stemming from the set business rules.

## 1.2. Implementation of the DRT service model

The first chapter gave an overview of what DRT service model is and how it is used as a service. In the current chapter we describe how the DRT service model could be implemented. Briefly, the core requirements stemming from the DRT business rules must be followed and correct questions put forward throughout the process.

### 1.2.1 Service model innovation process

The innovation process used by the Norwegian transport operator RUTER is used as the basis for developing the DRT service model. This approach follows the principles of service design. (RUTER AS, 2021)

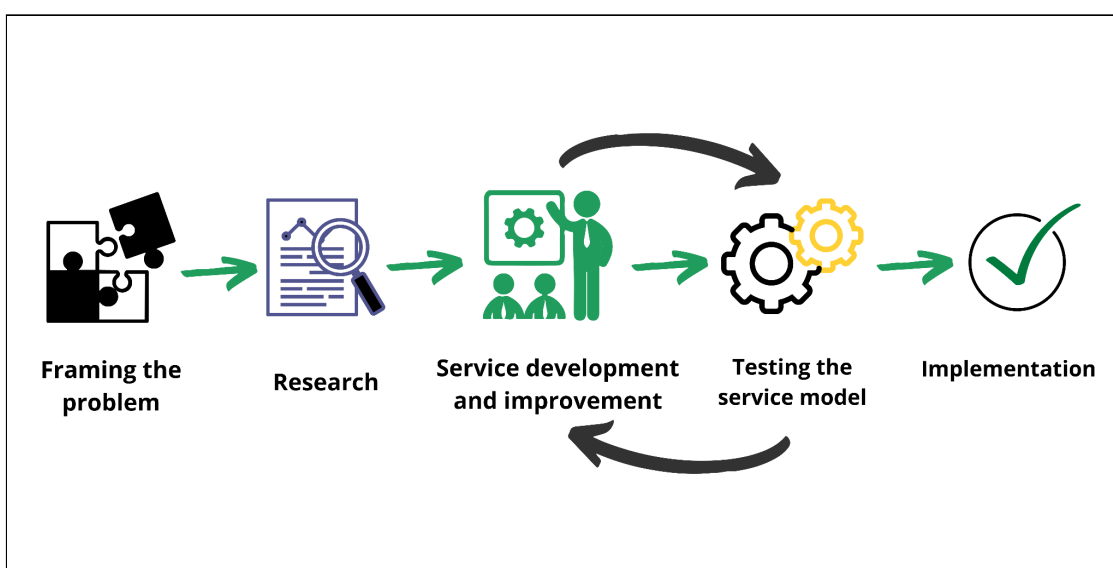


Figure 2. Innovation process (RUTER approach to innovation process)

The aim of the innovation process is to develop a solution that corresponds to the expectations of the user, considers user comfort and cost effectiveness and is based on continuous service improvement, development and testing.

**1. Problem framing** - in this stage the user target groups are mapped and their main problems in the context of mobility services identified. Answers will be given to the “20 questions prior to implementing the DRT service model” outlined in section 1.2.2.

**2. Research** - in this stage feedback from target groups will be analysed in the context of the possible delivery of the service model. Questionnaire presented in Appendix 2 will be used both in the research and service testing phase.

**3. Service development and improvement** - after the service has been launched the process will be evaluated continuously according to the feedback received (Appendix 2). Project steering group will be established who will monitor the delivery of the service model on a monthly basis. An ideal steering group consists of the transport operator, transport service provider, project partners (in case DRT is implemented as part of a specific project) and DRT software service provider. In cooperation with the pilot partners and steering group the service performance and related key parameters are monitored continuously and changes introduced, if necessary.

The situational framework for the development of the service model may be assessed using the PESTEL model, in order to understand the factors that affect it. Section 1.5 “Using the PESTEL model for the analysis of the DRT service model” could serve as an example.

Recommendations for key parameters to be followed in the service development process:

1. Number of passengers in total
2. Passengers per ride
3. Number of orders
4. Mileage of completed driving routes in total (km)
5. Share of beneficial mileage (km)
6. Kilometre cost per passenger (eur)
7. Direct cost per kilometre (eur)
8. Direct costs (eur)
9. Passenger kilometres (km)

**4. Testing the service model** - continuous testing of the service model performance takes place. In case certain aspects are not functional, they will be transferred back to service development and improvement where the steering group can take decisions concerning changes in the business rules, such as widening the service area, expanding the target groups eligible for the

service, changing the operating times, need to add additional vehicles - or even deciding whether the DRT software needs adjustment or parameters altered.

**5. Implementation** - if the service has proved its sustainable functioning, improved and testing accordingly its delivery will become daily and regular.

### **1.2.2 20 questions to answer prior to implementing DRT service model**

In order to understand how the DRT transport model might function, we have developed a set of basic criteria that help to assess which preconditions for the delivery of DRT are already present and which need to be improved. The questions are divided under five categories: 1) area and target group, 2) service delivery time, 3) paying, 4) fleet and drivers and 5) dispatcher.

#### **1) AREA AND TARGET GROUP**

1. In which area and for what type of people access to public transport is a major problem?
2. Will the DRT solution be used or will door-to-door service be provided?
3. Who has the right to order the ride? 1) Everybody, 2) Local inhabitants, 3) Targeted only at pupils?
4. How many people (approximately) in the area need DRT?
  - a. How many pupils live in sparsely populated areas and whose current school bus route is unreasonably long?
  - b. How many people currently need social transport?
5. How many people (regular transport, school transport, social transport) use the service daily and during the weekends?
6. Is it possible to meet the mobility needs of different target groups with a single vehicle?

#### **2) SERVICE DELIVERY TIME**

7. What are the days and time the service is operational? Is the service operational also during the weekends?
8. What is the reasonable time for pre-ordering the ride?
9. What is the accepted time of ride compared to taking the direct route?



### **3) PAYING**

10. Does the passenger pay a fee for the ride?
11. How is paying organised?
12. Is it necessary to subsidy the ride? If yes, then for which target groups?
13. How is subsidizing divided between the different target groups?

### **4) FLEET AND DRIVERS**

14. How many and which vehicles are used?
15. Who are the drivers?
16. How the ordering, financially maintaining and managing of vehicles is organised?

### **5) DISPATCHER**

17. Will the dispatcher be subcontracted or is he/she on the payroll on the local PTO?
18. What are the working hours of the dispatcher?

### **SUNDRY**

19. Do you have a mobility plan?
20. Please ask your partners and colleagues if there were any issues that were not tackled.

### 1.3. Example: DRT service model implementation in Saaremaa, Estonia

Using the methodology described in subchapter 1.2 we describe the example of implementing DRT based service delivery innovation process on Sõrve peninsula, Saaremaa, Estonia.

#### Phase 1 - problem framing

The demand for DRT is expressed by the mobility needs of people living on Sõrve peninsula and the will of the transport operator to provide DRT in a sparsely populated area where the schedule of traditional public transport does not correspond to the mobility needs of the inhabitants.

Following the business rules and service design principles we have mapped the main target groups in need of DRT and provided answers for the core questions relevant to its delivery:

1. **Delivery area and target group** - Saaremaa, Sõrve peninsula, its inhabitants and visitors.
2. **Service delivery time** - 8AM - 9PM, all days.
3. **Paying**- free of charge for the inhabitants during the pilot project, costs covered by the Estonian Transport Administration.
4. **Fleet and drivers**- two vehicles provided by Toyota Baltic: SUV Toyota Highlander and minivan Toyota Proace City Verso (see picture 1). The drivers are provided by the transport operator, Saaremaa municipality.
5. **Dispatcher**- on the payroll of Saaremaa municipality, who answers the calls related to DRT.



Picture 1. Toyota Proace City Verso

Source: (Modern Mobility, 2021)

## **Phase 2 research and Phase 3 continuous development and improvement of the service model**

1. **Establishment of the steering group**, consisting of representatives of the transport operator (Saaremaa municipality), 2) Estonian Transport Administration, 3) the largest public transport provider in Estonia, Põhja-Eesti Public Transport Centre and 4) DRT software provider Modern Mobility.
2. **Continuous feedback mechanism has been established** for improving DRT delivery (Appendix 2).
3. **Indicators have been defined** to monitor DRT delivery on a monthly basis and assess whether the service model should be altered. In the Saaremaa pilot the following indicators are used:
  - a. Number of passengers in total
  - b. Passengers per ride
  - c. Number of orders
  - d. Mileage of completed driving routes in total (km)
  - e. Share of beneficial mileage (km)
  - f. Kilometre cost per passenger (eur)
  - g. Direct cost per kilometre (eur)
  - h. Direct costs (eur)
  - i. Passenger kilometres (km)

**PESTEL model for analysing DRT service model has been completed**, see chapter 1.5.

## **Phase 4 testing of the service model**

Continuous testing of the service model has been carried out on the Sõrve peninsula in Saaremaa since July 2021. The steering group meets on a monthly basis to assess the indicators developed under Phase 3 and to make recommendations to alter them (if needed), followed by their incorporation into the delivery of the Saaremaa DRT pilot. Today we see the need to widen the

testing area in order to embrace more people into the pilot. In parallel to testing, daily marketing and information dissemination activities take place to introduce and embed the concept of DRT in the local communities.

We have received various valuable suggestions for improving the service from our customers. These are being incorporated by the software provider Modern Mobility into the test and real-time delivery environments.

### **Phase 5 continuous delivery of the service model**

We aim to incorporate the developed service model into the traditional public transport delivery by July 2022.

## 1.4. Cost-benefit analysis of the DRT service model

This chapter includes the business logic for both transport operators and local governments to be considered while implementing the DRT service model. Also cost-benefit analysis has been conducted that could be used for calculating the financial viability of the service model.

### Cost component to be considered in developing the DRT service model:

- Labour cost of the drivers
- Labour cost of the dispatcher
- Fuel costs
- Daily maintenance of the fleet
- Leasing and capital costs of the fleet
- DRT software costs

We have used the following assumptions while conducting the analysis:

- 1) The purchaser purchases the service based on **cost components** and not based on the price of mileage.
- 2) The purchaser aims to ensure sustained service delivery, i.e. guaranteed available resources as vehicles and drivers.
- 3) The service is provided using vehicles that are less than 5 years old and that have been acquired as brand new.
- 4) The service is part of the public transport network, i.e. interconnectivity to larger transport nodes where full-scale buses operate.

The cost component based approach enables the local PTO to manage the price of the service and achieve more effective results through higher use of the service, compared to purchasing the lowest price per mileage. The local PTO can manage the profit margin of the service through both pricing and organizational aspects. The objective of the local PTO is thus to maximize the number of clients and not to provide service with a predefined lowest price. This difference in approaches in competition with alternative transport solutions (private car) should lead in the long run to a more economical solution for the society and allows to react to changes in the demand more flexibly.

Saaremaa DRT pilot project showed that after two months of operations, the average ride is 59km with 1.5 passengers on board. In order to achieve higher occupancy and effectiveness we have set as an aim to implement more interconnecting rides and presume that the routes will thus be somewhat shortened.

The analysis is based on the number of passengers and the occupancy rate of the vehicle. We have calculated the needs for vehicles and related costs based on the assumption of having 200 - 800 passengers per month. Based on the Saaremaa pilot we can say already today that achieving the occupancy rate of 1.8 passengers is realistic even in cases of low user activity. The service becomes competitive if the rides are shortened and there are 2.4 passengers per ride on an average. The latter scenario can be achieved in our opinion only if the service is connected more tightly with the current transport routes, i.e. substituting the present routes and schedule (see Table 1).

The work-load of the drivers is calculated using the labour legislation in force, where full-time working is 150 hrs per month (together with pauses). The operational hours require having an additional driver on the payroll. The analysis shows that the scenarios contain at least 25% of spare time in terms of working hours, as the demand is not divided equally. The average speed for the ride is 50 km/h that considers the traffic citation also in sparsely populated areas (see Table 1).

	200	400	600	Ver1. 800	Ver2. 800
Number of passengers	200	400	600	Ver1. 800	Ver2. 800
Average number of passengers per ride	1.5	1.6	1.8	1.8	2.4
Number of rides	133	250	333	444	333
Mileage covered	7867	13750	16667	22222	15000
Length of one ride (km)	59	55	50	50	45
Drivers workload	52.44%	61.11%	74.07%	74.07%	66.67%
Number of vehicles needed	1.0	2.0	2.0	3.0	2.0
Number of drivers needed	2.0	3.0	3.0	4.0	3.0

The costs are determined according to the actual costs that occurred during the Saaremaa pilot project. Estimated maintenance costs were provided by Toyota Estonia and the leasing costs are based on the standard price of Toyota Proace City model (21 000€) that allows to include 7-9 seat B-category vehicles into the model. The fuel costs are based on actually reported costs per mileage. Modern Mobility software “VEDAS” price per month for up to 3-vehicle fleet is also added (see Table 2).

<b>Table 2. Expenditure</b>					
Number of passengers	200	400	600	Ver1. 800	Ver2. 800
<b>Labour costs in total (€)</b>	<b>4335</b>	<b>4335</b>	<b>4335</b>	<b>5602</b>	<b>4335</b>
<i>Dispatcher labour costs (€)</i>	535	535	535	535	535
<i>Drivers labour costs (€)</i>	3800	3800	3800	5067	3800
<b>Fleet maintenance in total (€)</b>	<b>897</b>	<b>1606</b>	<b>1883</b>	<b>2561</b>	<b>1725</b>
Fuel (€)	747	1306	1583	2111	1425
General maintenance (€)	150	300	300	450	300
Technical maintenance (€)	132	264	264	396	264
<b>Leasing costs (€)</b>	<b>367</b>	<b>734</b>	<b>734</b>	<b>1101</b>	<b>734</b>
<b>Software</b>	1000	1000	1000	1000	1000
<b>Total expenditure (€)</b>	6599	7675	7953	10264	7794

The service was launched in July 2021. After six weeks of operations we had achieved 204 passengers and the expenditure for a passenger 26€. If the number of passengers is 800, the costs decrease three times and reach approximately 10€ per passenger. It is obvious that greater efficiency is achieved by increasing the number of passengers per ride. Results from the feedback indicated that the passengers are ready to co-finance the service. The profitability of the service could thus be improved by establishing a 30-50% of co-financing (see Table 3).

