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DREAM_PACE

D1.1.1 Report on governance and planning for public transport, mobility innovations and DRT in CE Regions

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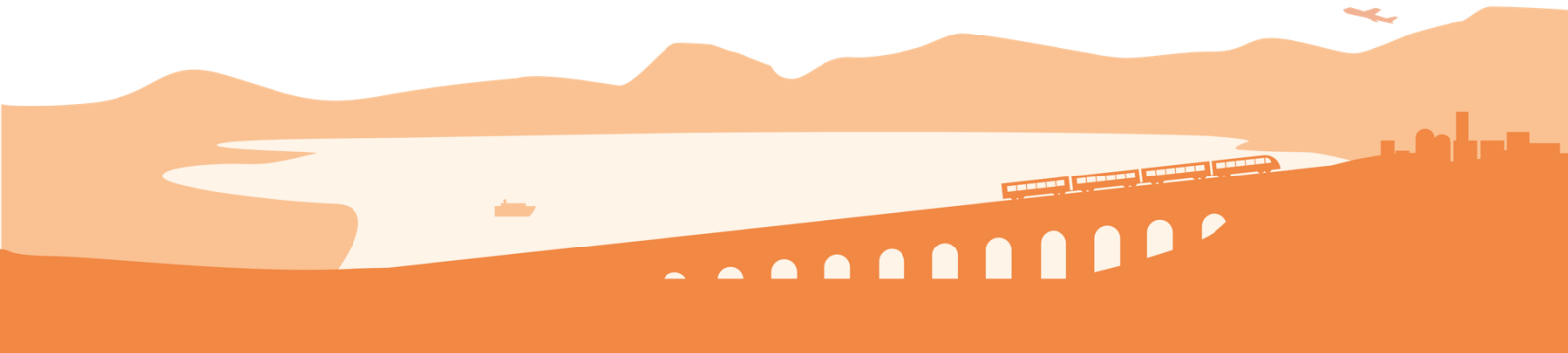

Authors and log change of the document

Partner No.	Partner Acronym	Name of the author	Action	Version
2	Redmint	Gabriele Grea Anja Seyfert	1st version of the document	1
8	ATE	Florian Kressler	Review of the document	2
4	Mobilissimus	Nikolett Csörgő	Review of the document	3
12	RC	Hassan Hussin	Review of the document	4
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Contents

1. Executive summary 3

2. Public transport and flexible mobility in low demand, peripheral and rural areas 4

2.1. Challenges and opportunities for mobility in rural and peripheral areas 4

2.1.1. Information and digitalization are changing public transport 5

2.1.2. The role of sharing in revisiting the concept of public transport 5

2.1.3. DRT as key resource to face new challenges 6

2.1.4. The significant role of traditional Local Public Transport (LPT) 6

2.1.5. The importance of coordination between services to achieve efficiency goals 6

2.2. DRT and public transport: understanding the past for shaping the future 7

3. Institutional and regulatory frameworks for LPT, innovative and DRT services 10

3.1. Austria 10

3.2. Croatia 11

3.3. Germany 11

3.4. Hungary 11

3.5. Italy 12

3.6. France 13
3.7. UK 14
3.8. Focus SUMPs: planning for mobility innovations in EU 14
4. DRT models and trends 17
4.1. Examples of integrated DRT governance and planning approaches 17
4.1.1. Sprinti, Hannover Region (DE) 17
4.1.2. TAD, Île-de-France (FR) 17
4.1.3. Mybuxi /Ebuxi (CH) 17
4.1.4. fflecsi, Wales (UK) 18
4.1.5. Some highlights on DRT trends 18
4.2. Main findings from international DRT projects 19
4.2.1. The Response project (Interreg Baltic Sea) 19
4.2.2. The SMACKER project (Interreg Central Europe) 20
4.2.3. The Last Mile project (Interreg Europe) 20
5. Conclusions 21
6. References 22

1. Executive summary

The territory of central Europe is characterised by uneven transport connections and mobility opportunities, across and within regions, between urbanized contexts and rural and peripheral areas.

The project's common challenge is to improve accessibility and connectivity in CE peripheral and rural areas through better integration of public transport networks with Demand Responsive Transport (DRT) services, building on joint development and implementation of governance, planning, digital and operational innovations.

DREAM_PACE will develop innovative DRT concepts complementing regional mobility networks.

The project will improve DRT planning and delivery capacities of public authorities and operators.

A new generation of DRT services will become functional and integral part of regional mobility networks, enhancing accessibility for citizens, territorial cohesion and social inclusion. Integration is the key to the DREAM_PACE innovative approach, as DRT services are mostly developed as stand-alone solutions to specific needs, the potential of scalable strategies and solutions is widely underestimated.

Project Partners (thereafter PP) will jointly develop a strategy for DRT in Sustainable Urban Mobility Plans to be adopted at EU level, co-design, test and implement innovative DRT solutions enhancing mobility networks. Strategies and solutions will foster a better integration of DRT and public transport (Bologna, Pavia, Budapest areas), support a higher coordination among existing DRT initiatives (Osttirol, Baden-Württemberg) and experiment new integrated approaches for DRT "green fields" (Split-Dalmatia County).

DREAM_PACE will exploit the potential of integrated planning and digital and operational innovations for a common strategy and develop innovative DRT modular solutions. The project implementation builds on transnational cooperation to guarantee an adequate responsiveness and adaptability of project results to specific characteristics of mobility ecosystems across CE rural and peripheral areas.

This report investigates the main trends and developments in governance and planning for DRT in relevant CE Regions and beyond, highlighting advanced examples of integration in public transport and innovation ecosystems, with a specific focus on peripheral and rural areas.

The second chapter introduces the main concepts and challenges related to public transport and flexible mobility in low demand, peripheral and rural areas.

Chapter 3 presents an overview of the institutional and regulatory frameworks starting from the countries engaged in the project, and includes other relevant cases for the purpose of the study. Moreover, a focus on SUMPs and planning for mobility innovations in the EU is included.

The fourth chapter provides a brief but significant review of case studies that tackle relevant aspects related to governance and planning of DRT services. The first part of the chapter is dedicated to four examples of active services that highlight the importance of governance and planning solutions to make DRT effective and successful. The second part presents the main findings of previous projects on DRT dealing with governance and planning challenges and that identified valuable hints and recommendations.

The conclusions of this introductory work on governance and planning for DRT services in the framework of local public transport and mobility innovations aim at providing useful takeaways for the elaboration of D.1.1.2 “State of the art report on governance structures and planning processes for DRT in the pilot areas”, that will be developed with the contribution of project partners in the six pilot areas, highlighting gaps and specificities of governance frameworks and planning approaches.

Finally, chapter 6 contains the references of the document.

2. Public transport and flexible mobility in low demand, peripheral and rural areas

Demand Responsive Transit (DRT) services are frequently identified as a useful solution to improve the connectivity of areas with low population density thanks to the greater flexibility compared to scheduled local public transport services.

In order to better contextualize their function within public transport networks, it is appropriate to focus on the fundamental concepts relating to low demand, peripheral and rural areas and mobility. A study prepared for the TRAN Committee of the European Parliament [Bisaschi, 2021], investigated the main challenges and trends in transport policies and infrastructures in low-density and depopulating areas, providing an assessment of policies and projects development in some representative territories.

