

# DEMAND RESPONSIVE TRANSPORT

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Guidelines for Public Authorities

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<https://www.interreg-central.eu/Content.Node/SMACKER.html>



## What is Demand Responsive Transport?

Demand Responsive Transport (DRT) is a flexible form of public transport that adapts to the needs of its users. DRT does not follow a fixed timetable or route. Instead, the route or timetable is calculated in response to user requests - vehicles change their routes or timetables based on particular transport demand at the time.

DRT has characteristics of both buses and taxis and can take the form of a wide range of solutions: from the familiar "dial-a-ride" services that are usually booked by phone, to dynamic applications that allow trips to be booked through an application that adjusts the route in near real-time to accommodate new pick-up requests.

DRT services are well suited to be shared and flexible, using fleets of vehicles that are deployed on demand to pick up and drop off passengers according to their needs (1). DRT lies somewhere between the unsustainable, flexible and individual transport services provided by private vehicles (e.g. cars) and the sustainable, shared but less flexible traditional public transport services (metro, tram and bus), with varying degrees of sustainability/shareability/flexibility depending on the service (Figure 1).

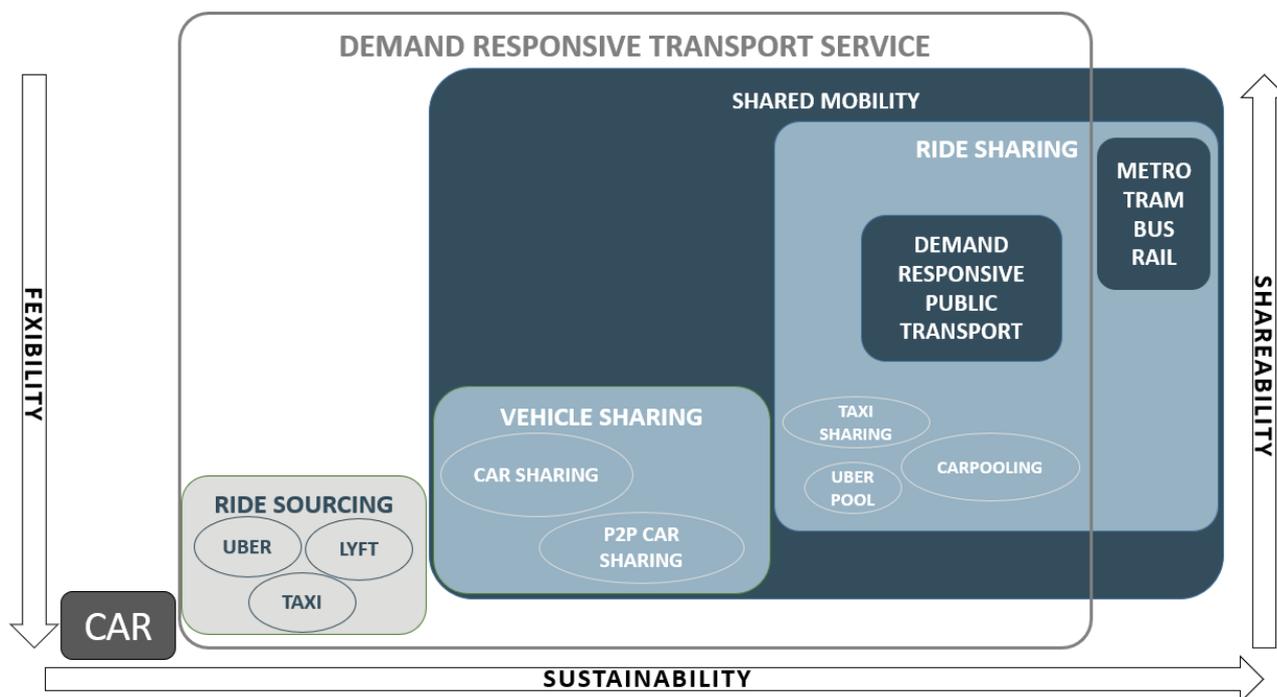


Figure 1: Classification of Demand Responsive Transport services (1)

Recent developments in technology and business models have led to much greater diversity in the modes of transport available (2). In the past, the vast majority of trips in urban areas were made by private vehicles and public transport, with taxis, cycling and walking making up the rest. Fast-forward 10 years and there are now all sorts of transport options, including car sharing and ride sharing, as well as dockless bikes and electric scooters (eScooters). Despite these new offerings, there is still a significant gap in the market between relatively low-cost or subsidised public transport and commercial ride-sharing and taxi services that can be accessed on foot or by bicycle. There is growing interest in whether on-demand public transport can fill this gap.