<b>Table 3. Efficiency rate</b>					
Number of passengers	200	400	600	Ver1. 800	Ver2. 800
Cost per passenger	33.00	19.19	13.25	12.83	9.74
Price of line kilometre	0.84	0.56	0.48	0.46	0.52
Price of passenger kilometre	0.93	0.58	0.44	0.43	0.36

## 1.5. Using PESTEL model for the analysis of the DRT service model

PESTEL model helps to understand the national trends and regulations and targets of local governments that form the external factors that need to be considered while designing an innovative service. PESTEL analysis is a supportive tool to be used on how DRT is related to political, economical, social, technological, environmental and legal factors. The use of PESTEL is also recommended by the Norwegian transport operator RUTER whose innovation process structure and approach we have used to complete this document. (RUTER AS, 2021)

PESTEL models focus on six aspects: political, economical, social, technological, environmental and legal factors. The local transport operator of the region where DRT is planned to be implemented should be involved in delivering the analysis, as the organisation can give the most precise and relevant input. Conducting the analysis and assessing the situation helps to understand what affects DRT and the weight of the factors involved. The following is the results of the PESTEL analysis based on the pilot in Saaremaa.

6 PESTEL FACTORS	Outside factors to be considered	Factors directly affecting DRT	Relevance to Saaremaa municipality
<b>POLITICAL</b>	<ul style="list-style-type: none"> <li>1) Governmental policies</li> <li>2) Political stability</li> <li>3) Corruption</li> <li>4) International trade policy</li> <li>5) Labour legislation</li> <li>6) Trade restrictions</li> </ul>	<ul style="list-style-type: none"> <li>1) Governmental long-term policy to achieve carbon neutrality supports sustainable transport solutions.</li> <li>2) Political stability - the climate objectives are above party politics and thus less likely to be affected by political change</li> <li>3) Corruption - this aspect does not affect DRT. DRT service is usually procured or partially financed</li> </ul>	<ul style="list-style-type: none"> <li>1) Great positive effect</li> <li>2) Great positive effect</li> <li>3) No effect</li> <li>4) No effect.</li> <li>5) No effect.</li> <li>6) No effect.</li> </ul>



		<p>4) International trade policy - DRT is a service designed for the internal market.</p> <p>5) Labour legislation - providing public transport service and respective regulations and restrictions are provided in the Public Transport Act.</p> <p>6) Trade restrictions - DRT is a service designed for the internal market.</p>	
<p><b>ECONOMICAL</b></p>	<p>1) Economic growth</p> <p>2) Exchange rates</p> <p>3) Interest rates</p> <p>4) Unemployment rate</p>	<p>1) Economic growth may have a negative effect as people have the possibility to use a private car more and accept the higher costs.</p> <p>2) Not relevant for Estonia, as the country is part of the eurozone.</p> <p>3) Higher interest rates suppress consumption (including purchasing private cars) thus they support opting out for alternatives, including DRT.</p> <p>4) Higher unemployment rates decrease consumption and increase demand for DRT.</p>	<p>1) Negative effect</p> <p>2) No effect</p> <p>3) Great positive effect</p> <p>4) Small effect</p>

## SOCIAL

<ol style="list-style-type: none"> <li>1) Population growth</li> <li>2) Division by age</li> <li>3) Attitude towards making a career</li> <li>4) Importance of safety</li> <li>5) Health awareness</li> <li>6) Lifestyle based attitudes</li> <li>7) Cultural barriers</li> </ol>	<p>1) Population growth - decreased population in remote areas and increased urbanization decreases the rate of return for route- and schedule based public transport.</p> <p>2) Division by age - aging population brings along an increased number of people with limited mobility possibilities and their need for the “last mile” service increases.</p> <p>3) Attitude towards making a career - flexible working possibilities / distant working decreases the number of people “at work” from 9AM to 5PM. It also decreases the need for schedule-based transport and supports the introduction of DRT.</p> <p>4) Importance of safety - DRT increases the possibilities for safe mobility. Systematic and continuous surveillance over public transport vehicles in cooperation with the service operator and police guarantees this - one can be sure that the public transport vehicles on the road are safe. This also increases the</p>	<ol style="list-style-type: none"> <li>1) Great positive effect</li> <li>2) Great positive effect</li> <li>3) Small positive effect</li> <li>4) Small positive effect</li> <li>5) Small positive effect</li> <li>6) Great positive effect</li> <li>7) Neutral</li> </ol>
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		<p>reliability of the DRT service.</p> <p>5) Health awareness - the COVID pandemic has caused us to introduce additional restrictions to using public transport. Today the use of masks in public transport is common. The contracts regulating the public transport provision also regulate the requirements ensuring safety of passengers.</p> <p>6) Lifestyle based attitudes - the increasing environmental awareness in the society favours sustainable transport means</p> <p>7) Cultural barriers - DRT is a local service. Providing the service for foreign tourists may expose cultural barriers between the dispatcher, drivers and tourists.</p>	
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<b>TECHNOLOGY</b>	<ol style="list-style-type: none"> <li>1) Technological stimula</li> <li>2) Innovation level</li> <li>3) Automatization</li> <li>4) R&amp;D</li> <li>5) Technological changes</li> <li>6) Technological awareness</li> </ol>	<p>1) Technological stimula - the ICT development enables to create additional services and make the user experience more comfortable.</p> <p>New environmentally friendly vehicles may provide an additional positive impact of the service to the environment.</p>	<ol style="list-style-type: none"> <li>1) Great positive effect.</li> <li>2) Great positive effect.</li> <li>3) Great positive effect.</li> <li>4) Great positive effect.</li> <li>5) Great positive effect.</li> </ol>
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2) Innovation level - the availability of mobile Internet is beneficial to the service delivery. The larger share of mobile phone users decreases the administrative costs of the service provision. The average technological awareness on Saaremaa is fairly good.

3) Automatization - the DRT software used in Saaremaa municipality allows automatically to register the orders and create transport routes to respond to the clients' requests in real time and to create optimal and cost-effective routes for the local governments. Self-service solutions help to improve the accessibility of the service.

4) R&D - TalTech Kuressaare college and Kuressaare Regional Training Centre are both located in Saaremaa. The subjects taught in the schools include accounting, software development, small boat building etc. Saaremaa island has the competence to teach younger generations interested in technology and development activities, such as software developers.

5) Technological changes - an increasing number of elderly use smart- and ICT devices, which is also a widening trend in Saaremaa.

6) Great positive effect.

		<p>This is supported by the wide spread technological acceptance of younger generations who spread their knowledge also among elderly family members.</p> <p>6) Technological awareness - TalTech Kuressaare college, boat cluster and large employers in the electronic sector like Incap Electronics Estonia, Ionix Systems or Ouman Estonia provide possibilities for the youngsters to raise their technological awareness. The elderly are actively taught to use computers. Medical counselling of the elderly takes place from a distance, using smart devices.</p>	
<p><b>ENVIRONMENT</b></p>	<ol style="list-style-type: none"> <li>1) Weather</li> <li>2) Climate</li> <li>3) Environmental policy</li> <li>4) Climate change</li> <li>5) Pressure from NGOs</li> </ol>	<ol style="list-style-type: none"> <li>1) Bad weather increases the need for DRT</li> <li>2) Climate - the marine climate is warm and wet. A high rate of humidity both in summer and winter.</li> <li>3) Environmental policy - Saaremaa municipality was awarded the 2020 “most environment friendly local government” title. The transport component in the nomination contained the introduction of CNG buses and the plan to move towards hydrogen buses.</li> </ol>	<ol style="list-style-type: none"> <li>1) Great positive effect</li> <li>2) Little effect</li> <li>3) Great positive effect</li> <li>4) Positive effect</li> <li>5) Positive effect</li> </ol>

		<p>4) Climate change - decreasing CO2 emissions is the objective that Saaremaa strives to achieve.</p> <p>5) Pressure from NGOs - the increasing climate awareness supports the pressure put forward by NGOs.</p>	
<p><b>LEGAL</b></p>	<ol style="list-style-type: none"> <li>1) Anti discriminatory legal acts</li> <li>2) Legal acts against monopolies</li> <li>3) Labour legislation</li> <li>4) Consumer protection legislation</li> <li>5) Copyright and patent legal acts</li> <li>6) Health and safety legislation</li> </ol>	<p>1) Anti discriminatory legal acts. Estonian constitution prevents discrimination on any grounds. The area is regulated.</p> <p>2) Legal acts against monopolies are part of the Estonian legal system. The area is regulated.</p> <p>3) Labour legislation is part of the Estonian legal system. The area is regulated.</p> <p>4) Consumer protection legislation is part of the Estonian legal system. The area is regulated.</p> <p>5) Copyright and patent legal acts are part of the Estonian legal system. The area is regulated.</p> <p>6) Health and safety legislation is part of the Estonian legal system. The area is regulated.</p>	<ol style="list-style-type: none"> <li>1) Great positive effect</li> <li>2) Great positive effect</li> <li>3) Great positive effect</li> <li>4) Great positive effect</li> <li>5) Medium positive effect</li> <li>6) Great positive effect</li> </ol>

## **2. METHODOLOGY**

In this chapter Modern Mobility explains the background and structure of the survey. Sampling and set is described. Also an overview of how data was obtained and which tools were used in its processing is given.

### **2.1. Background and structure of the survey**

The aim of the paper is to develop a DRT service model enabling to launch and analyse demand responsive transport service in Saaremaa, on the Sõrve peninsula. Modern Mobility conducted a web-based survey carried out in Google Forms to obtain feedback on the service delivery. The questionnaire consists of the main part and sections. There are seven questions in the main part and in the sections respectively six when you use public transport, seven when you use a private car, and one concerning whether the respondent has used DRT or not. If the answer is “yes” additional 13 questions concerning DRT are to be answered. For a detailed overview of the questionnaire used, see Appendix 2.

The questionnaire is based on the recommendations of documenting the innovation process used by the Norwegian transport operator RUTER and following the practical experience of Modern Mobility conducting similar research. Also feedback from Saaremaa municipality and input from Toyota Baltics and Stockholm Environment Institute (SEI) Tallinn branch has been taken into consideration.

The following three research questions were tackled by Modern Mobility to reach the research objective:

1. Which characteristics must the DRT service model meet?
2. What does the DRT model look like in Saaremaa?
3. What are the conclusions and recommendations derived from the Saaremaa pilot project to introduce DRT service in other sparsely populated areas?

The overall background of the service user will be firstly researched, with a specific focus on the mobility situation of the respondents:

1. Place of residence - settlement (village, borough, town)
2. Sex
3. What is your age?
4. I am:
  - a. Employed
  - b. Retired
  - c. Pupil
  - d. Tourist
  - e. At home
  - f. Other
5. How often do you need to commute?
6. At what times do you usually need transport?
7. What kind of transport do you use mainly / most frequently?

After the first seven questions the questionnaire will be split into different strands, depending on whether the respondents chose 1) public transport, 2) private car, 3) private car and public transport or 4) other to allow the respondents to provide information that best meets their case. All answering “other” will be asked whether they have used DRT. This selection is justified as to combine both those who have already used DRT and who have not into a single survey. In analysing and interpreting the results, focus will be on those who have already used DRT. The DRT pilot project in Saaremaa lasts until July 2022. Modern Mobility team collects continuous feedback after this research paper has been delivered and feedback from the current and potential users will be analysed to obtain an improved overview of the mobility needs.

People using a private car will then be asked:

1. Why do you use a private car?
2. What purpose do you use a private car for?
3. How often do you use a private car?
4. On which days do you use a private car?
5. What is your average daily mileage (estimation, kilometres)?



6. How many people are usually in the car?
7. Would you use demand responsive transport instead of using a private car?

People using a public transport will then be asked:

1. How far is the nearest public transport stop?
2. How often do you use public transport?
3. On which days do you use public transport?
4. What do you use public transport for?
5. What is your average daily mileage (estimation, kilometres)?
6. How are you satisfied with the current public transport provision?

People using VEDAS will then be asked:

1. What did you use VEDAS for?
2. How would you characterize the ordering process?
3. How would you prefer to order a ride?
4. How would you rate your riding experience? (seven grade rating)
5. Remarks on the ordered ride:
6. Would you use demand responsive transport service also in the future?
7. Would you use demand responsive transport service if you would have to pay:
8. How would you prefer to pay for the service?
9. Which vehicle did you use during your ride?
10. How would you characterize the size of the vehicle?
11. What additions would you like to see on the vehicle?
12. Are you generally satisfied with the vehicle you rode (cleanliness, safety, comfort, extras etc)?
13. What should be improved in the VEDAS service provision?

The survey provides Modern Mobility relevant feedback from the clients on the performance of the DRT model and its improvement needs.

## **2.2. Conducting the survey - sampling and data collection**

The survey was carried using Google Forms web-based questionnaire and respective statistical analysis. Modern Mobility used a specially developed questionnaire (Appendix 2) as means for collecting data. This enables sending the questionnaire at targeted email accounts and compared to working with a paper version of a questionnaire, it is more time-effective for gathering and analysing the responses. VEDAS Saaremaa Sõrve pilot project participants who did not use email were personally called by the Modern Mobility team.