2.1. Challenges and opportunities for mobility in rural and peripheral areas

In the debate on areas with weak demand, there is often a tendency to focus attention on the aspect of population density. However, academic research has shown that the concept is more complex: in particular, the remoteness that characterizes certain areas generates a locational disadvantage which in turn translates into fewer opportunities for socio-economic development. The demography of these areas is affected by specific phenomena such as emigration, low birth rates and an aging population. They are also the specificities of the territories such as, for example, the proximity of borders, the presence of mountains, insularity, etc. to define the main challenges in terms of accessibility [Bisaschi, 2021].

The isolation and lack of connections with the territory play an important role in the dynamics of demographic decline. Sparsely populated areas are more sensitive to the dynamics of emigration and low birth rates. The theme of emigration in Europe highlights contrasting dynamics between urban and rural areas [Vasileios, 2019], in which remote areas experience depopulation in favour of metropolitan areas and more dynamic urban agglomerations. In addition, further challenges are posed by the aging of the population, the result of emigration of the new generations, an increase in life expectancy and a decrease in the birth rate.

In particular, the decrease and aging of the population determine a reduction in the human capital available to the regional labour markets, which in an evolutionary context goes in the direction of the "knowledge economy" and thus inevitably determines a further marginalization of rural areas [Li, 2019].

At an empirical level, these considerations are confirmed by the fact that in some regions there is a vicious circle [Vasileios, 2019] in which migratory movements towards more economically favourable environments further reduce the socio-economic dynamism of remote and rural areas.

Looking at the opportunities generated by the territory, a report developed by the Nordic Center for Spatial Development [Dubois, 2012] highlights how large urban centres benefit from outsourcing phenomena linked to the knowledge economy, while less populated areas more focused on the primary sector are affected by smart specialization phenomena distributed in a non-homogeneous way (particularly in agriculture, fishing, forestry). The report also highlights how in some low-density areas the presence of cultural and natural heritage leads to the development of the tourism industry, which has a positive impact on demographic dynamics and attracts a workforce, especially a seasonal one [Dubois, 2012].

For the reasons outlined above, it is essential to identify mobility solutions that not only aimed at responding to the specific needs of citizens in remote areas by guaranteeing accessibility to basic services and compensating for the lack of connectivity, but also aimed at supporting sustainable socio-economic development that will reverse the vicious demographic circle by improving the attractiveness of the territories.

Looking at the specific context of rural and mountainous areas, a report by the International Transport Forum [ITF, 2015] underlines the difficulties relating to the supply of local public transport not only linked to competition from private vehicles and to the structural conditions of demand (ageing, emigration), but also to the increase in operating costs and financing difficulties.

The increase in costs due to the distance between origin and destination is certainly an intrinsic feature of mobility in rural and mountainous areas. Furthermore, in low-density areas transport providers cannot exploit the economies of agglomeration and scale present in more populated areas.

The study [ITF, 2015] mentioned above also underlines how many of the challenges relating to the development of local public transport in rural areas are substantially similar in different countries and contexts. It identifies in particular the common difficulty of public administrations and transport authorities to meet the accessibility needs of different user groups, in territories often characterized by a diverse mix of population types and different densities.

Identifying effective solutions is essential for the accessibility of the territory, its competitiveness and social cohesion. A diverse range of solutions needs to be identified, including innovative transport services. In this context, the evolution of the regulatory and planning framework is an obligatory step for integrating new and flexible solutions such as transport on call (DRT) into existing networks.

2.1.1. Information and digitalization are changing public transport

Among the factors to be considered when redesigning the framework of local mobility in line with the need for accessibility in peripheral and rural regions, the issue of digitization certainly plays a significant role.

Technological development in telecommunications and the development of mobile computing platforms are changing the way consumers conceive public transport services. The frontier is that of increasingly personalized services with respect to the needs of passengers, capable of responding also to life models and mobility habits built around local communities. The challenge of the digital economy is to be able to generate real benefits for citizens, even in contexts characterized by the critical issues described above.

Furthermore, the data generated through the digitization process can help governments, businesses and individuals make more informed decisions. Data improve understanding of commuter behaviour and supports the development of solutions and the implementation of targeted policies, and can help trigger change in user habits and behaviour.

From the point of view of the management of mobility, the improvement of the available information base is instrumental to better understand demand, to improve planning of the services to meet the needs of the users, and to evaluate more precisely the profitability of the transportation services by identifying its market potential.

2.1.2. The role of sharing in revisiting the concept of public transport

A further point of reflection is the potential role of sharing services, such as car and ride sharing/pooling. If it is true that people's mobility habits are changing, it is equally clear that this is not happening uniformly. In less populated areas the dependence on the private car is still high. The development of sharing services (whether they are "asynchronous" as in the case of car sharing, or "synchronous" as for ride pooling) becomes a necessary lever to reduce dependence on car ownership under three conditions: that a sufficient critical mass is reached to make the new services recognizable and reliable; that the services are kept active also by drawing on different resources at the local community level; and that virtuous forms of cooperation and integration between different methods and services are developed.

2.1.3. DRT as key resource to face new challenges

The interest in on-call (or demand responsive) services in recent years is closely linked to the technological and digital evolution of the platforms that today allow more efficient travel planning, an improvement in sharing information with users (in real time) and greater route flexibility.

One of the reasons for this is linked to the potential of replacing traditional services with this new method, particularly in rural and low-demand areas. Conceptually, call services are distinguished between those that offer "door-to-door" relationships and those that are offered between predefined points, exclusively in the presence of demand. In this way, the on-call service adapts to user needs: routes, active stops and timetables are designed on the basis of passenger requests.

DRT services can satisfy different mobility needs, focusing on areas with varying mobility needs, or on off-peak time slots, or on specific demand categories (e.g. disabled, elderly, students, tourists). The services can also be combined with conventional methods, improving their capillarity and sustainability.

2.1.4. The significant role of traditional Local Public Transport (LPT)

The new forms of mobility do not reduce the importance of conventional public transport but complement it, even in rural areas where DRT services alone are not able to meet the demand. The improvement of the quality of the services is a shared approach which has the aim of attracting new passengers and improving the economic efficiency of the offer.

Experience shows how the improvement of service levels, particularly in rural areas, is successful through the involvement of local levels. This is the case, for example, of Japan [ITPS, 2011] where the involvement of the municipalities, citizens and the main economic operators of the area (and therefore of the "customers" of mobility) in the regional planning of public transport services has led to a revitalization of many services and the consequent increase in demand.

The development of public transport in rural and sparsely populated areas needs to be part of a wider strategy, in synergy with local and regional plans. The identification of critical connections is fundamental, for which it is necessary to provide minimum levels of service also through new forms of mobility and services of a different nature.

2.1.5. The importance of coordination between services to achieve efficiency goals

Connected to the previous point is the issue of coordination between services. Better coordination, especially between services offered locally such as on-call services, can generate economies of scale. In particular, in many cases the improvements concern common planning and production, but also the collaboration between different forms of transport and the sharing of means and resources.