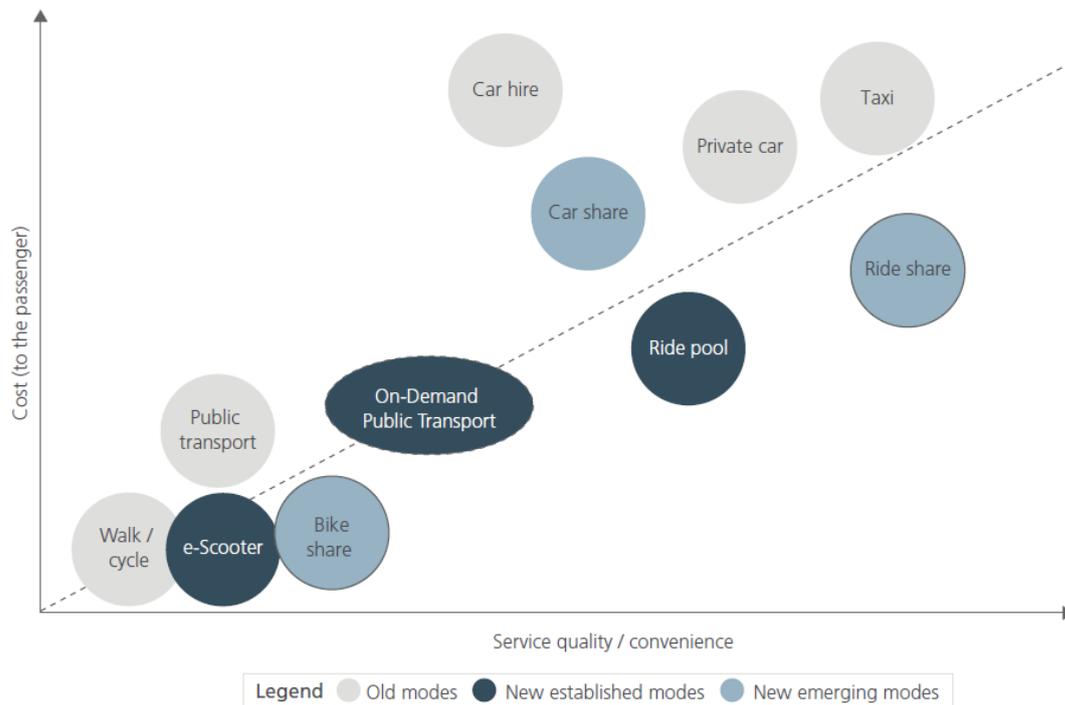


Figure 2: Price and service attributes of different transport modes (2)

DRT can be used to solve a range of mobility problems. It can be used for first and last mile service for passenger and freight transport, or it can replace poorly performing, low-frequency low patronage services by transferring users to the wider public transport network. On-demand public transport is particularly suitable when there is insufficient demand for frequent and direct mass transport.

### Benefits of Demand Responsive Transport

- Replace a fixed route

Because a DRT service operates only when needed and on an optimised route, it can cover fewer kilometres overall than a fixed-route service, which reduces fuel consumption. Also, the size of the vehicles can be adjusted to the expected number of passengers, reducing CO2 emissions per passenger and per kilometre travelled. More trips can be made when a DRT service is aimed at unlocking suppressed travel demand to improve social inclusion and rural mobility.

- Substitute car journeys

A DRT service can replace multiple, single occupancy car journeys. For example, in a commuting area where there is insufficient demand for a fixed bus service, or to serve those who work in shifts or work flexibly. Switching from a private petrol or diesel car to a DRT vehicle would improve emission reduction.

- Encourage active travel

There is an opportunity to better link bus and DRT services with cycling and walking to make it easier to travel without a car and by different modes of transport. This can be facilitated by taking bicycles on board or on external racks, or by providing secure bicycle parking facilities at bus stops or frequent destinations.



## Types of DRT

Demand Responsive Transport is implemented in many different ways. Its main characteristic is flexibility and demand responsiveness, being adaptive in either scheduling, routing or a combination of scheduling and routing. The most commonly used types of DRT are (2):

- **fixed routing** (itineraries) and **flexible scheduling** (fixed time slots or on demand);
- **fixed routing** (itineraries) **with routing deviation on demand**;
- **with flexible routing** (itineraries) **with predefined stops**;
- **with flexible routing** (itineraries) and **flexible stops** (door-to-door service, very similar to a taxi).

DRT services also differ in terms of the type of vehicles used. Depending on the market served, DRT services can be provided by minibuses or medium-sized vehicles (22 to 30 seats), sometimes also by taxi operators:

- **Taxis** provide more cost-effective DRT services in areas where demand is lowest and more dispersed.
- **Minibuses** work better on semi-fixed route patterns in more densely populated areas.