The sampling consisted of 120 VEDAS users in Saaremaa. Data processing was carried out using MS Excel and Google Sheet to filter the necessary input from the raw data.

The clients in the sample can be classified using the following characteristics:

1. Sex
2. Age
3. Place of residence
4. Use of transport
5. User of DRT / not using DRT

The Google Forms based questionnaire developed by the Modern Mobility team consisted of open and multiple choice questions. The questionnaire was sent to the respondents on September 9th, 2021. The web-based possibility ([www.vedas.ee](http://www.vedas.ee)) and paper-based questionnaire for giving feedback were available since August 29th, but only a smaller number of people use it. The questionnaire could be answered until September, 24th 2021. 35 responses were obtained via email and ten on paper. Ten people provided their input using a phone-based interview. Altogether 55 responses were collected, out of which 50 were from people who had used DRT and 5 from potential users (no practical experience with DRT). All 55 responses were subject to further analysis, 50 responses from DRT users were analysed separately.

### 3. RESULTS AND CONCLUSIONS OF THE SURVEY

This chapter contains analysis of the responses to the questionnaire and conclusions concerning the delivery of the DRT service model in Saaremaa, on the Sõrve peninsula. The analysis carried out by the Modern Mobility team contains responses from altogether 55 respondents, out of which 50 were from people who had used DRT and 5 from potential users (no practical experience with DRT). We highlight the results of the DRT delivery results and as conclusions, suggest the best suitable model of DRT to be used in sparsely populated areas.

#### 3.1. Results of the survey

In the first unit similar questions were asked from both DRT users and potential users. Respondents by sex were 10 (18.2%) men and 45 women (81.8%), see Figure 3.

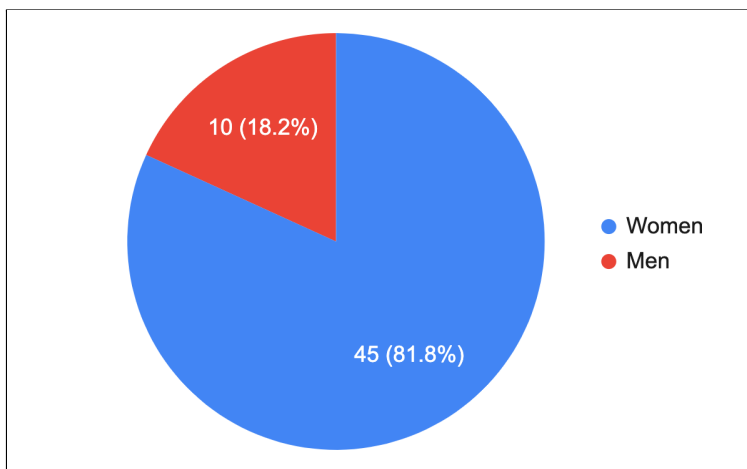


Figure 3. Classification of respondents by sex, n=55

Source: (Modern Mobility)

The age classification of the respondents was as follows:

- 46-60: 19 respondents (34.5%)
- 31-45: 11 respondents (20%)
- 71-85: 8 respondents (14.5%)
- 61-70: 7 respondents (12.7%)
- 0 - 18: 7 respondents (12.7%)

- 19-30: 3 respondents (5.5%)

The age-focused classification of DRT users helps to understand which user segments are mostly interested in the service, see Figure 4.

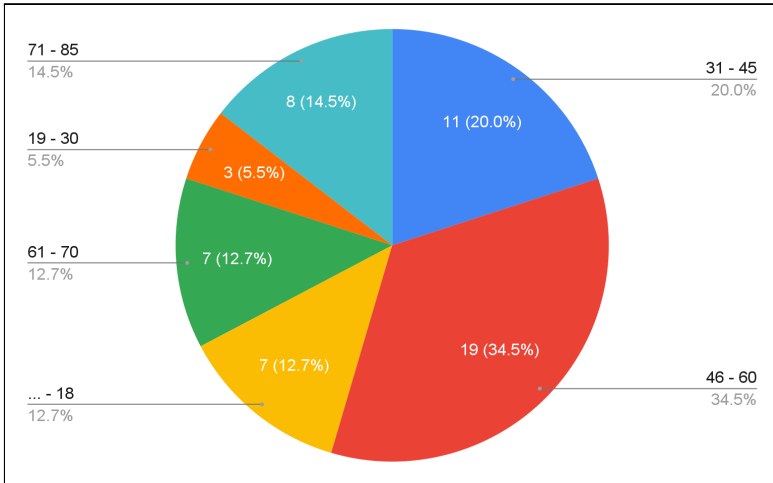


Figure 4. Classification of respondents by age, n=55

Source: (Modern Mobility)

The target group on the Sõrve peninsula is best characterized by the profile of the respondents: 20 (36.4%) were employed, 13 (23.6%) retired, 7 (12.7%) pupils, 7 (12.7%) at home and the rest either tourists, people spending their summer in Sõrve or distant workers. The population on the Sõrve peninsula increases considerably during the summer, thus the people spending their holidays there were also part of the sample (see figure 5).

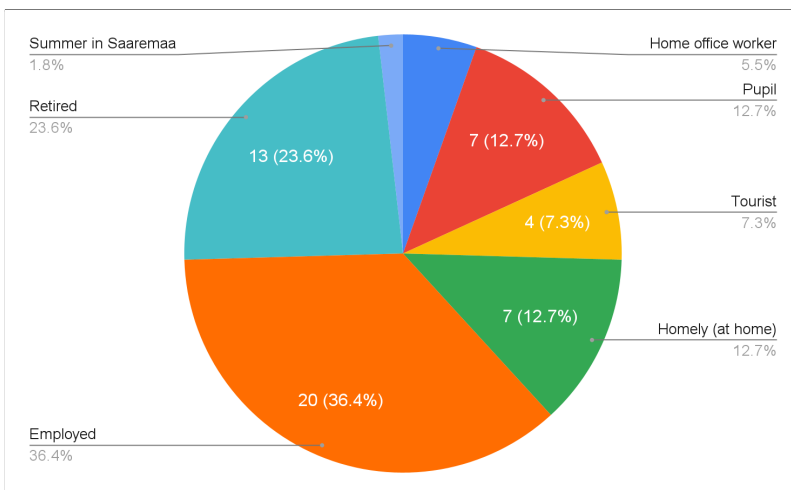


Figure 5. User profile of the respondents, n=55

Source: (Modern Mobility)

In order to understand the specific mobility issues in sparsely populated areas, questions concerning the mobility needs of the respondents were posed (how frequently do they need to use transport). 22 of the respondents (40%) answered that the need is 1-2 days per week, and 13 (23.6%) that it is 3-5 days per week. But there were also respondents who needed to move daily. The rest may be pigeonholed as random users, who would need the service a couple of times in a month or even year (see figure 6).

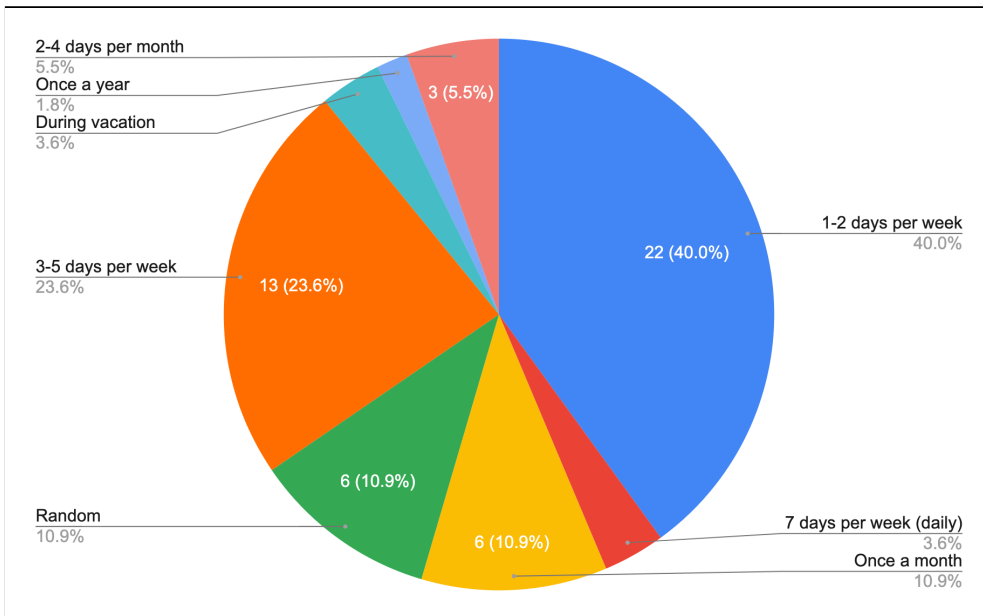


Figure 6. Transport needs, n=55

Source: (Modern Mobility)

The respondents were given the possibility to specify at which times they would most likely need to use DRT. It is clear that the largest share, 25 respondents (45.5%), prefer morning hours (8AM - 10AM). The respondents with a flexible daily schedule (21 respondents, 38.2%) preferred later hours (10AM - 12AM). At these times people would like to travel from Sõrve to Kuressaare. For returning home, the elderly preferred times between 12PM and 4PM. Also times from 7PM to 9PM were frequently highlighted (22 respondents, 40%). For detailed information see figure 7.

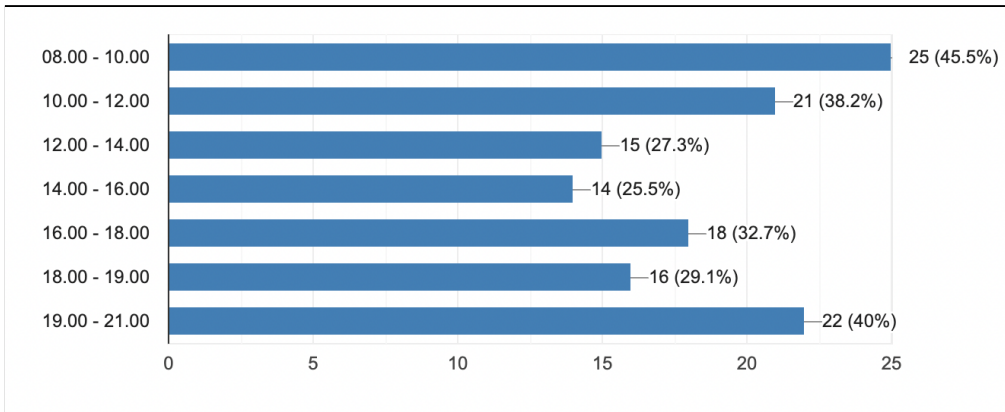


Figure 7. Preferred times for using the transport, n=55

Source: (Modern Mobility)

For any mobility need (to work, to school, visit to a doctor etc.) the availability of means is extremely important. We asked whether the respondents use private cars or also public transport. 22 respondents (40%) use public transport, 14 (25.5%) both and 19 (34.5%) private cars. See also figure 8.

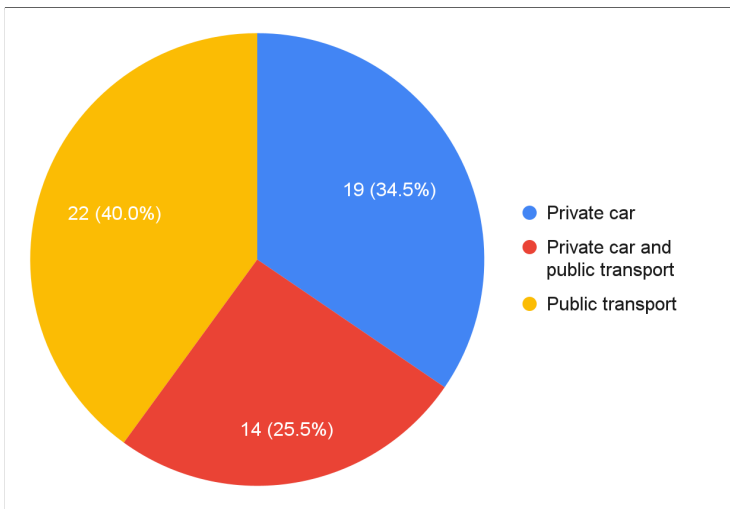


Figure 8. Preferred mobility means, n=55

Source: (Modern Mobility)

Following the individual preference of mobility means of the respondents, the frequency of using the transportation means was asked. Out of 33 respondents using a private car 11 (33.3%) answered that they use the car daily. These are mainly employed people or families, where daily commuting is inevitable. 11 respondents (33.3%) answered that they use the car on 3-5 days. They are also mainly employed people. 9 respondents (27.3%) use the car once or twice a week, when they need to go shopping or consume other services (see figure 9). Private car users also

explained that it is often used when there is a need to visit multiple locations or catch for example a bus to the mainland.