Often, particularly in scattered areas, fleets are underutilized during the day, and more efficient exploitation can occur by using fleets for different functions during the day. A further element is given by the possible integration of special services in the set of services offered (e.g. school buses and services for the disabled and elderly), with particular attention to maintaining satisfactory levels of service for the main beneficiary categories. An additional suggestion concerns the coordination between passenger and freight services, in particular postal services. In some rural realities, the postal operator has historically also provided passenger transport services. For example, in the United Kingdom [White, 2011], some experiments have been carried out in which postal vans on some routes between sorting depots and collection points have been replaced with minibuses, allowing the joint transport of mail and passengers.

2.2. DRT and public transport: understanding the past for shaping the future

The analysis of the literature relating to the development of on-demand services is useful for defining the framework within which the attempts to make local public transport more flexible can range, between improving the accessibility of the territories, raising the quality levels of the service for citizens and the economic efficiency of services and the system.

With flexible services we mean those complementary services to mass transport that insert elements of flexibility in the transport offer in space and time. In space, going to fit into the territories and relationships (for example first-last mile, or door-to-door) not served by the traditional offer, over time going to integrate the existing offer at times in which the services of fixed schedules and routes are costly and ineffective at meeting demand.

The historical reconstruction of the development of flexible services constitutes a first step towards the construction of a classification system that allows us to understand the potential of DRT systems in contributing to more sustainable mobility.

According to some authors [Deka, 2023], the first Demand Responsive Transit experiment can be dated back to 1916 in Atlantic City, in the United States, where some informal services (called jitneys) were developed to respond to the growing demand for travel by citizens. However, soon these services were limited by the local authorities to operate on fixed routes due to competition with existing services (especially trams) and thus reducing their attractiveness and relevance.

The DRT returns in the 1960s, corresponding to the growth of urban sprawl. In 1969, with the CARS project, the Massachusetts Institute of Technology (MIT) developed the first algorithm for managing relationships between origins and destinations in a "many to many" logic, with the aim of obtaining an effective assignment of the demand, reducing the need for personnel and therefore making "door-to-door" transport more convenient. In the 1970s some demonstration projects based on shared and dial-up taxi services in California, Illinois and Iowa were funded through federal resources [Cervero, 1996].

However, in reality, the high operating costs, slower commercial development and high prices led to the failure of many initiatives in the United States. Between the 80s and 90s, a differentiation of informal services for weaker groups of users (the so-called paratransit services) began with the level of use of the available communication technologies. In the 2000s, despite the spread of the internet, DRT services remain marginal and are not particularly successful in replacing traditional paratransits. In the past couple of years, however, they have started to stand out more, and technological evolution has made DRT an option for the development of mobility services for a wider audience in urban and metropolitan areas [Pettersson, 2019].

Looking from the same historical perspective to experiences in the United Kingdom [Ryley, 2014], in the 1960s the concept of DRT was experimentally applied as a dial-a-ride and flexi-route service, in some rural areas. It was then refined, further developed and extended in the 70s in various areas of the country. A second wave of interest in DRT services was noted in the 1980s, corresponding with the early stages of the Thatcher government's deregulation of the public transport sector. Under different premises, in the 2000s DRT services found new interest thanks to central government sponsorships which secured funds dedicated to rural road transport (e.g. the Rural Bus Challenge). An interesting aspect of this approach is the support given to numerous rural initiatives promoted by the communities (e.g. community based) through public institutions such as the Commission for Rural Communities. At the same time, the urban contexts have seen a rapid growth of telephone call services (dial-a-ride), in particular to support the categories of users unable to use conventional services. In 2012, most of the approximately 2,000 existing DRT service schemes pursue social or community purposes (serving areas of low demand), and depend on public funding. Similar to the case of the United States, therefore, flexible services also play an important role in the United Kingdom in guaranteeing accessibility to areas with low demand, and in urban areas to specific categories of users.

In general, also in other international examples, until the first decade of the new millennium, DRT services, despite their development, were not particularly successful in replacing scheduled public transport in situations where the latter was not economically sustainable [Davison et al., 2014].

Looking instead at the decade 2010-2020, there has been a rather rapid evolution of DRT services also in urban areas, strongly linked both to the rapid diffusion of smartphones and mobile applications and to the decrease in subsidies to local public transport, also paving the way to private "market" initiatives developed by the so-called Transportation Networking Companies (TNC) [Coutinho, 2023].

Examples of DRT solutions developed from 2012 onwards include ViaVan (today Via), Kutsuplus, Bridj, Chariot, Padam, UberPool, Lyft Lines and Shuttle. The services offered are developed in the market space between public transport and taxi/TNC services, with very different business models and service characteristics. Some of these examples will be taken up again in the next chapter in the market analysis and case study review.

From an analysis conducted on 114 DRT services in the world active between 1970 and 2019 [Currie, 2020] it emerges that about half of the promoted services have terminated their activities by the end of the period. The work distinguishes three historical phases (Dial-a-ride telephone call services 1970-1984, Paratransit/Community transport 1985-2009, ICT tech Microtransit DRT 2010-2020) and analyzes the results in terms of number of projects and longevity. The number of projects of the first phase (1970-1984) is low but there is a high success rate, while a high percentage of the projects were started in the following period (in particular between 1999 and 2004) dominated by local public and social services (paratransit/community) and many are still active (58%). The last phase is dominated by the development and diffusion of digital platforms at the service of the DRT, it is interesting to note that despite the period closest to the present day, 45% of the initiatives have already shut down again.

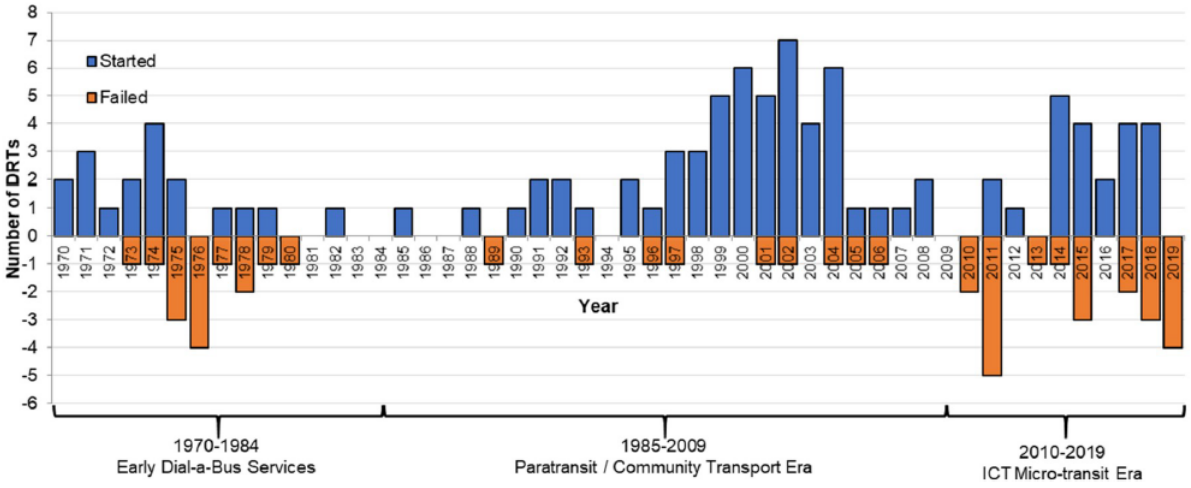

Figure 1. Frequency distribution of start and end of services (period 1970-2019, 114 services analysed) [Currie, 2020]

Looking at the overall dynamics, it emerges that 50% of the services survive for less than 7 years, distributed unequally across the phases considered: 30% of the paratransit/community projects have a life span equal to or greater than 7 years, demonstrating a superior longevity. If, on the one hand, the relative simplicity of the operating model is identified among the causes of success (limited number of deviations from the defined path), the cited work does not, however, resolve the knot of the relationship between success and cost-effectiveness. On the one hand, the correlation between the presence of subsidies and the longevity of services is not confirmed, while on the other, there is no empirical evidence of the greater cost-effectiveness of digitized services. This last consideration can be linked both to the demand side and to the supply side: on the one hand some of the new services analysed could have - given the greater level of flexibility and complexity - fewer passengers transported, on the other hand the investments in new means could be particularly impactful.