### Examples of demand responsive services (2)

- A **“Virtual line”**. A virtual line is a service that is similar to normal scheduled services since it stops at fixed stopping points, follows regular routes and runs according to timetables set in advance. The basic difference compared with normal scheduled services is that it only runs if requested by one or more users.
- A **“Door-to-Door” service**. A Door-to-Door service, although less common, is a service transporting users from their homes to specified destinations. It is reserved for the elderly or for people with reduced mobility. There is no set route in this case and the service may be provided by taxis or minibuses belonging to the main network operator.
- **“Stop-to-stop” or “point-to-point” services**. Stop-to-stop or point-to-point refers to a system that serves an area with stops defined in advance. Routes may vary depending on stops and user demand. It may also use taxis or minibuses.

On-demand public transport is not the same as commercial ride-sharing services such as Uber, taxis and others (although there may be scenarios where ride-sharing providers could participate in on-demand public transport). Commercial on-demand services typically focus on optimising the journey for the individual passenger to reduce waiting and/or travel times. On-demand public transport focuses on optimising the journey for groups of passengers travelling to or from a hub at a subsidised price. This can result in relatively longer waiting and travel times compared to commercial on-demand services and is more likely to involve shared journeys. The concept is similar to that of pooled ride-sharing services such as UberPool and LyftShared<sup>1</sup>, but these are generally not subsidised.

<sup>1</sup> In UberPool and in LyftShared passengers get matched with other passengers going in the same direction and they share the ride. The trip costs are split between all passengers.



## Things to consider

When setting up and procuring a DRT service, a local authority has many decisions to make. DRT services are most effective when integrated into a regular network, and they are not the right solution in all circumstances. For example, it is unlikely that there are benefits to replacing frequent urban and interurban routes. But if an existing line has too few passengers on several trips, a conversion to DRT can be considered. However, a more forward-looking strategy is to fill the time and space gaps with new DRT services in the region.

### Mobility challenges of the area

When considering the introduction of DRT, local authorities should always take into account the mobility problems in the area. This would help determine whether DRT is suitable for the area in question. The main considerations must be:

- the main areas to be served (residential areas, industrial areas, tourist areas),
- the identification of key destinations, such as employment zones, major employers, town centres, hospitals and health facilities, leisure attractions, transport hubs in the area,
- existing passenger transport services,
- existing mobility habits in the area.

Demographic and economic data should be considered, as well as the reasons why people are travelling (purpose of the trip). The matrix below shows the viability of flexible public transport services in peripheral areas, taking into account demographic and economic data as well as the purpose of the trip. According to a report of the Transport Research Board of Transit Cooperative Research Program (4), the trip demands that are most suitable for Demand Responsive Transport services come primarily from the traditionally transport-dependent populations of elderly persons, people with disabilities and people with low incomes, although there are youth activities that could be considered viable for flexible public transport services.

Demographic/Trip Purpose	Youth < 18	Adult 18 - 64	Elderly 65 and over	Persons with Disabilities	Low-Income Persons
Work	Low Potential for Demand Responsive Transport				
School					
Non-Emergency Medical	High Potential	Medium Potential	High Potential for Demand Responsive Transport		
Shopping/Groceries	Low Potential				
Shopping/Other	High Potential	Low Potential			
Social interaction	High Potential	Low Potential			

Figure 3: Matrix of the DRT potentials bases on user's typology and travel reasons (4)



### Policies and legal framework

The authorities regard public transport as a basic need of all residents, so its provision has always been part of policy and is addressed in legislation. Policies at all levels (national, regional, local) should definitely lay all the necessary foundations for the implementation of DRT even if the DRT is not explicitly mentioned. While the inclusion of DRT in sustainable mobility policies can facilitate the implementation process, this is not a prerequisite for policies dealing with sustainable mobility and public transport provision should always provide a sufficient basis.

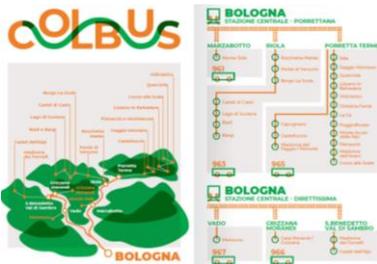
On the other hand, legislation should be studied carefully as public transport is rather regulated. Therefore, a good understanding of national legislation is necessary to ensure compliance with existing laws. Close cooperation with local transport operators is advisable. Nevertheless, several good practice examples show the legal basis for the implementation of a DRT in the European countries.

Check out

[SMACKER](#)  
[Review of policy level for rural and peripheral areas](#)



### Good practice example: ColBus - last mile connection for tourists and residents



ColBus complements the "traditional" public transport services in the mountainous part of the metropolitan city of Bologna. The services improve accessibility of the area for residents and tourists and provide last-mile mobility between scattered villages and municipalities where rail/bus stations are located. The ColBus works with an ad-hoc IT management and booking system, which is also endowed with an app for smartphones. It is used both by the transport service provider, including the drivers, to manage the DRT service and by the passengers to easily book their journeys.