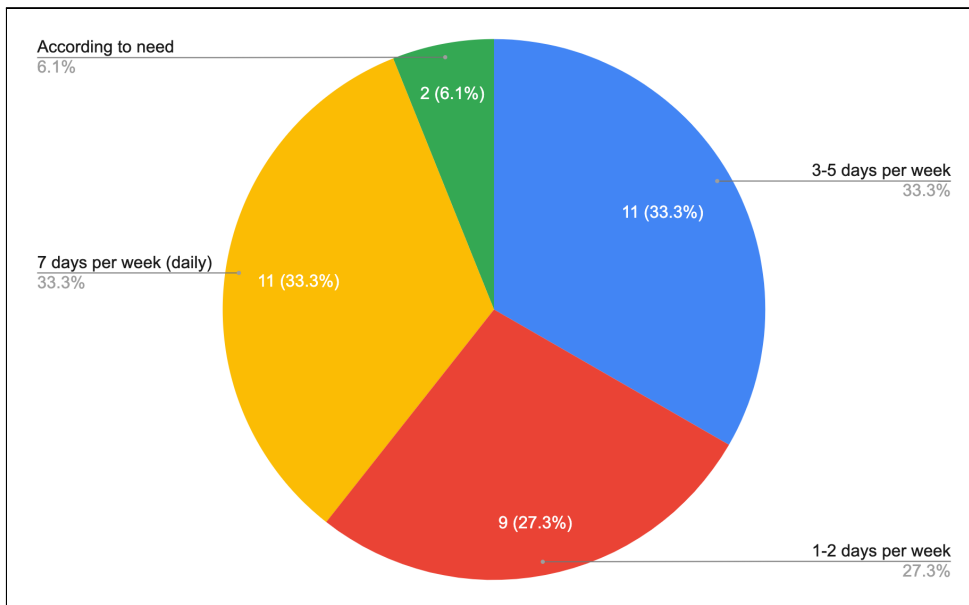


Figure 9. How frequently is the private car used, n=33

Source: (Modern Mobility)

In order to better understand why the respondents use private cars instead of public transport we posed questions that were targeted at discovering the relevant motives. Out of the 33 respondents 23 (53.5%) answered that the public transport schedule does not meet their needs, 11 (25.6%) noted that the schedule is too sparse, 5 (11.6%) said that they prefer driving a car and there were also those who were not satisfied with the public transport at all (see figure 10).

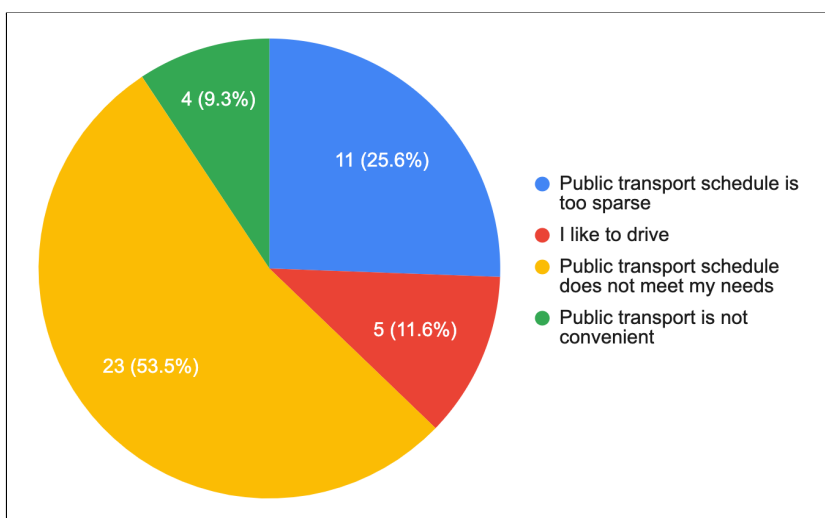


Figure 10. Why private cars are used?, n=33

Source: (Modern Mobility)

The following is a selection from the feedback why private cars are used:

- It is more convenient to use a private car when you have to visit multiple locations. On the other hand, if you need to catch a long-distance coach, DRT is excellent.
- When I go to the city, it involves various activities and moving without a car is too time-consuming to travel long distances. I could not solve them all with a single trip without a car.
- Sometimes I need to catch a bus in the city or get home - and this is timecritical. Thus I prefer a private car.
- I do not have a car, but my neighbour or children / grandchildren help me - as the public transport schedule does not meet my needs.
- The public transport does not meet my needs. When I have to get to work, how can I do it without a private car when the public transport is not there daily? That is why I use a private car.
- I am using rulator. This is the main reason why I use a private car. If possible, I would gladly switch to DRT.
- I use my car as I have to visit multiple locations.
- We use our family car as public transport is not suitable for a large family to visit a food store.

We asked the respondents to highlight the purposes private cars are used for. Out of 33 of the respondents using private cars 21 (30% of the total number of respondents) answered “going to a food store”, 15 (21.4%) “to spend free time”, 14 (20%) “to get to work”, 8 (11.4%) for other purposes - such as volunteering, running personal errands, visiting parents, helping neighbours, vistig events etc. Private cars are also needed for taking children to school or to non-formal educational activities. For detailed information see Figure 11.



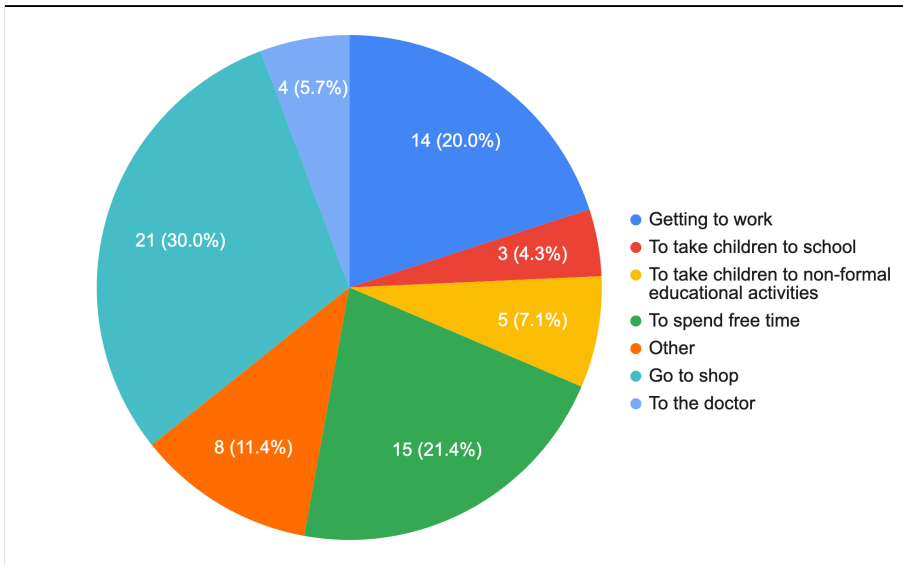


Figure 11. Which purposes do you use private car for?, n=33

Source: (Modern Mobility)

For people living in sparsely populated areas the private car provides the necessary flexibility for mobility at any given time. When asked whether the respondents would be ready to shift from using a private car to DRT 30 out of 33 (90.9%) answered affirmatively and only 3 (9.1%) would not give up. But they would be willing to suggest DRT to their children - and DRT would definitely find its niche in certain “one direction” rides (like catching the Tallinn coach).

For detailed information see figure 12.

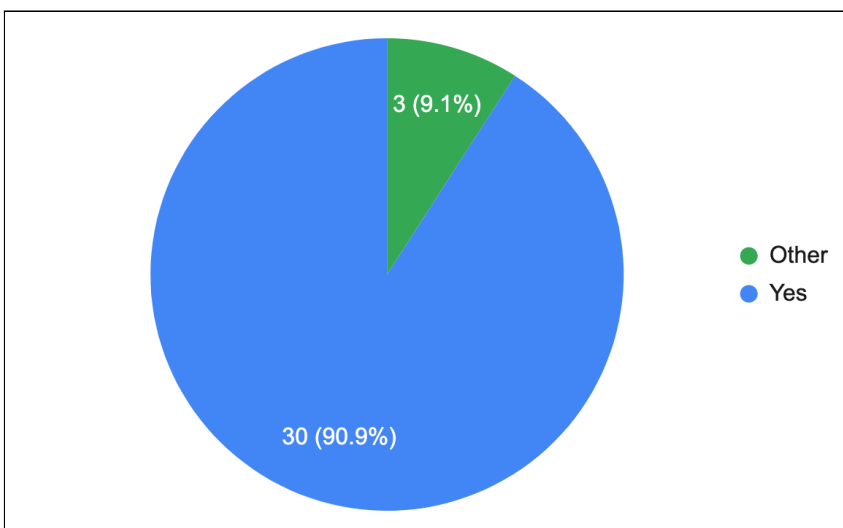


Figure 12. Would you be willing to shift from using a private car to DRT, n=33

Source: (Modern Mobility)

We also analysed the frequency of using public transport. Out of 36 respondents using public transport 17 (47.2%) answered that they use public transport 1-2 days per week, 8 (22.2%) use 3-5 times a week and the rest ad hoc, from a couple of times per month to once in a year (see figure 13). Those using public transport 1-2 days per week usually go to the city for shopping, visiting a doctor or for various other purposes. People using public transport 3-5 times per week are usually employed, but prefer public transport to private cars. Needs-based users include elderly (who take a ride when they need it) and people having cottages in the sparsely populated region. A detailed overview of the rationale for using public transport is given on figure 14.

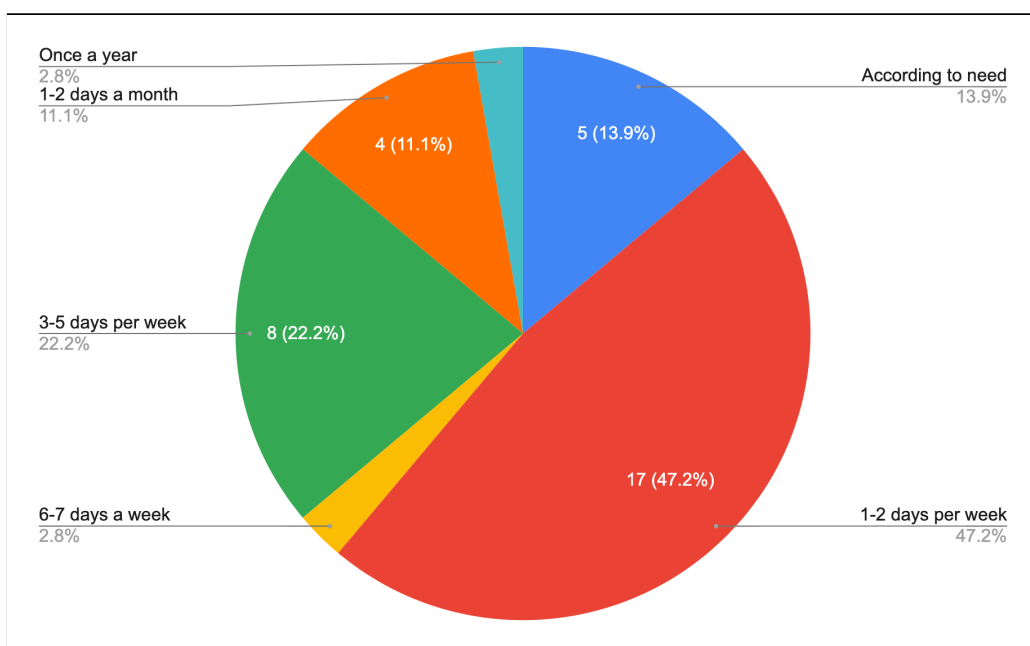


Figure 13. How often do you use public transport?, n=36

Source: (Modern Mobility)

Out of 36 respondents the rationale for using public transport was divided as follows: 15 (23.1%) to go shopping, 12 (18.5%) to spend spare time, 10 (15.4%) other - like travelling from Tallinn to Saaremaa, attending church, visiting the cemetery, visiting relatives in the nursing home, visiting one's country residence, consuming of various services, taking care of grandchildren, participating in rehabilitative care etc. The rest of the respondents noted that public transport is used to get to work, school, non-formal educational activities and tourism. See also figure 14.

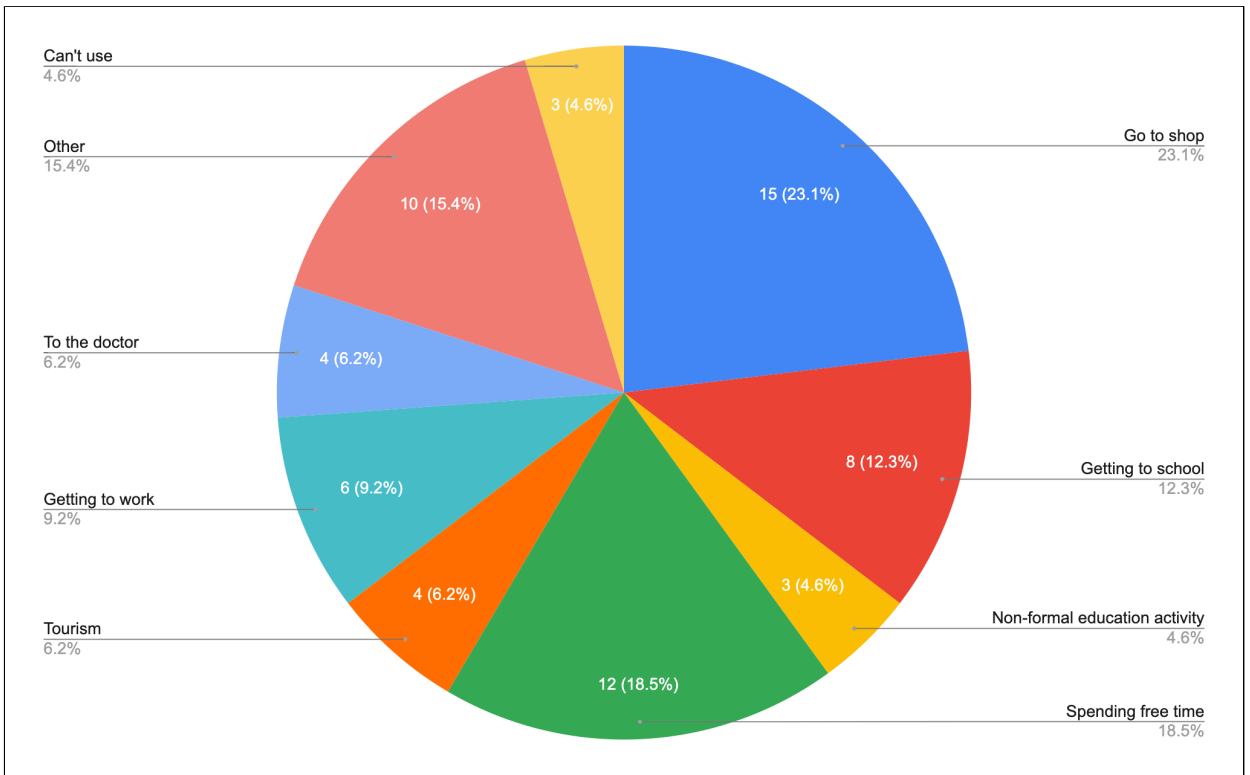


Figure 14. Which purposes do you use public transport for?, n=36

Source: (Modern Mobility)

The survey was aimed at both people who have already used DRT and the potential users. Out of 55 respondents 50 (90.9%) have already used the service and 5 (9.1%) have not yet had the time for it (see figure 15).