Despite the growing dynamism of the market, it is a fact that to date a sustainable and tested business model has not yet emerged for this type of service. The reasons are different, and some suggestions will come in the following chapter from the analysis of the most recent trends, to then be reworked in the final considerations in the form of guidelines.

The brief historical excursus proposed suggests some elements for in-depth analysis, which concern in particular on the one hand the problem of identifying an adequate classification of flexible mobility services capable of understanding the differences and suggesting success factors, and on the other the theme of the social objectives pursued and the economic efficiency of the various types of service and fields of application.

3. Institutional and regulatory frameworks for LPT, innovative and DRT services

The chapter presents an overview of the institutional and regulatory frameworks starting from the countries engaged in the DREAM_PACE project, and includes other relevant cases for the purpose of the study. Moreover, a focus on SUMPs and planning for mobility innovations in the EU is included.

3.1. Austria

In Austria, most transport related matters are the responsibility of the federal government, but have to be administered at regional (Länder) level, either on behalf of the federal administration or autonomously, according to the national Constitution.

The following examples will show this constitutional cooperation between federal and regional levels.

As for road traffic regulations, the planning and financing of public transport is an example of constitutional cooperation between federal and regional levels. The federal law establishes the responsibility for the planning and financing of public transport in Austria with the aim of strengthening and optimizing rail and bus services (especially at regional level). The Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (bmk) cooperates with the Länder in financing regional public services; the Länder themselves are responsible for the optimization and planning of timetables, tendering of services and customer relations. The Verkehrsverbundorganisationen (Verkehrsverbünde – transport networks) are responsible for the organization of public transport services. Public transport is organised in seven regional transport associations (Verkehrverbünde), respnsible for the organisation of public transport services.

The legal regulations regarding DRT[1] only partially reflect the current practice and the latest developments, which is why the creation of "clear and stable framework conditions" is also one of the projects in the government program 2020-2024.

The following definitions for on-demand buses and collective taxis can be found in the Kraftfahrliniengesetz (KflG):

- "On-demand buses [are] domestic scheduled motor vehicle services that
  a) either do not run without notification and only establish the desired connections within a licensed route system from the required stops if notifications have been made by telephone or in another specified way, or
  b) run according to the timetable only on a specific basic route of the route system without registration, but deviate from the basic route if there are registrations, serve the required stop (request stop), and then return to the basic route and continue to the final stop;"
- "Collective taxis [are] taxi services that transport passengers, after pre-ordering by telephone, with taxis specially marked as call-collective taxis at fixed departure times from specially designated departure points for a fixed fare to a desired destination within a specified, defined operating area." Collective taxis are therefore subject to the Occasional Traffic Act (GelverkG) just like taxis. The operating regulations for the taxi market, which differ in the individual federal states, also apply to the latter.

[1] https://www.bedarfsverkehr.at/

3.2. Croatia

Municipalities are organized by local self-government units independently or in agreement with several local self-government units. A written contract regulates mutual rights and obligations, and competent representative bodies make decisions. The law stipulates that a concession can be used to acquire the right to perform communal activities and use communal infrastructure to perform communal activities of regular passenger transport. Regulation 1370/2007 provides guidelines and basic rules for organizing passenger transport. The model of the organization of the provision of public transport services (including the DRT) can be in the form of a concession contract or a public service contract. When entering a public service contract, the county pays the service provider the net financial effect. The compensation to the public transport service provider must not amount to more than the net economic effect calculated according to the equation defined by Regulation 1370/2007. The procedure for concluding contracts for public services is carried out by public bidding following Regulation 1370/2007 and the Law on Public Procurement (OG 120/16, 114/22). According to the relevant law, a network in the field of public transport is considered to exist if the service is provided by the conditions established by the competent authority Law on Public Procurement (OG 120/16, 114/22), Law on Concessions (OG 69 /17, 107/20), Law on Road Transport (OG 41/18, 98/19, 30/20, 89/21, 114/22).

3.3. Germany

In Germany [Agora Verkehrswende, 2021], the regulatory framework for DRT services is integrated within the Personenbeförderungsgesetzes (PBefG), i.e. the passenger transport law.

With the 2021 amendment to the law, the federal legislator created a legal basis for new digitally supported mobility offers by defining the two categories of "scheduled transport on call" and "aggregated transport on call". In the first case, by call service we mean an extension of scheduled public transport that satisfies the related public service obligations, while in the second it is a "market" offer that is not commissioned by the transport authorities.

In the case of scheduled on-demand transport, both virtual stop and door-to-door systems (or combinations of them) can be adopted, depending on the requests of the administration and in compliance with the public service obligations. These services must also comply with regulations and standards defined by local planning and accessibility requirements for public transport. On the other hand, these services benefit from the VAT reduction for public transport and, more importantly, the cost coverage is defined outside the normal financing instruments for local public transport and can be very different, particularly in the low-demand rural areas.

On the other hand, aggregated on-call transport services are developed outside the perimeter of local public transport, and are subject to restrictions to protect local public transport and taxi services from possible competition. In particular, there are limitations in the operational area (usually the municipal territory), advance booking and requirements on passenger grouping quotas and minimum fares. The licensing authority also applies additional rules, such as the obligation to return to the site after the execution of a transport order and accessibility requirements and low levels of emissions.

3.4. Hungary

The organizational framework of public transport in Hungary includes a combination of national and local authorities, public and private transport operators. Railway services are provided by MÁV-Start as national operator, and on some Western-Transdanubian lines by GySEV (Raaberbahn). Regional and long-distance bus services are operated by the national company Volánbusz, being in the same company group as MÁV-Start. Local services are operated by local companies in Budapest and some bigger or medium sized cities, in other

ones Volánbusz operates local services too. Contracts in the field of public transportation, as well as the funds allocated for the DRT area, are different for every region. Each region has a unique organization and regulations governing public transport. Different studies' proposals provide guidelines for DRT to be organized so that it is part of the public service, and the calculation of fees for discount tickets should be part of the public service contract.

For a long time, the legal and regulatory background was the main obstacle to the take-up of Demand Responsive Transport, as it could not be considered a public service, i.e. it could only be operated on a commercial basis. However, as it was not a public service, it could not receive subsidies, as these were only available for services with a fixed route and timetable.