### Funding

Broadly speaking, an 'economically successful' or economically viable service is one where costs and revenues are at least in balance. If this is not the case, the service needs continuous funding (subsidy). Current experience with DRT services shows that these services are not sustainable without direct subsidy. The trade-off between the provision of mobility services and the funding needs for such services should consider the overall priorities in favour of residents and the environment. To ensure viability and increase revenue, contributions from local businesses or major employers may also be appropriate if the system serves a commercial area or touristic area that is not well served by public transport.



## Community engagement

Check out

[SMACKER  
Methodology  
for stakeholder  
involvement](#)

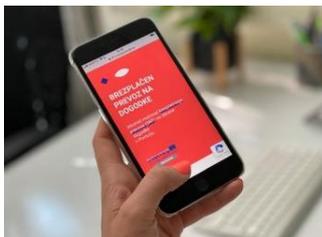


To ensure the best possible acceptance of DRT, local and regional stakeholders should be involved from the outset. In the broadest sense, stakeholders are those who are affected by the outcome or can influence the project in a positive or negative way. Stakeholders such as mobility providers, transport operators, employers, community groups, tourist boards, etc. should be involved. Particular attention should be given to inclusion of disadvantaged and vulnerable groups.

Stakeholder engagement can be seen as the process of including the concerns, needs and values of stakeholders in the decision-making process. It is a two-way communication process that provides a mechanism for stakeholders to exchange information and interact with the formal decision-makers.

Stakeholder involvement brings in knowledge about problems and needs, enables the development of alternative solutions, ensures better quality of decisions, helps overcome conflicts and increases public support and social empowerment. It increases the legitimacy of planning and decision-making and allows stakeholders to provide feedback on the acceptability and usefulness of management actions. So, it is important that Authorities work closely with stakeholders in their community to ensure successful planning of DRT service. One of the possibilities of how to engage stakeholders, is establishment of a Local Mobility Forum that formalizes the process of cooperation, sets objectives, defines structures and operating procedures. This formalization can help Authorities to overcome (sometimes) conflicting demands and requirements of stakeholders. The **SMACKER Methodology for stakeholder involvement** (left bracket above) provides methodological suggestions for the stakeholder involvement.

### Good practice example: RESPONSIBUS - mobility between hotels and major event site



The DRT service connects hotels and the city centre with a major event area in a small rural region in Slovenia. It serves both residents and tourists and is offered as a free-of-charge transport option for event visitors to promote sustainable mobility and provide an alternative to mobility by car. A customized IT solution has been developed that allows booking of RESPONSIBUS rides via web-app in three languages.



## Getting people on-board

Attracting sufficient ridership is critical to the viability and success of a DRT service. Communication and continuous engagement are needed to increase understanding of any DRT service, encourage improvements and build confidence in the reliability and sustainability of the service. The more people know and understand about the service, the more familiar they are with it, the more likely they are to use it. Various nudging and promotional campaigns can be designed to reach different target groups of potential users. For instance, it is possible to think about:

- Guided (demand responsive) public transport tour per target group.
- Demand responsive public transport try-out activities (free public transport test ticket etc.).
- Competition with lottery to promote (demand responsive) public transport commuting from home to work/school.
- Personal mobility assistants for elderly people or persons with disabilities at major transport interchanges.
- Bonus mile programme for (demand responsive) public transport.
- Gamification for (demand responsive) public transport.
- Mobility management in workplaces and organisations.

Check out  
[SMACKER](#)  
[Review of](#)  
[behaviour change](#)



Promotion of Demand Responsive Transport can be combined with promotion of public transport and sustainable mobility in general.

### Good practice example: Demand Responsive Transport in Budapest



BKK Centre for Budapest Transport operates six DRT lines in the outskirts of Budapest. The telephone service booking was expanded into an online service request for the local DRT lines. During the 1-year pilot, 527 passengers registered, 60% of whom used the system regularly and frequently. As both users and the transport operator were satisfied, the online booking system will remain in operation. The booking system will be integrated into the BudapestGO app in the near future.



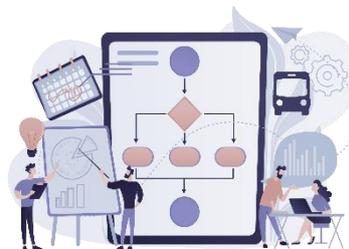
Interested in developing Demand Responsive Transport?

SMACKER can support you all the way!

Use **SMACKER TOOLBOX** and access best practices, guidelines and templates to develop a DRT service.



### Project Partners



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4. Transportation Research Board. *A Guide for Planning and Operating Flexible Public Transportation Services*. 2010.
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6. Illustrations from freepik (vectorjuice).