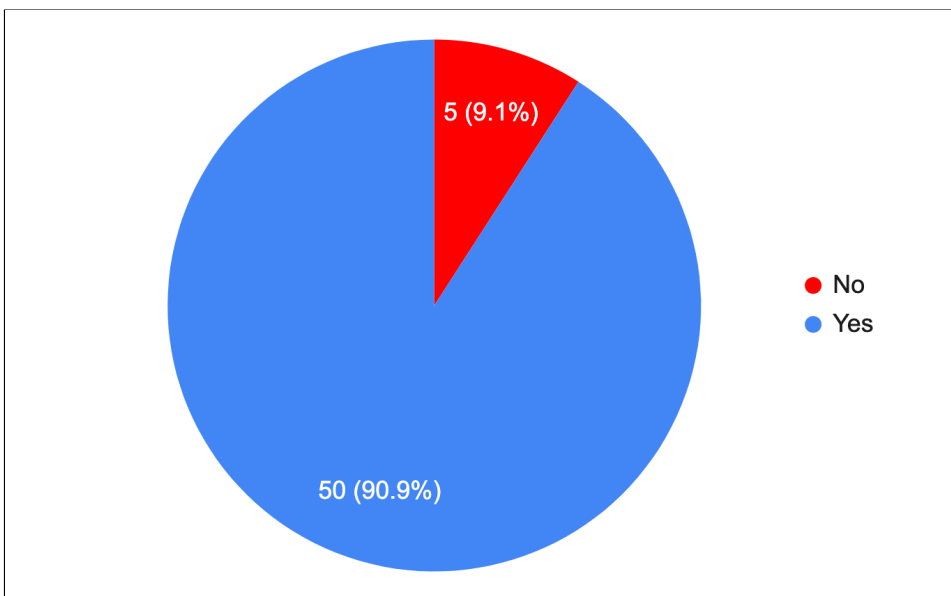


Figure 15. Have you used DRT in Saaremaa?, n=55

Source: (Modern Mobility)

Users of DRT had multiple choices to select while determining why they use DRT. Out of 50 respondents 15 (20.8%) used DRT to spend spare time, 13 (18.1%) to go shopping, 10 (13.9%) to get to work, 9 (12.5%) for tourism purposes, 8 (11.1%) to catch long-range transport (to or from Tallinn, either bus or plane) for achieving multimodality (combining various means of transportation to reach the destination). It was also noted that DRT is used to visit a doctor, get to school, visit events, non-educational educational activities, getting to rehabilitation treatment, consuming different services, visiting one's summer residence in summer, taking care of grandchildren, attending church, visiting cemetery. For detailed information see figure 16.

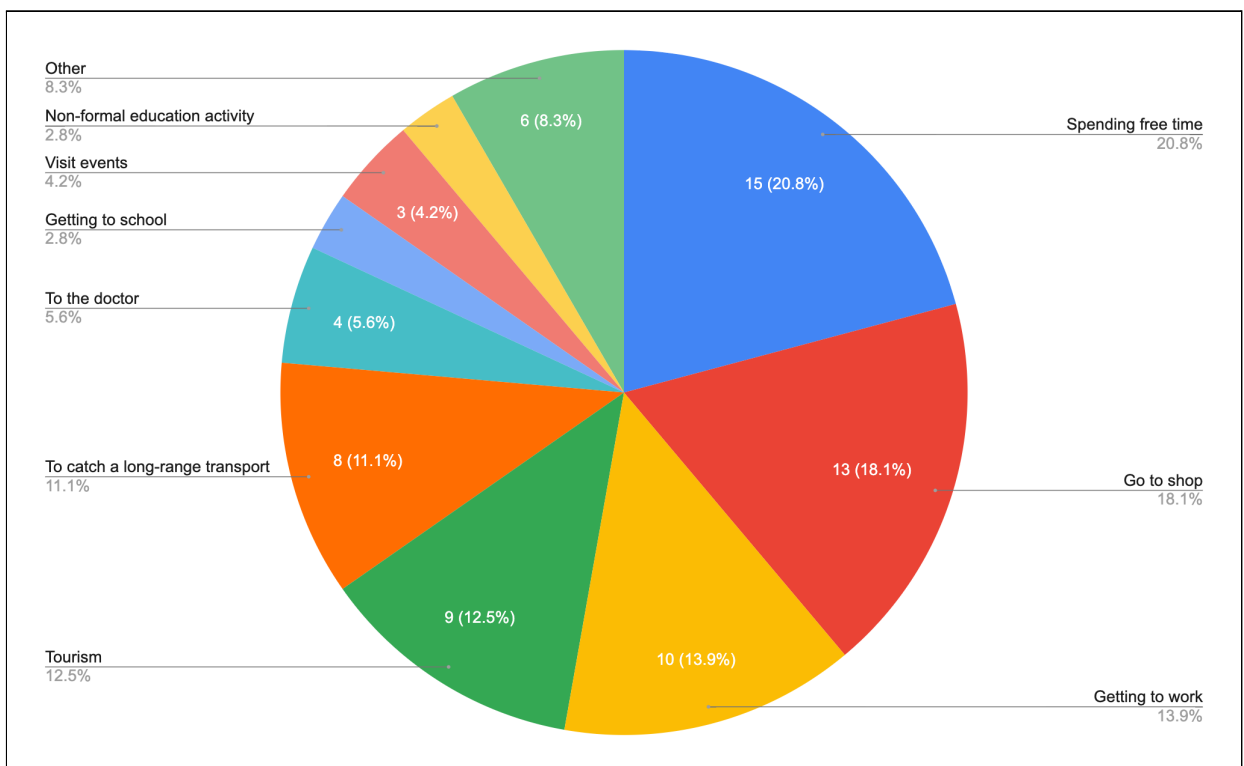


Figure 16. Why did you use DRT?, n=50

Source: (Modern Mobility)

One might think that ordering DRT is complicated - but this is not the case. The pilot was started with the possibility to order rides 24h beforehand using phone and the dispatcher service. The dispatcher registered the request and transmitted it to the drivers. Out of 50 respondents 46 (92%) said that ordering was smooth and there were no problems. It must be noted that the eldest DRT user was a 85-year old lady who was very positive about the service and thanked for its convenience and smooth operations. One of the respondents had ordered DRT for his 80-years old neighbour, who was likewise happy with the service. Still 4 respondents (8%) considered

ordering complicated. Based on the feedback we are sure that calling a dispatcher for ordering the ride is not a problem (see figure 17). The dispatcher service received additional positive feedback: ability to handle different generations professionally, find the best possible route etc.

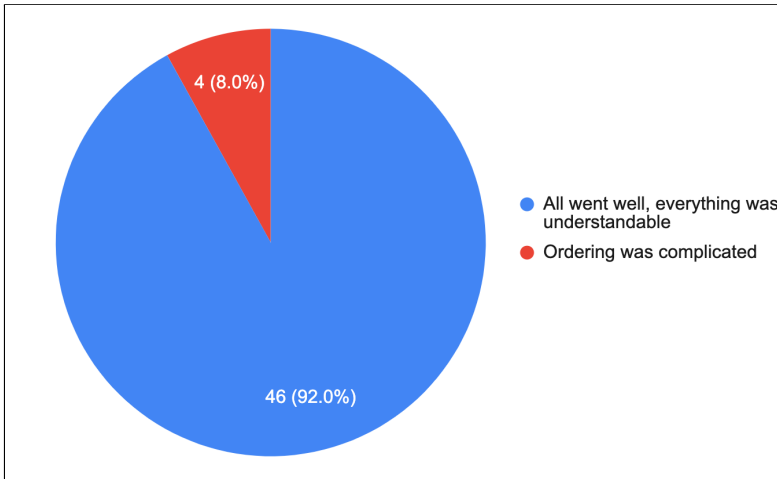


Figure 17. How was ordering the ride evaluated?, n=50

Source: (Modern Mobility)

Concerning the different possibilities for ordering the ride, 37 respondents (59.7%) preferred ordering via the dispatcher, 20 (32.3%) using a mobile app, 3 (4.8%) through the Internet and 1 (3.2%) via email. Half of the respondents chose in parallel the dispatcher and mobile app options that indicate the positive effect of having multiple choice. One respondent specifically noted the need for having multiple choices as sometimes accessing the dispatcher is not possible. For detailed information see figure 18.

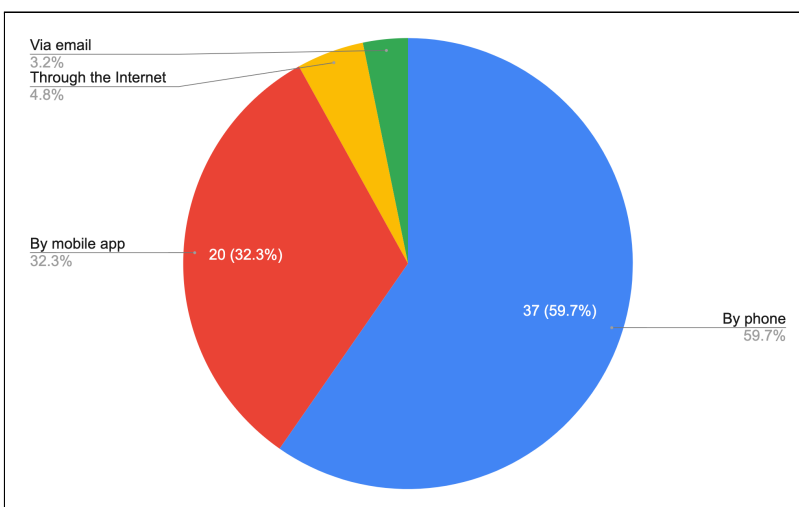


Figure 18. How would you prefer to order the ride?, n=50

Source: (Modern Mobility)

The DRT experience for the users has been excellent. On a 7 grade scale (1 -weak, 7 -excellent) out of 50 respondents 43 (86%) evaluated DRT with 7 (or excellent), 1 (2%) with 6, 3 respondents (6%) with 5, 2 respondents (4%) with four and one respondent (2%) with 1. The average grade on a 7-number scale was 6.2 (see figure 19).

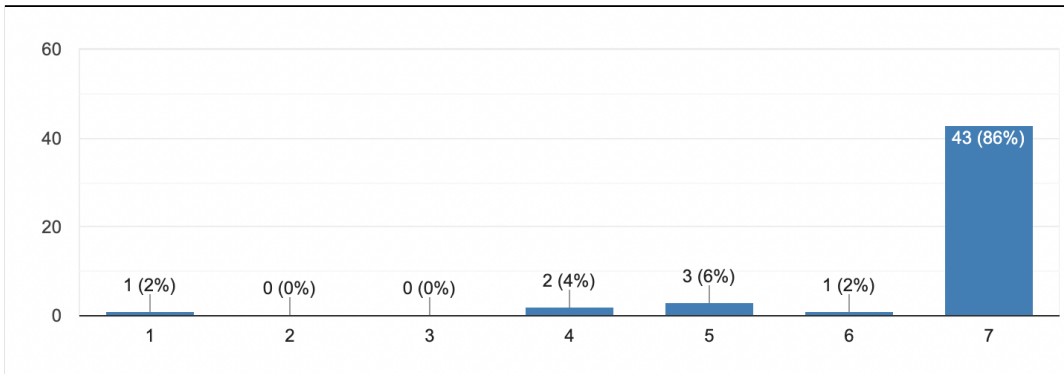


Figure 19. How was DRT experience evaluated? 1 (weak) - 7 (excellent), n=50

Source: (Modern Mobility)

We also enquired about the punctuality of the drivers. Out of 50 respondents 47 (94%) answered that the driver was there on time (see figure 20). Excellent and friendly service provision was highlighted and it was also noted that the driver reached the pick-up destination rather before the prescribed time. DRT deployed on the Sõrve peninsula in Saaremaa was designed to include reserve time for pickup and leaving, ensuring that all requests will be completed on time.

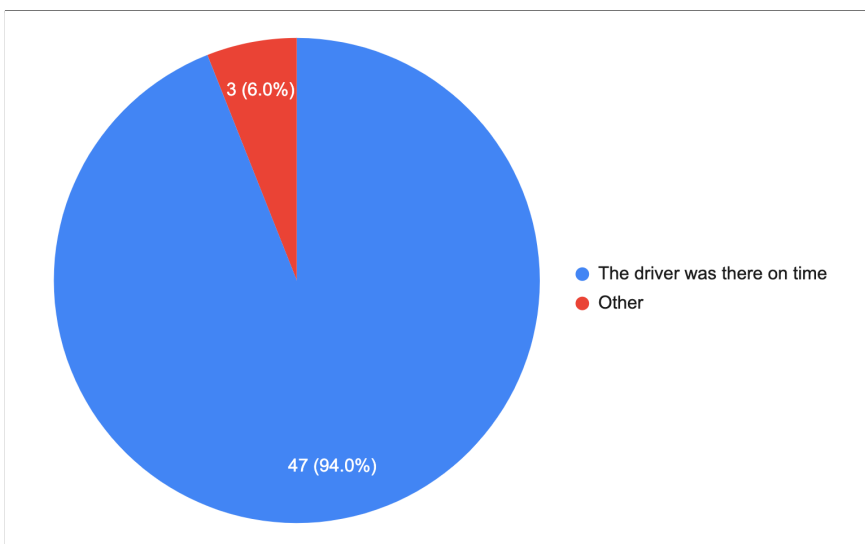


Figure 20. Notifications concerning the ride, n=50

Source: (Modern Mobility)

49 respondents out of 50 (98%) are eager to use the DRT service also in the future (see figure 21).