According to Act XLI of 2012 on Passenger Transport Services:

- A demand-driven service is "a passenger transport service organised by a service provider licensed for such services under a public service contract or a route license, using information technology tools, and operating on a variable route or at variable intervals, or on a variable route and at variable intervals". In the latter case the services are subject to the public service rules (except for timetables). The service may be provided by any vehicle required by the conditions, subject to the necessary authorisation.
- Public regional and suburban passenger transport services may be provided by means of a partially demand-driven passenger transport service in the case of dispersed settlements, in areas with a lower population density than the national average, and in settlements where the lack or state of road infrastructure justifies it.

The issue of public transport organizations in general and DRT services is aimed at transport policy and decision-makers. The emphasis is that public transport and DRT are organized as part of the public service contract and following Directive 1370/2007 to compensate for costs not covered by the company's income. This implies the need for signing a contract, considered a risk for local authorities. Some studies provide guidelines to introduce DRT as an addition to existing services. Accordingly, it is proposed to transform the existing traditional public transport service into a demand-responsive system to provide a higher level of service without increasing costs. In some cities, DRT was already tested, e.g. under the SHAREPLACE project in Zalaegerszeg in 2019-2020, or is under preparation, like in Nyíregyháza. In Budapest DRT services are operated by BKK for several years, offering more and more advanced booking or operational opportunities. DRT operation would be the clue for many cities or suburban areas, as well as in low-density rural areas countrywide. Although several studies have already proven the feasibility and the great outcomes from economic and financial aspects, the classic operational model oriented national operator cannot easily adapt such solutions yet.

3.5. Italy

In Italy, DRT services are identified among the types of service to meet the mobility needs in areas with low demand.

Resolution no. 48 of 30 March 2017 of the Transport Regulation Authority, identifies in Measure 2 (as described in the explanatory report) the territorial-type criteria that the Authorities responsible for programming and planning the LPT can use to identify low demand areas.

The Resolution underlines that for the purposes of identifying weak demand measurable and rigorous criteria must be used, which take into account territorial, temporal and socio-economic aspects. With reference to the territorial aspects, the Resolution proposes the identification and quantification of specific evaluation and identification criteria. In particular, the following criteria are proposed:

1. population density, for which an indicative threshold of 50 inhabitants/km2 (in some cases 30 inhabitants/km2) is proposed;
2. degree of urbanisation, for which the methodology developed by Eurostat considers the percentage of population residing in so-called rural cells – i.e. with a density of less than 300 inhabitants/km2 and 5,000 inhabitants in total - greater than 50%;
3. elderly population: percentage of resident population (established by the competent bodies) aged 70 or over;
4. elevation greater than 600 meters above sea level.

It is possible for local institutions to integrate the territorial aspects mentioned with further criteria (e.g. the infrastructural endowment, the degree of use of the existing mobility offer), and to consider the temporal dynamics (e.g. fluctuation of demand, seasonality) and the socio-economic characteristics (e.g. economic conditions, reduced mobility, presence of categories of users to be protected) to define the concept of low demand.

Measure 3 of the Resolution (as described in Annex 1 - Regulatory Act) defines the criteria for the choice of transport services capable of satisfying low demand relationships. In particular, the measure underlines how the areas with weak demand are served, "in urban contexts or for short-distance journeys within a mobility basin, through demand transport services, including shared mobility services, such as the car-sharing and collective taxis, connected, where necessary, to scheduled transport services. In these cases, it is also necessary to provide for the integration of scheduled and on-call services with school transport services, with those dedicated to the transport of the elderly and disabled, and with other solutions offered by individual Municipalities, without prejudice to the provisions of the article 14, paragraph 4, of Legislative Decree no. 422/1997". Furthermore, the measure establishes that "in cases where the demand or weak relationship is concentrated in limited periods of the year or week or at specific times, through periodic services of a non-continuous nature or on-call transport services, also relating only to certain portions of the territory concerned. The resolution also clarifies that the DRT services identified for areas with low demand are part of the planning process, are subject to a service contract and subject to public service obligations, and can receive financial compensation.

In extreme synthesis, today the Italian regulation identifies on-demand services mainly as tools for satisfying the mobility needs in the presence of "low demand", places them in the context of local public transport, and includes car sharing, taxis and possible "other" alternative/supplementary flexible transport systems, however without specifying their nature and characteristics (e.g. the possibility of integrating, under certain conditions, non-scheduled, voluntary and peer-to-peer services).

3.6. France

In France, according to the transport code, DRT services are part of the local public transport offer, and are operated with fixed fares and vehicles with a minimum capacity of four seats. These can be organized to meet the mobility needs of specific categories of users.

There are two "families" of call services:

a) virtual lines, with predefined routes and stops, with the latter being able to be activated upon request, and may or may not be based on predefined timetables;
b) area services, without a predefined itinerary or programme, where the stops may or may not be predefined (door-to-door services).

Some services can be organized as a combination of the two models described. An example is that of an area service which operates in supply towards a fixed destination (generally a node of the traditional network). Another case is that of "end of line" call services, where the final stretch of a traditional line is replaced by a virtual line.

In the French system, as for the conventional services, it is the local authorities or the autorité organisatrice de la mobilité (AOM) who organize the on-call services. The sharing of responsibilities between the different territorial government entities (regions, departments, municipalities and groups of municipalities) is defined by the Loi d'orientation des transports intérieurs (LOTI).

The authorities responsible for planning and implementing services define the main characteristics of transport services, including pricing. In terms of on-call services, the objective of the authorities is to guarantee their economic feasibility despite the limited numbers. In the extra-urban context, the DRTs are considered public services, the organization of which is the responsibility of the departments.

Municipalities and groupings of municipalities which request it, however, can be entrusted with their organisation. In this case the terms of the agreements are bilateral between the two levels of governance, and the organizer is called "autorité organisatrice de second rang (AO2)".

3.7. UK

In the United Kingdom, where public transport policies are a devolved matter, Demand Responsive Transport (DRT) services are organized by local authorities, which can take advantage of some types of funding provided by the central government.

Different types of transport services can be considered DRT depending on the function performed, including flexible bus services, minibuses for community transport, licensed taxis or private hire vehicles (PHV), social services and non-urgent patient transport.

Also classified as Dynamic DRT (D-DRT) are those services in which routes are adapted in real time to meet new requests, often made a few minutes in advance.

The national Department for Transport has developed a toolkit to support local administrations in planning DRT services, which provides, among other indications on the possible financing instruments to be adopted, among which are instruments such as Section 106 funding (which consists in allocating part of the charges related to residential development projects to finance sustainable mobility services), the Community infrastructure levy (a purpose tax on real estate development projects), but also the development of partnerships such as local economic partnerships and contributions from companies for employee mobility.

3.8. Focus SUMPs: planning for mobility innovations in EU

The second edition of the guidelines for the development and implementation of a Sustainable Urban Mobility Plan (SUMP), published in November 2019, aims to integrate into the original consolidated methodology the most dynamic elements of the evolution of the urban mobility landscape, together with the experience gained in drafting and implementing the first generation of plans based on the original methodological framework.

To complete the methodology, a series of thematic guides have been drawn up in recent years, some of which focus on the integration of specific technological and operational innovations, distilled from the experience of international projects and successful case studies.