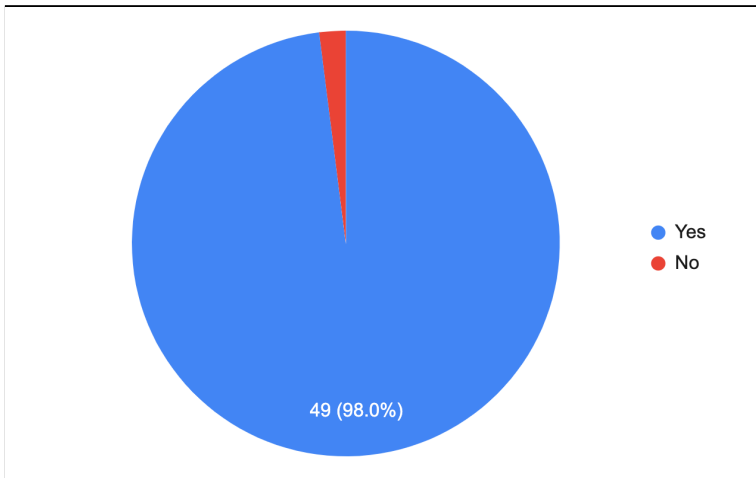


Figure 21. Would you use the DRT service also in the future?, n=50

Source: (Modern Mobility)

An important aspect in connection with designing DRT is the willingness of the clients to pay for the service and in which amount. Out of 50 respondents 20 (40%) are willing to contribute 1-2€, 16 (32%) 2-4€, 6 (12%) 5-8€ and 4 respondents (8%) are not willing to pay at all. 4 (8%) respondents answered “other”, i.e from 50cents to 10€, with marking that public transport on the national level is free of charge. The willingness to partially compensate the related costs is explained by the need to have mobility options that would fill in the current gaps (see figure 22).

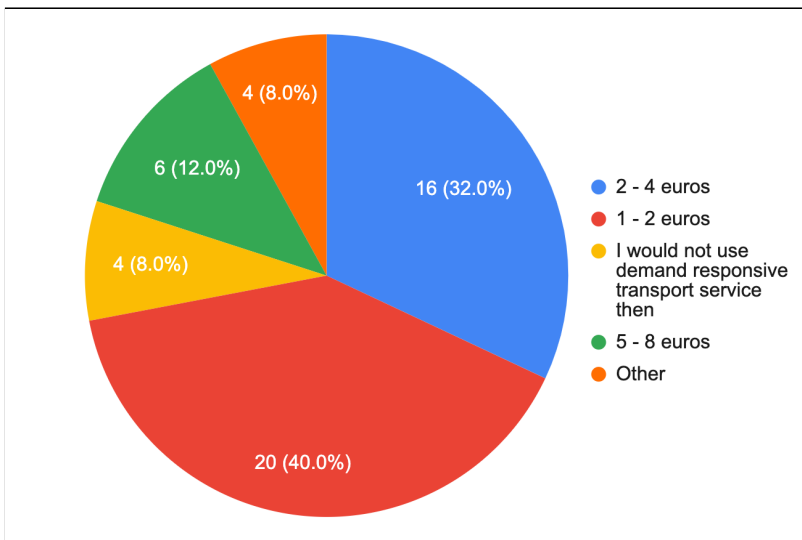


Figure 22. Would you be ready to co-finance DRT and if so, in which amount?, n=50

Source: (Modern Mobility)

We presumed that the customers are willing to co-finance DRT service. Therefore we enquired what kind of paying methods they would prefer, with a multiple choice. Out of 50 respondents 24 (35.8%) wished to pay using a mobile app, 20 (29.9%) would prefer paying in cash to the driver and 19 (28.4%) would use the ticket valid in other types of public transport. Also paying with a card was highlighted. The different paying methods are a bonus. Paying in cash could be a problem especially for the elderly, as cash could be sparse and there are no ATMs in rural areas. Therefore paying by card or using a mobile app are most beneficial. For detailed information see figure 23.

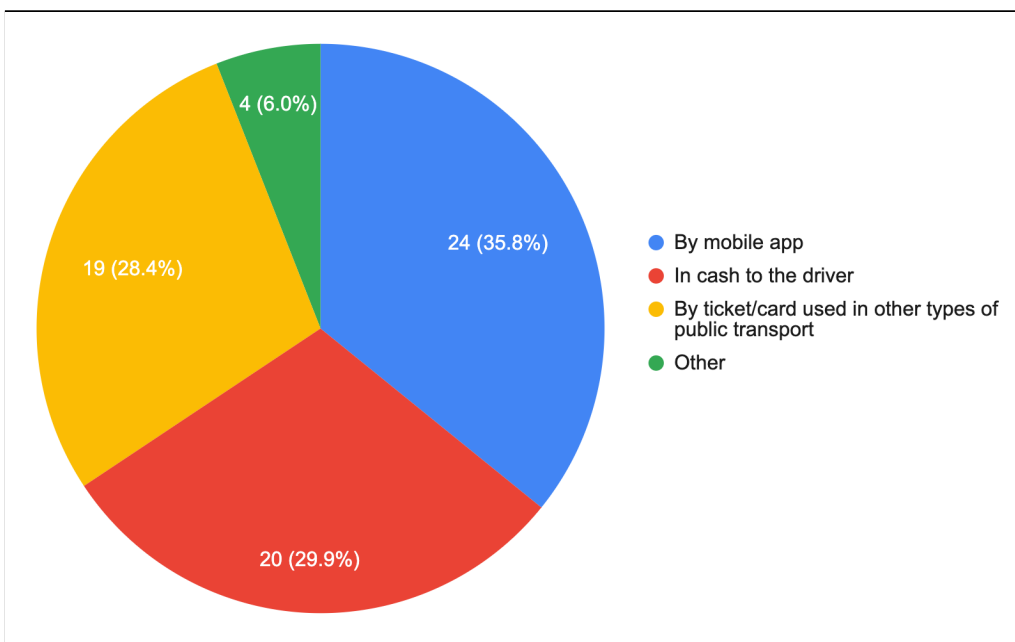


Figure 23. Which is the preferred method for paying, n=50

Source: (Modern Mobility)

We also decided to obtain feedback about the vehicles used: Toyota Highlander and Toyota Proace City Verso that both accommodate 6 passengers and a driver. It is important to understand the necessary characteristics and the suitability of the vehicles to deliver the DRT service. Thus we enquired how the customers were satisfied with the vehicle they used (including its capacity). Out of the 35 respondents 19 (54.3%) used Toyota Proace City Verso during their last ride and 16 (45.7%) Toyota Highlander. See figure 24.



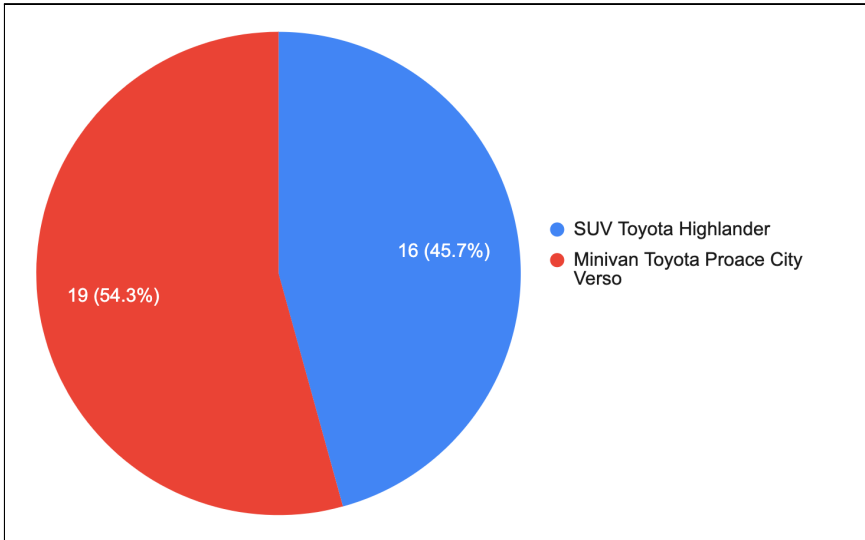


Figure 24. Which vehicle was used?, n=35

Source: (Modern Mobility)

The question concerning the capacity of the vehicle (too large / too small) 34 (97.1%) out of the 35 respondents answered that it was sufficient. Only one respondent requested a large vehicle. The peculiarities of sparsely populated areas demand the selection of a specific vehicle to provide the service. Using a 20-seater microbus is not necessary. Experience from Saaremaa has shown that usually two persons take a drive with a private car (results from the survey in August 2021 indicate that the average number of passengers per private car is 1.7), thus the use of smaller vehicles is justified.

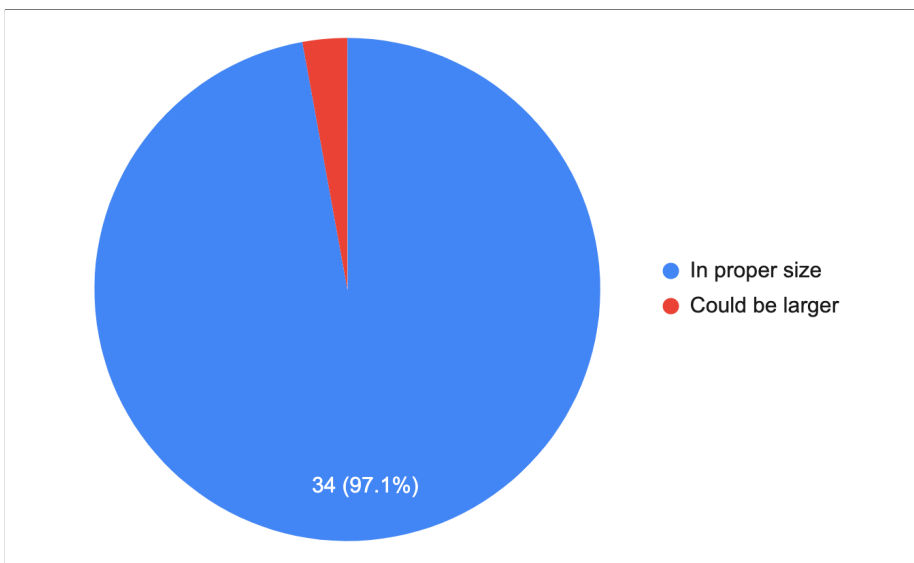


Figure 25. Are you satisfied with the capacity of the vehicle?, n=35

Source: (Modern Mobility)

The following is an extract from the feedback provided to the piloted DRT service:

Age	<b>How did the DRT service meet your needs and if something should be altered - then what and how?</b>
16	Everything is perfect.
43	No need to change, all works well.
46	The drivers must definitely be professionals.
29	The vehicle was very comfortable and the driver very kind and friendly.
39	One could see from a mobile app whether the DRT service passes my place of residence also today and I could use it respectively, if there are empty spaces.
71	I like everything about the service: nice drivers and music.
37	Excellent and highly necessary service. I very much hope that it will be sustained for the benefit of the people living in sparsely populated areas.
52	Pickup and leaving could be more flexible. The bus-stop is 1.5 km from home and sometimes it is really difficult to walk the road with heavy bags. Also the service provision at late hours could be more flexible.
48	Everything was OK.
43	Suits me!
31	Everything was OK - carry on and sustain living on the islands.
60	The template for ordering the service should be accessible on the Internet.
78	Disseminate the information to the people not having a personal car.
35	Nothing to add, everything has been perfect.
38	Waiting for the service mobile app.
55	I would like to have the possibility to order the ride on the same day and also for early hours.
62	For ordering the ride an additional phone number besides the dispatcher must be in force (weekends, holidays).
72	Sometimes there is a need to start at earlier hours and it would be very nice if the service would pick me up and lay down directly at home.
54	The service could start at 6AM as I have to be in Kuressaare at 6.30.
68	The delivery area could be wider: not only Kuressaare, but also Lümända and Kihelkonna, for example.
61	The ordering time could be shorter. You do not always know your movements 24h ahead, especially if this is an unexpected ride.
53	Everything is perfect. Hopefully the service will be sustained.

85	The service is really handy. Even the phone number is so simple that everyone can handle it. It is so simple.
69	It works fine for me and I am really satisfied. The service is logical and understandable. I would like to hug the drivers if possible. I am religious and now I can attend the sermons regularly. I would like to hand out three prizes: one for the Folding Fan, second for the rulator and third for those people who designed DRT. By no means do not stop the service! Do disseminate the information in the National Broadcasting Service as the local radio does not reach all places on the peninsula.
17	The service times could be different, starting from 7AM (the school bus schedule is 0630AM) and operational until 10PM.
57	Working well. Excellent!
75	No need to change. Clearly understandable. The service must be sustained.
67	Everything is running smoothly, nothing that is not understandable.
54	Nothing in particular to wish for. Ordering could still take place in real-time. If a ride takes place one could see it online and hop on. It would be great if such a functionality exists.
67	Distance to my bus-stop is 3 km and it is very complicated to reach it, as I have to use the rulator. Everyone is accustomed to the current transport organization. But it is very difficult for people with special needs. Sörve peninsula is in general a complicated area. The solution that you could be picked up not only at regular bus-stops but from desired locations is very much appreciated.
60	All very well!
71	The service has been functioning well. For everyone following their needs and capacity!