The importance of these methodological complements is connected to the need to understand and interpret the role that technological and operational innovations may have in responding to the environmental and climate change consequences, economic and social dynamics that characterize urban and metropolitan contexts. With a focus on mobility, the approach adopted has among its primary objectives that of promoting a new culture of mobility connected to the conscious and sustainable use of new technologies.

As part of the CIVITAS Satellite initiative, which ended in 2020, the main factors destined to have a decisive impact on urban mobility were identified, which a SUMP must consider in its evolution:

a) the electrification of the various modes of transport and an innovative and efficient use of the infrastructure also through the integration of energy from renewable sources;
b) the development of intelligent, connected and cooperative transport systems (C-ITS);
c) data analysis as a key element for the development of new services, policies and planning practices (data-based planning) for sustainable mobility;
d) integration platforms for traditional and innovative mobility services (i.e. Mobility as a Service);
e) the innovative organizational elements characteristic of shared mobility, from on-call services (Demand Responsive Transit) to the different sharing models (in particular "free flow");
f) the enhancement of active mobility, including new micro-mobility concepts;
g) behavioural change, new expectations towards user-friendly and flexible services and decentralized production;
h) a new management of urban space, dynamic and restrictive towards cars, which will also include air mobility.

Among the thematic guides developed within the reference framework of the SUMP methodology, the one on the integration of shared mobility in sustainable urban mobility planning, developed within the CIVITAS Prosperity project, takes into consideration different types of new mobility services: bike systems -public sharing, sharing electric scooters and motorcycles, car-sharing, but also ride-sharing (pooling) and ride-hailing, and collaborative models for the mobility of goods.

Specific insight is provided by the guide on the safe use of micro-mobility in urban areas, which constitutes one of the outputs of the CIVITAS Elevate project, which focuses on light vehicles other than bicycles (electric or traditional), proposing a series of recommendations for safe integration of micro-mobility into urban mobility planning.

Another line of thematic insights specifically concerns the aspects related to the application of communication and digital technologies to improve the sustainability of urban mobility. In particular, it is worth mentioning first of all the thematic guide on the role of intelligent transport systems (ITS) in sustainable mobility planning, which focuses on the analysis of a wide range of technological solutions capable of supporting and facilitating the achievement of sustainability objectives of urban mobility typical of SUMPs, including information systems for passengers, driving and safety, intelligent management systems for accesses, flows, traffic lights, etc., technological innovations at the basis of new concepts such as electronic and immaterial ticketing, Mobility as a Service and demand-responsive services (the new frontier of traditional on-call services).

The guidelines on ITS, focusing on technology as an enabling factor for the achievement of sustainability objectives through the development of solutions and services, are complementary to most of the thematic guides developed within the SUMP methodology, and in particular to those on Vehicle Access Regulations (UVAR), Vehicle Automation (CCAM) and Mobility as a Service.

The thematic guide on regulated vehicle access to urban areas UVAR and SUMP focuses on regulation as a functional tool to achieve an interconnected set of primary objectives, including air quality, reduction of congestion and improvement of the liveability and attractiveness of the urban environment. As mentioned, technological innovation plays a very important role in facilitating the achievement of these objectives by supporting the implementation of restrictive measures.

Looking at the future challenges of urban mobility, one cannot fail to consider automation among the potentially most disruptive factors. The guide on the automation of road vehicles in sustainable urban mobility planning outlines possible planning development scenarios, functional to guide the integration of the new technology into the existing urban mobility system, to guarantee a coherent development with the objectives of sustainability and inclusiveness.

Together with automation, mobility as a service (MaaS) constitutes one of the future trends that are considered as potentially disruptive. The guide Mobility as a Service and sustainable urban mobility planning

presents in particular a review of tools for assessing the readiness of a city for its introduction, and for exploring possible operational and governance models.

It should be noted that, since innovations in urban mobility are rapidly evolving, the methodologies and planning support tools mentioned are at the centre of continuous insights and developments also thanks to international projects involving policymakers and stakeholders. This is the case, for example, of Mobility as a Service which, within the Dynaxibility4CE project funded by the Interreg Central Europe Programme, has developed an in-depth study focused on a) stakeholder participation and demand analysis, b) availability, quality, standardization, data sharing and management, c) incentive measures and schemes to support the adoption of MaaS, and d) integration between new and traditional mobility services in the MaaS ecosystem. The project has also developed a tool for the self-assessment of scenarios, built to support local authorities and operators in strategic choices regarding governance and market models to be developed.

Concerning DRT, DREAM_PACE aims at developing and delivering a strategy for integrating it in the SUMP methodology for central Europe regions and beyond, coordinating and building on the inputs generated by the partners during the project lifetime, contributing to the completion of the range of tools useful to plan for innovations within the SUMP framework.

4. DRT models and trends

In this chapter we present a brief but significant review of case studies that tackle relevant aspects related to governance and planning of DRT services. The first part of the chapter is dedicated to four examples of active services that highlight the importance of governance and planning solutions to make DRT effective and successful. The second part presents the main findings of previous projects on DRT dealing with governance and planning challenges that identified valuable hints and recommendations.

4.1. Examples of integrated DRT governance and planning approaches

4.1.1. Sprinti[2], Hannover Region (DE)

The Sprinti service, active in the Hannover Region, integrates the existing traditional services with the aim of making the overall offer more flexible and efficient, especially in the evening and on holidays. The service is active from morning to late evening.

The service stems from a project developed between the Region and the technological partner Via and is designed so as not to cannibalize the existing services that are offered as an option to users when available.

The service delivers more than 3,000 trips a week, and the average wait is 16 minutes.

A particularly relevant aspect of the solution adopted is the digital integration with traditional public transport services. In fact, the DRT service is displayed both on the dedicated app and on that of the public transport operators of the region (GVH). In this way the solutions are always complementary, and the overlap between the traditional offer and DRT is avoided.

4.1.2. TAD, Île-de-France (FR)

To respond as much as possible to the mobility needs of the inhabitants of Ile-de-France (12,000 square km) and to adapt to the diversity of the region's territories, Île-de-France Mobilités (IDFM) has developed a service focused on the outer suburbs, providing solutions diversified and tailored to areas with low population density, complementary to traditional public transport by road and rail.

The TAD IDFM platform was developed by the region in partnership with the technological partner Padam, with the aim of integrating all possible use cases and potential DRT operators in the region. Today TAD IDFM covers 40 territories and 9 different possible service designs. The platform handles 12,000 bookings per month with an 80% share rate. 95% of bookings are made through the app.

The aspect of integration is certainly the most interesting in this case, where the solution exploits the high level of coordination between services that regional governance offers.

4.1.3. Mybuxi[3] /Ebuxi[4] (CH)

Mybuxi is an initiative born from the needs of users, and which provides for the involvement of citizens not only as users but also as voluntary drivers, to ensure accessibility to rural areas with an all-electric fleet.

The main motivation for introducing the service is to improve the accessibility of the non-vehicle population.

[2] https://sprinti.gvh.de/

[3] https://mybuxi.ch/en/home-en/

[4] https://ebuxi.ch/

In general, the public transport infrastructure in Switzerland offers a good connection between urban centers, but poor connections with residential and rural areas. Under such conditions, an integrated system of DRT and public transport has the potential to improve accessibility and generate stable demand, while reducing the risk of competition between the two transport modes. EBuxi was conceived as a connecting service to trains and buses. At the same time, it offers a great degree of flexibility of routes and schedules [Thi Tao, 2023].