## 3.2. Conclusions and recommendations

The chapter focuses on the results of the survey and respective recommendations.

Based on the DRT service model implemented in Saaremaa and the results of the survey conducted among the beneficiaries, Modern Mobility presents the following results:

### 1. **Inhabitants on the Sõrve peninsula in Saaremaa would gladly use DRT.**

Out of the 33 respondents who use a private car 30 (90.9%) are ready to replace it with DRT. 3 (9.1%) would not give up using a private car, but they would be willing to suggest DRT to their children - and DRT would definitely find its niche in certain “one direction” rides (like catching the Tallinn coach). Analysing in detail why did people use DRT, out of 50 respondents 15 (20.8%) used DRT to spend spare time, 13 (18.1%) to go shopping, 10 (13.9%) to get to work, 9 (12.5%) for tourism purposes, 8 (11.1%) to catch a long-range coach (to or from Tallinn) for achieving multimodality (combining various means of transportation to reach the destination). It was also noted that DRT is used to visit a doctor, get to school, visit events, non-educational educational activities, getting to rehabilitation treatment, consuming different services, visiting one’s summer residence in summer, taking care of grandchildren, attending church, visiting cemetery etc. When the 50 DRT users were asked whether they would use DRT in future, 49 (98%) answered affirmatively. In total, the DRT service was rated by the 50 respondents on an average with a very high value of 6.62 (on a 7-grade scale, 1-weak and 7-excellent).

- ### 2. **Ordering DRT is convenient for the inhabitants.**
- Out of 50 respondents 46 (92%) said that ordering was smooth and there were no problems. It must be noted that the eldest DRT user was a 85-year old lady who was very positive about the service and thanked for its convenience and smooth operations. One of the respondents had ordered DRT for his 80-years old neighbour, who was likewise happy with the service. Ordering DRT is easy also for the younger generations who are accustomed to using innovative mobility services.

- 3. The inhabitants of Saaremaa are willing to contribute to the development of the mobility service using co-financing.** Out of 50 respondents 20 (40%) are willing to contribute 1-2€, 16 (32%) 2-4€, 6 (12%) 5-8€ and 4 respondents (8%) are not willing to pay at all. 4 (8%) respondents answered “other”, i.e from 50 cents to 10€, with marking that public transport on the national level is free of charge. The willingness to partially compensate the related costs is explained by the need to have mobility options that would fill in the current gap. Generally speaking, 43 (86%) of the respondents are willing to contribute into the development of DRT using co-financing.
- 4. Requirements that DRT must meet.** It is absolutely vital that the local inhabitants are willing to use the service. Local government or transport operator must define: 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher. Ordering the service must be as flexible as possible. The pilot on the Sõrve peninsula indicated that the best solution is having multiple choices for ordering (dispatcher, mobile app). 37 respondents (59.7%) preferred ordering via the dispatcher, 20 (32.3%) using a mobile app, 3 (4.8%) through the Internet and 1 (3.2%) via email. Half of the respondents chose in parallel the dispatcher and mobile app options that indicate the positive effect of having multiple choice. One respondent specifically noted the need for having multiple choices as sometimes accessing the dispatcher is not possible.
- 5. Recommendations for other transport operators and local governments based on the Saaremaa DRT experience.**
- a. Establish the business rules for providing the service: 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher.
  - b. Dispatcher is a must - this allows access to the service also to the older generations.
  - c. Mobile application as an app or using an Internet browser ensures using the service also among the younger generation and provides additional possibility for ordering the service when the dispatcher is busy.

- d. Allow to use different alternatives to order the ride.
- e. If it is necessary for the customer to co-finance the ride, prefer using a mobile app or transport ticket. It gives a better overview of the transactions and does not contain expenses related to handling cash. Also many elderly living in sparsely populated areas have only a certain amount of cash at home.
- f. Collect continuous feedback from the users to improve the service and to make it meet the needs of the customers.

The authors of the work highlight the following aspects for transport operators and local governments that are interested in introducing DRT service model in sparsely populated areas:

- 1. While planning the DRT service, think through the business rules:** 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher
- 2. Test DRT service model in the community.** Start with a pilot project to learn the needs of the local people and to learn yourself which must the service provision business rules in your community be.
- 3. Conduct a survey to find out the mobility needs.** After the pilot has been launched, ask feedback from the local population concerning the service delivery. We have developed a specific questionnaire that helps to assess the current transport situation and provides information about the piloted DRT service model. If you have conducted a mobility survey beforehand, you can validate the feedback during the DRT pilot project. If you have not studied the questions pertaining to DRT before, we would suggest including the topic into the future questionnaires.
- 4. For launching DRT, areas that are not covered sufficiently with the current public transport routes suit well.** If you are not sure which area to select for piloting, then think about inhabited areas, but that have poor transport connections to the sparsely populated spots. Also areas from which people could be taken to larger transport nodes (to provide the “last mile” service for the sparsely populated areas) could be considered.

**5. Allowing various target groups to use DRT ensures a sustainable number of passengers and fulfillment of the vehicles.** While drafting the business rules the possibility of handling multiple target groups must be considered. A wide range of target groups ensures that the chosen fleet will be sustainable, occupied by customers and that they would not travel empty.

## SUMMARY

The aim of this paper was to develop and describe the DRT service model that helps to launch and analyse the service provision on the Sõrve peninsula in Saaremaa.

The innovation process used by the Norwegian transport operator RUTER is used as the basis for developing the DRT service model. Also the need to introduce the solution into a wide range of municipalities (not just Saaremaa) was taken into consideration. In addition, the practical experiences of Modern Mobility in introducing and implementing DRT solutions, feedback from DRT users, feedback from the Saaremaa municipality and input from Toyota Baltics, Estonian Transport Administration and Stockholm Environment Institute Tallinn branch experts were used.

Following the results of the conducted survey, answers were given to three research questions posed:

1. **Which characteristics must the DRT service model meet?** The DRT service model must meet the following conditions:
  - a. **The transport operator and local population** must be willing to use DRT service.
  - b. **Clear business rules for operating the service:** the local government or transport operator must determine prior the service is launched: 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher.
  - c. **Ordering the service must be as flexible to the client as possible** - both the possibilities of ordering the ride using a dispatcher or by a mobile app must be available.
  - d. **Establish a steering group responsible for the development of the service model**, that could include decision makers from the following institutions: 1)



transport service operator, 2) local municipality representative, 3) community leaders, 4) service provider representative (if the service is provided by an independent organisation) and 5) DRT software provider, when possible.

- e. **Establish key performance indicators in the steering group** to evaluate the service delivery and improve it.
- f. **The service must be aimed at continuous improvement**, to meet the expectations of the clients through obtaining continuous feedback from the users that serves as a basis for the steering group to change the business rules.

**2. What does the DRT model look like in Saaremaa?** The inhabitants of the Sõrve peninsula in Saaremaa would gladly continue to use DRT. Out of 50 respondents DRT users 49 (98%) answered affirmatively. The service received a very high rating of 6.62 on a 7-grade scale (1-weak, 7-excellent). 43 out of 50 responded users of DRT service are willing to contribute also using co-financing (86%). In order to sustain DRT in Saaremaa:

- a. There is a need for the inhabitants of the Sõrve peninsula to move and the willingness of the transport operator to provide DRT in sparsely populated areas, as the route schedule in force does not meet the needs of the population.
- b. The business rules have been defined:
  - i. **Delivery area and target group** - inhabitants of the Sõrve peninsula in Saaremaa and its visitors.
  - ii. **Service delivery time** - 8AM to 9PM, on each day (monday till sunday).
  - iii. **Payment method**- free of charge to the user during the pilot project, subsidized by the Estonian Transport Administration.
  - iv. **Fleet and drivers** - Toyota Baltic provided two vehicles, SUV Toyota Highlander and minibus Toyota Proace City Verso. The drivers were organised by the transport operator Saaremaa municipality.
  - v. **Dispatcher** - employed by Saaremaa municipality for answering the calls ordering a ride.
- c. In order to develop the service:
  - i. **Steering group has been established**, which consists of representatives from 1) transport operator Saaremaa municipality, 2) Estonian Transport Administration, 3) the largest public transport provider in Estonia,

Põhja-Eesti Public Transport Centre and 4) DRT software provider Modern Mobility.

- ii. **Mechanism for obtaining feedback has been established** in order to improve DRT service (Appendix 2).
- iii. **Key performance indicators have been established** to monitor DRT service, analysed and assessed monthly whether the service model should be altered.

**3. What are the conclusions and recommendations derived from the Saaremaa pilot project to introduce DRT service in other sparsely populated areas?** The following five aspects for transport operators and local governments that are interested in introducing the DRT service model in sparsely populated areas emerged as a result of the survey.

- 1) **While planning the DRT service, think through the business rules:** 1) delivery area and target group, 2) service delivery time, 3) payment methods, 4) fleet and drivers and 5) dispatcher.
- 2) **Test DRT service model in the community.** Start with a pilot project to learn the needs of the local people and to learn yourself which must the service provision business rules in your community be.
- 3) **Conduct a survey to find out the mobility needs.** After the pilot has been launched, ask feedback from the local population concerning the service delivery. We have developed a specific questionnaire that helps to assess the current transport situation and provides information about the piloted DRT service model. If you have conducted a mobility survey beforehand, you can validate the feedback during the DRT pilot project. If you have not studied the questions pertaining to DRT before, we would suggest including the topic into the future questionnaires.
- 4) **For launching DRT, areas that are not covered sufficiently with the current public transport routes suit well.** If you are not sure which area to select for piloting, then think about inhabited areas, but that have poor transport connections to the sparsely populated spots. Also areas from which people could be taken to

larger transport nodes (to provide the “last mile” service for the sparsely populated areas) could be considered.

- 5) **Allowing various target groups to use DRT ensures a sustainable number of passengers and fulfillment of the vehicles.** While drafting the business rules the possibility of handling multiple target groups must be considered. A wide range of target groups ensures that the chosen fleet will be sustainable, occupied by customers and that they would not travel empty.

**RUTER innovation process structure works very well in the given context and it could be successfully used for elaborating DRT service models.** Five phases must be carried out: 1) frame the problem; 2) Analyse the problem; 3) Start developing the service and continuously update it; 4) Carry out as much tests as possible and keep switching the service between phases three and four until it is ready for phase five; and 5) implement it until the service has become a regular part of the daily life. While developing the service model use PESTEL analysis in order to understand the national framework and local factors in order to understand how DRT is related to political, economical, social, technological, environmental and legal aspects. It is important to ask during the service model elaboration and testing what can be done more efficiently to introduce the service and how to ensure that through continuous service improvement it will become part of the daily life.

The author of the paper, *Modern Mobility*, is of the opinion that the objectives have all been achieved and that the results, recommendations and suggestions reached could be used by the transport operators and local governments interested in developing a DRT service that best meets the needs of the local population and the local PTO.

## SOURCES

Coutinho, F. M., van Oort, N., Christoforou, Z., Alonso-González, M. J., Cats, O., & Hoogendoorn, S. (2020, 11 1). Impacts of replacing a fixed public transport line by a demand responsive transport system: Case study of a rural area in Amsterdam. *Research in Transportation Economics*, 83, 11. Elsevier. 10.1016/j.retrec.2020.100910

Gorev, A., Popova, O., & Solodkij, A. (2020). Demand-responsive transit systems in areas with low transport demand of “smart city”. *Transportation Research Procedia*, 50, 160 - 166. Scienccdirect. 10.1016/j.trpro.2020.10.020

Grieco, M. (2021, 1 1). A Dictionary of Transport Analysis. *Demand Responsive Transport*, 87 -93. Scienccdirect. 10.1016/B978-0-08-102671-7.10619-0

International Bank for Reconstruction and Development / The World Bank. (2019). Poland catching - up 3 regions. *RURAL PUBLIC TRANSPORT in Zachodniopomorskie*, 56.  
<https://documents.worldbank.org/curated/en/419001562666842364/pdf/Poland-Catching-Up-Regions-Three-Rural-Public-Transport-in-Zachodniopomorskie.pdf>

Mageean, J., & Nelson, J. D. (2003). The evaluation of demand responsive transport services in Europe. *Journal of Transport Geography*, 11(4), 16. Elsevier. 10.1016/S0966-6923(03)00026-7

RUTER AS. (2021, 06 30). ITERATIVE INNOVATION PROCESS FOR ON-DEMAND  
TRANSPORT. *Project RESPONSE*, 1 - 30.