The initiative is also innovative because it identifies a solution capable of tackling two problems: accessible and cost-effective mobility and social inclusion for pensioners, involved as voluntary drivers.

The service, managed by a non-profit association, is active in various areas, the network consists of more than 1,500 virtual stops and more than 158,000 passengers have been transported since the start of the project in spring 2019.

4.1.4. fflecsi[5], Wales (UK)

The solution arises from the partnership between the Transport Authority of Wales (TfW) and the Via platform, with the aim of improving accessibility to essential services for citizens of rural areas.

Operators and local municipalities in rural, urban and suburban areas have been involved with the aim of consolidating the network.

fflecsi operates in 12 areas with 11 different operators, using a mix of solutions, including dynamic, advance booking and hybrid call services. An interesting figure reports how 10% of fflecsi passengers had never previously used local public transport services.

4.1.5. Some highlights on DRT trends

Sprinti is digitally integrated with traditional public transport services. The DRT is displayed both on the dedicated app and on that of the public transport operators of the region in order to be complementary, always indicating the fastest and most convenient solution regardless of whether it is fixed or flexible.

Mybuxi is innovative for three reasons: born from the needs of users, it was designed around these and is managed on a non-profit basis, it involves citizens and in particular retirees as voluntary drivers addressing the issue of social inclusion, and proposes a flexible travel at affordable prices with the aim of bridging the first and last mile gap for rural areas.

Like TAD IFM, fflecsi is designed at a regional level and coordinates a number of services with different models, and different operators who manage the individual services. An interesting aspect is that of branding, where the identification of the name with the regional level provides a unique identity and a high perception of integration.

Some of the most relevant success stories in the DRT sector highlight the importance of coordination between the various services, which can bring different advantages depending on the degree of integration: from common branding to the possibility of programming modular services through the same interface, to monitoring and management of services offered by different operators up to the possibility of pooling production factors such as means in a flexible way between services.

Any reference and coordination platform must certainly be scalable, modular and versatile. But the most important lesson on this issue is that the key element is not so much the size of the single service, but the fact that it can be put online by exploiting the synergies that can be activated between services of various kinds. Likewise, it is very important that the technological solutions adopted are able to interface

[5] https://www.fflecsi.wales/

effectively with the company information systems (for the management and adaptation of personnel and machine shifts), to guarantee the efficiency of operations.

4.2. Main findings from international DRT projects

4.2.1. The Response project (Interreg Baltic Sea)

The Response project (Interreg Baltic Sea Region 2014-2020) involving partners from Estonia, Denmark, Sweden, Norway and Lithuania, analysed 36 case studies of predominantly flexible services (door to door) in 12 countries (Germany, the Netherlands, Ireland, United Kingdom, Norway, Finland, Denmark, Sweden, Estonia, Czech Republic, Slovenia, Australia), classifying them among others by booking methods, geographical areas, types of users and vehicles [Response, 2020].

The analysis revealed the prevalence of services that use apps for bookings, minibuses for transport, and are not dedicated to specific types of passengers. Furthermore, fares are on average in line with those of local public transport and in rural areas booking times are on average longer.

Most of the door-to-door services analysed are carried out in urban areas or cover both urban and rural areas. As highlighted in the literature [Davison, 2012], DRT services are more efficient when integrated with public transport. From the evidence of the cases analysed, it emerges that in the presence of integration, passengers experience better accessibility to traditional public transport networks, in particular thanks to the creation of new services or, in some cases, new lines.

The analysis identifies four types of barriers, linked to the issue of data, the market, legal and administrative issues and the rules of supply and assignment.

As regards the first category, the common themes in all countries concern the availability, but above all the quality and accessibility of data, as well as the issues of privacy and protection and, last but not least, software costs. In terms of the market, it emerges that the presence of low significance of public transport tariffs (e.g. in Estonia) constitutes a criticality for the sustainability of DRT services, while the fragmentation of the regulatory system (in particular between public transport, special services e.g. for the disabled, taxis) constitute a barrier to the development of effective and efficient service models as happens in Sweden. Furthermore, in the countries of the Scandinavian peninsula, the restrictions linked to the possibility of awarding services by integrating different types of vehicles, services and in some cases obtaining permits to operate outside the predefined lines are still relevant. in Estonia it is possible for the contracting authority to request different types of vehicles in the same service contract, but all guidelines must be predefined. In Denmark, DRT services are entrusted separately from the LPT, in Sweden, special and school services require special permits.

The analysis of the cases has shown that the diffusion of DRT services is linked to the greater or lesser stimulus by public administrations and citizens to discuss, plan and support the development of specific actions. At the same time, it is believed that when DRT services reach an adequate critical mass, service costs and public and private funding will decrease, production will become more efficient and consequently the awareness of public administrators and planners towards DRT services will grow.

Finally, the project partners recommend the adoption of "holistic" reporting practices, which by enhancing the socio-economic benefits generated in terms of greater mobility of generally marginalized user groups, further stimulate support for the service and the development of dedicated policies.

4.2.2. The SMACKER project (Interreg Central Europe)

SMACKER (Interreg Central Europe 2014-2020) analysed a set of 26 good (and bad) practices through a review of experiences conducted in previous European projects and international cases, based on their transferability potential, success factors, relevance of social, economic and environmental impacts (sustainability).

The analysis carried out highlighted how successful experiences are characterized by the simultaneous presence of three factors:

a) ICT technologies for fleet management capable of managing the planning and creation of routes for the different vehicles involved in the service in a coordinated and efficient way;

b) on-board units monitoring each vehicle involved accurately,

c) information supports that provide end users with relevant information to allow reservations in a simple and reliable way.

A further consideration emerging from the project analyses concerns the marginality of the use of flexible services for tourist mobility. Synergies with other uses of DRT systems could generate significant impacts on the sustainability of the system as a whole.

4.2.3. The Last Mile project (Interreg Europe)

Last Mile (Interreg Europe 2014-2020) is a project focused on policies aimed at promoting the development of sustainable and flexible services for regional mobility systems. The results of the project highlight how the potential for DRT services is to be found in particular in the opportunity to connect suburban areas and mobility nodes (stations and main stops of regional and metropolitan transport). In this, the key challenge identified is represented by the ability of services to be efficient and easy to use, overcoming the sometime persistent preconceptions about their slowness or inefficiency.

DRT services can also generate benefits in rural areas, especially in those contexts where the presence of traditional extended services is cost-prohibitive. Flexible services, in addition to improving the accessibility of rural areas, have the potential to make them more attractive, also through the improvement of connectivity for tourism purposes.

Support for citizens with limited mobility remains one of the prevailing niches for DRT services, often provided independently of local mobility planning and financing dynamics. The evolution of services in a digital key brings with it various opportunities for better integration and efficiency, with the risk, however, of leaving the comfort zone of traditional users.

In this context, the question of the integration between DRT services and Mobility as a Service platforms arises, to which we will return in the phase of elaboration of the recommendations for the development of a strategy on on-call services.