[https://media.voog.com/0000/0045/1309/files/WP4.3%20Report\\_RESPONSE\\_InnovationProcess.pdf](https://media.voog.com/0000/0045/1309/files/WP4.3%20Report_RESPONSE_InnovationProcess.pdf)

# APPENDIXES

## APPENDIX 1 - Standard terms and conditions of service for public demand-response passenger transport in Saaremaa municipality (pilot project)

### Standard terms and conditions of service for public demand-response passenger transport in Saaremaa municipality (pilot project)

#### 1. Definitions

- 1.1 Also Public Transport Act (§ 2-9) and Law of Obligations Act (§824, 827 and 847) are applicable to “Definitions”.
- 1.2 Passenger - person travelling a public transport vehicle together with his baggage, following the regulations of the contract for carriage of passengers.
- 1.3 Carrier - entrepreneur contracted to deliver DRT-based public transport service who has a contractual obligation to carry passengers according to their orders submitted through the dispatcher
- 1.4 ‘Ticket’ - a document preserved in the web-based environment that proves that the contract of carriage has entered into force and certifies the passenger’s right to be carried.
- 1.5 “Public transport vehicle” - a vehicle used for the provision of DRT services;
- 1.6 Contract for carriage of passengers - a contract between the carrier and the passenger by which the passenger has the right to use a public transport vehicle providing DRT services and the carrier is obliged to carry the passenger to a destination with or without baggage. The contract enters into force when the order has been approved by the dispatcher.
- 1.7 Hand baggage - personal belongings of the passenger that during the DRT ride are under the custody of the passenger. Hand baggage also includes pets.
- 1.8 Standard conditions - the current document regulating the service content and its provision.
- 1.9 Party ordering the service - Saaremaa municipality via Saaremaa Municipality Government as the public transportation organizer Tellija.

#### 2. Service target group and making, receiving and confirming the order.

- 2.1 DRT service target group are inhabitants, visitors and tourism entrepreneurs in Salme and Torgu areas. The service is provided in Salme and Torgu areas;
- 2.2 DRT service is provided during the pilot period 01.07.2021 - 30.06.2022 daily from 8AM to 9PM;
- 2.3 During the pilot period the passengers do not have to pay for the service. The costs are covered from the state budget;
- 2.4 Orders can be made from Mondays to Thursdays from 8.30 AM to 4PM and on Fridays from 08.30 AM to 2.30PM by calling the dispatcher +372 4525135. The passenger must order the service at least 24h prior to the desired pick-up time;

- 2.5 The order could be made using the phone number given under section 2.4. While ordering by phone the passenger is asked starting point, destination and time of the ride;
- 2.6 If the logistics does not match with the passenger order concerning time, the dispatcher contacts the passenger and a new starting point and time of reaching the destination will be agreed. The difference in picking up and reaching the destination cannot differ more than 30 minutes from the initial order;
- 2.7 If the order fits into the logistics, the order is confirmed. Orders made using a phone will be added to the web-based environment and addressed for the driver to deliver;
- 2.8 The service provider is obliged to pick the passenger up and take him to the destination at agreed times, with the exceptions listed under sections 2.9, 3.3, 4.2, 4.3, 4.4 and 4.6.
- 2.9 The passenger is obliged to be at the agreed upon pick-up point on the given time. If there is no need for the service, the passenger must cancel the ride as set out under section 3.

### **3. Cancelling the ride**

- 3.1 The ride may be cancelled, but not less than 12h prior to the initially agreed pick-up time;
- 3.2 The ride can be cancelled via contacting the dispatcher using the phone number listed under section 2.4 and in the noted time-frame;
- 3.3 In case the ride is not cancelled and the passenger does not appear to the agreed-upon pick-up point in the given time and this has happened at least twice, the dispatcher has the right not to serve the client in the future.

### **4. Carrying the passengers**

- 4.1 The passenger enters and leaves the public transport vehicle at agreed-upon locations;
- 4.2 The public transport vehicle driver may refuse to serve a drunk or aggressively behaving passenger and not allow him to mount the vehicle, even if the passenger has the right to ride. In such cases the passenger does not have the right to claim compensation from the carrier that occurred for using other types of transport;
- 4.3 The public transport vehicle driver may refuse to serve a dirty or smelly passenger and not allow him to mount the vehicle, even if the passenger has the right to ride. In such cases the passenger does not have the right to claim compensation from the carrier that occurred for using other types of transport;
- 4.4 The public transport vehicle driver may request a passenger described under sections 4.2 and 4.3 to leave the public transport vehicle at any given time, even if other passengers have not complained. The public transport vehicle driver may stop in that case and deviate from the initial logistics. The public transport vehicle driver notes down the rationale why the passenger was requested to leave and the short description of the passenger. If another passenger notifies the driver about a person falling under categories listed under sections 4.2 or 4.3, the decision to request leave is made by the public transport vehicle driver;
- 4.5 The public transport vehicle driver may not request to leave a person under 18 years of age prior to reaching the destination, notwithstanding the sections 4.2 and 4.3 ;
- 4.6 In case conditions independent from the carrier occur that disable service provision or may jeopardize people, environment or assets, the service provider has the right to stop the service and continue after the danger has passed, notifying passengers about the situation.
- 4.7 The carrier may surpass the logistical sequence if there are road-works on the determined route and the road is closed, an accident has happened or other obstacles prevent using the

road safely. In case of extreme slipperiness of the road the route may be changed, notifying passengers about the situation.

- 4.8 The passenger is responsible that his baggage does not disturb or impede fellow passengers or harm the public transport vehicle. It is forbidden to carry flammable or corroding liquids (lubricating oils, fuels, natural gas, acids and solvents etc.), smelly objects or substances, poisonous substances or other similar chemicals. The public vehicle driver has the right at any time to refuse the passengers to mount the vehicle or to check the baggage during the ride, if the baggage may harm other passengers or the vehicle.
- 4.9 Passengers may transport skis and other sport gear when they are properly packed, fit into the vehicle and do not disturb other passengers. It is not allowed to transport bicycles, self-balancing personal transporters or any other means of transportation with an auxiliary engine. Scooters may be transported following the general rules for baggage transportation.
- 4.10 The passenger is allowed to mount the public transport vehicle with a pram or trolley, if, when packed, it fits into the vehicle and the general rules for baggage transportation apply to it.
- 4.11 It is not allowed to transport pets or birds in the public transport vehicle.
- 4.12 The passenger must comply with the general conditions at all times during the ride and follow the universally acknowledged rules and norms of conduct.
- 4.13. The passengers must comply with the orders and guidance of the public transport vehicle driver, police officer or any other official with the relevant capacity, guarantee personal safety and that of the baggage or accompanying underaged children and fasten the seatbelt during the ride.

## **5. Responsibilities and complaints.**

- 5.1 Carrier responsibility is limited to:
- 5.2 The carrier is not responsible if the hand baggage of the passenger is lost, destroyed or spoiled.
- 5.3 The carrier is not responsible for the damage that occurred to the hand baggage during the ride.
- 5.4 The carrier is not responsible for any losses occurred to to the delay in the ride not caused by the fault of the carrier.
- 5.5 The carrier is responsible for the injuries to the passenger if the harm was caused by the fault or negligence of the carrier.
- 5.6 In case of injuries to the passenger the carrier's responsibility is limited with respective legal regulations.
- 5.7 In case the passenger or a passenger without the ticket causes harm to a person, environment or property resulting from not following the general conditions, he has to compensate for all harm committed.
- 5.8 In case of damage the passenger must notify the carrier in a written form describing the harm that occurred to the person or to the property. The notification must be made during the service provision or immediately afterwards.
- 5.9 In notifying about the damage the passenger must prove that it took place during the service provision. The passenger must also prove the size of the damage that took place during the service provision.



- 5.10 All cases when damage to persons, environment or property occurred as a result of the carrier's fault or grave negligence are fixed with a special act composed by the carrier representative in the presence of the passenger. If the act is not composed on the location, the passenger has no further right to complain.
- 5.11 The public vehicle driver is the representative of the carrier concerning problems related to passenger and baggage transport on the public transport vehicle.
- 5.12 The passenger has the right to complain about the action or inaction of the carrier by letter or e-mail during maximum 7 (seven) days after the ride took place. Complaints received later will not be handled.
- 5.13 The complaint must include at least:
- 5.13.1 name and contact information of the applicant;
  - 5.13.2 date of submitting the complaint;
  - 5.13.3 description of the drawback or the situation, date and time when the ride took place, number of the ride;
  - 5.13.4 Specific and clear demand must be expressed, in case of a financial demand also cost statements or other relevant documentation must be presented
  - 5.13.5 The carrier goes through the complaint and gives the passenger an answer as quickly as possible, but not later than in 10 (ten) days since the complaint was made. If the time is not sufficient to give a final answer the carrier will notify the passenger about it, each case will be solved in no later than 1 (one) month after the complaint was made.

## APPENDIX 2 - Questionnaire

### Thank you for using the VEDAS transport service

Saaremaa municipality was the first local government in Estonia to develop a demand responsive transport service model to offer the inhabitants more convenient and needs-based public transport. During the one-year piloting period the inhabitants and visitors of Sõrve can give their input to developing the service, as the service model will be based on their feedback and service statistics.

We ask you to fill in the following short anonymous questionnaire that helps to improve the VEDAS service further!

### GENERAL QUESTIONS to determine the passengers' profile

(All respondents answer)

1. Place of residence - settlement (village, borough, town)
  - a. *Free text*
2. Sex
  - a. Male
  - b. Female
3. What is your age?
  - a. *Free text*
4. I am:
  - a. Employed
  - b. Retired
  - c. Pupil
  - d. Tourist
  - e. At home
  - f. Other
5. How often do you need to commute?
  - a. 1-2 days per week
  - b. 3-5 days per week
  - c. 7 days per week (daily)
  - d. Other
6. At what times do you usually need transport?  
(Pick all variants that are applicable)
  - a. 08.00 - 10.00
  - b. 10.00 - 12.00
  - c. 12.00 - 14.00
  - d. 14.00 - 16.00

- e. 16.00 - 18.00
  - f. 18.00 - 19.00
  - g. 19.00 - 21.00
7. What kind of transport do you use mainly / most frequently?
- a. Private car
  - b. Public transport
  - c. Private car and public transport
  - d. Other

### **QUESTIONS CONCERNING THE USE OF PRIVATE CAR**

(Applicable to respondents who answered that they use private car or private car and public transport)

8. Why do you use a private car?
- a. Public transport schedule is too sparse
  - b. Public transport schedule does not meet my needs
  - c. Public transport is not convenient
  - d. I like to drive
  - e. Other
9. What purpose do you use a private car for?
- a. Getting to work
  - b. To shop
  - c. To take children to school
  - d. To take children to non-formal educational activities
  - e. To spend free time
  - f. Other
10. How often do you use a private car?
- a. 1-2 days a week
  - b. 3-5 days a week
  - c. 7 days a week - daily
  - d. Other
11. On which days do you use a private car?
- a. Weekdays
  - b. Holidays
  - c. Weekdays and holidays
12. What is your average daily mileage (estimation, kilometres)?
- a. *Free text*
13. How many people are usually in the car?
- a. 1
  - b. 2
  - c. 3
  - d. 4

- e. 5-8
- 14. Would you use demand responsive transport instead of using a private car?
  - a. Yes
  - b. No
  - c. Other

**KÜSIMUSED ÜHISTRANSPORDI KASUTAMISE KOHTA**  
**QUESTIONS CONCERNING THE USE OF PUBLIC TRANSPORT**

(Applicable to respondents who answered that they use public transport or public transport and private car)

- 15. How far is the nearest public transport stop?
  - a. Less than 100m
  - b. 100 m - 500 m
  - c. 500 m - 1 km
  - d. 1 km - 2 km
  - e. 2 km - 4 km
  - f. 4 km and more
- 16. How often do you use public transport?
  - a. 1-2 days a week
  - b. 3-5 days a week
  - c. 6-7 days a week
  - d. Other
- 17. On which days do you use public transport?
  - a. Weekdays
  - b. Holidays
  - c. Weekdays and holidays
- 18. What do you use public transport for?
  - a. Getting to work
  - b. Shopping
  - c. Getting children to school
  - d. Getting children to non-formal education activity
  - e. Spending free time
  - f. Tourism
  - g. Other
- 19. What is your average daily mileage (estimation, kilometres)?
  - a. *Free text*
- 20. How are you satisfied with the current public transport provision?
  - a. Solves all / majority of mobility needs
  - b. Solves some mobility needs
  - c. Does not meet my requirements
  - d. Other

## USING VEDAS

(Everybody answers)

1. What did you use VEDAS for?
  - a. Getting to work
  - b. Shopping
  - c. Getting to school
  - d. Getting to non-formal education activity
  - e. Spending free time
  - f. Tourism
  - g. Other
2. How would you characterize the ordering process?
  - a. All went well, everything was understandable
  - b. Ordering was complicated
  - c. Other
3. How would you prefer to order a ride?
  - a. By phone
  - b. By mobile app
  - c. Other(please clarify)
4. How would you rate your riding experience? (seven grade rating)
  - a. 1 weak - 7 excellent
5. When you ordered the ride:
  - a. The driver was there on time
  - b. The driver was late 15 minutes or more
  - c. The ride took 15 minutes more than initially agreed
  - d. Other
6. Would you use demand responsive transport service also in the future?
  - a. Yes
  - b. No
  - c. Other
7. Would you use demand responsive transport service if you would have to pay:
  - a. 1 - 2 euros
  - b. 2 - 4 euros
  - c. 5 - 8 euros
  - d. I would not use demand responsive transport service then
  - e. Other
8. How would you prefer to pay for the service?
  - a. In cash to the driver
  - b. Using mobile app
  - c. By ticket or card used in other types of public transport
9. Which vehicle did you use during your ride?

- a. SUV Toyota Highlander
  - b. Minivan Toyota Proace City Verso
10. How would you characterize the size of the vehicle?
- a. Too large
  - b. In proper size
  - c. Could be larger
  - d. Such service should use mini buses
11. What additions would you like to see on the vehicle?
- a. Child seat for the safety of the children
  - b. Rack for 1-2 bicycles
  - c. Larger luggage room for extra size personal belongings, shopping bags etc.
  - d. Luggage rack for exceptional articles (skis, bicycles etc)
  - e. There is no need for additions
12. Are you generally satisfied with the vehicle you rode (cleanliness, safety, comfort, extras etc)?
- Free text*
13. What should be improved in the VEDAS service provision?
- Free text*