5. Conclusions

The conclusions of this introductory work on governance and planning for DRT services in the framework of local public transport and mobility innovations aim at providing useful takeaways for the elaboration of D.1.1.2 “State of the art report on governance structures and planning processes for DRT in the pilot areas”, that will be developed with the contribution of project partners in the six pilot areas, highlighting gaps and specificities of governance frameworks and planning approaches.

From the preliminary analysis conducted, few governance recommendations can be distilled to support the development of a development strategy for on-demand services in the engaged areas:

1. Promote the definition of a regulatory framework at national level aimed at enhancing the potential of flexible services, defining their fields of applicability and supporting their development, also through systematic integration into regional, urban and metropolitan mobility plans (PRT, SUMP);
2. Develop a regulatory system aimed at promoting the design of flexible services at local level, and lean procedures for the design and development within a common reference framework, which can be activated with specific objectives and timing/seasonality;
3. Develop a comprehensive and consistent classification of operating models for flexible services, typifying “readily usable” use cases while at the same time leaving room for evolution towards more composite and refined models where appropriate;
4. Spread the culture of participatory planning of services for local communities, promoting skills and methodologies of service co-design and the development of collaborative business models capable of activating local resources; plan the involvement of stakeholders and citizens;
5. Identify public (and private) resources for the development of new services also through rationalization measures of the existing network, and design incentive schemes for the development of local projects also by private actors;
6. Encourage the possibility of developing complementary flexible services - according to a defined common classification - through the awarding procedures, in the specifications and service contracts for the LPT and railways, encouraging cooperation between subjects;
7. Promote synergies between different policy sectors (mobility, health and welfare, education, tourism, etc.), identifying skills, activatable benefits and responsibilities, and defining an interdepartmental working group for the development of services to achieve different objectives in a synergistic way.

Moreover, few recommendations can be provided on the topics of funding and business models:

A. for the definition of the public funding rates, specific elements must be considered according to the objectives and the reference target of the individual services, identifying methods of sharing in the coverage of costs by Local Authorities and different stakeholders where appropriate;
B. differentiate the tariffs according to the characteristics of the service and the objectives defined, in some cases taking into account the willingness to pay of the users (tourist services);
C. analyse and monitor the levels of economic sustainability of the initiatives, through a dashboard for the control and monitoring of services and their use, and common indicators;
D. support Local Authorities and operators in identifying public funding opportunities and experimentation with innovative systems aimed at consolidating the network of flexible services and supporting their diffusion throughout the territory.

6. References

1) Agora Verkehrswende. 2021. Mobilitätsoffensive für das Land. Wie Kommunen mit flexiblen Kleinbussen den ÖPNV von morgen gestalten können. 2021.

2) Ambrosino, G., Nelson, J., Romanazzo, M. 2003. Demand Responsive Transport Services: Towards the Flexible Mobility Agency. s.l.: Italian National Agency for New Technologies, Energy and the Environment, 2003.

3) Autorità di Regolazione dei Trasporti. 2017. Delibera n. 48/2017. 2017.

4) Bisaschi, R., et al. 2021. Research for TRAN Committee – Transport infrastructure in low-density and depopulating areas, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels. 2021.

5) Cervero, R. 1996. Commercial paratransit in the United States: Service options, markets and performance.

6) Berkeley, CA: University of California Transportation Center, Working Paper 299, 1996.

7) Coutinho, F. M., van Oort, N., Christoforou, Z., Alonso González, M.J., Cats, O., Hoogendoorn, S. 2023. Impacts of replacing a fixed public transport line by a Demand Responsive Transport system: case study of a rural area in Amsterdam. s.l.: TU Delft, 2023.

8) Currie, G., Fournier, N. 2020. Why most DRT/Micro-Transits fail - what the survivors tell us about progress. s.l.: Research in Transportation Economics, vol. 83, Article ID 100895, 2020., 2020.

9) Deka, U., Varshini, V., Dilip, D. M. 2023. The journey of demand responsive transportation: Towards sustainable services. s.l.: Frontiers in Built Environment 8:942651, 2023.

10) Demand responsive transport: New insights from peri-urban experiences. Thi Tao, V., Imhof, S., von Arx, W. 2023. 2023, Travel Behaviour and Society 31, p. 141-150.

11) Dubois, A., Roto. 2012. Making the best of Europe's Sparsely Populated Areas, NORDREGIO WORKING PAPER 2012:15. 2012.

12) EIT Urban Mobility. 2022. Urban Mobility Next 7 Demand Responsive Transport: recommendations for successful deployment. 2022.

13) Enoch, M., Potter, S., Parkhurst, G., Smith, M. 2006. Why do demand responsive transport systems fail?. s.l.: Transportation Research Board 85th Annual Meeting, 22-26 Jan, 2006.

14) Folyanty, L. 2023. On-Demand Transit Market Report Q4/2022 & 2022 Recap. [Online] 2023. https://www.linkedin.com/pulse/on-demand-transit-market-report-q42022-2022-recap-lukas-foljanty/.

15) Davison, L., Enoch, M., Ryley, T., Quddus, M., & Wang, C. 2012. Identifying potential market niches for Demand Responsive Transport. 2012, Transportation Business & Management, p. 50-61.

16) Interreg Europe. 2018. A Policy Brief from the Policy Learning Platform on Low-carbon economy. 2018.

17) ITF. 2021. Innovations for Better Rural Mobility, ITF Research Reports. Paris: OECD Publishing, 2021.

18) ITF. 2015. International Experiences on Public Transport Provision in Rural Areas. Paris: OECD, 2015.

19) ITPS. 2011. National Regional Traffic Activation Case Studies in Japan. s.l.: Institution for Transport Policy Studies, 2011.

20) Lakatos, A., Tóth, J., Mándoki, P. Demand Responsive Transport Service of 'Dead-End Villages' in Interurban Traffic. Sustainability 2020, 12, 3820.

21) Li, Y. et al. 2019. Why some rural areas decline while some others not: an overview of rural evolution in the world. 2019.

22) Mueller, A., Beyer, S., Kopp, G., Deisser, O. 2019. User-Centered Development of a Public Transportation Vehicle Operated in a Demand Responsive Environment. s.l.: Stanton, N. (eds) Advances in Human Factors of Transportation. AHFE (2019). Advances in Intelligent Systems and Computing, vol 964. Springer, Cham., 2019.

23) Pettersson, F. 2019. An international review of experiences from on-demand public transport services. s.l. : The Swedish Knowledge Centre for Public Transport, 2019.

24) Response. 2020. Demand-responsive Transport to ensure accessibility, availability and reliability of rural public transport - A mapping study of business models and targeted barrier-enabler analysis for policy makers. 2020.

25) Ryley, T. J., Stanley, P. A., Enoch, M. P., Zanni, A. M., Quddus, M. A. 2014. Investigating the contribution of Demand Responsive Transport to a sustainable local public transport system. Research in Transportation Economics 48 (2014) 364-372, 2014.

26) Schasché, S. E., Sposato, R. G., Hampl, N. 2022. The dilemma of demand-responsive transport services in rural areas: Conflicting expectations and weak user acceptance. s.l.: Transport Policy 126 (2022) 43-54., 2022.

27) TRB. 2010. A Guide for Planning and Operating Flexible Public Transportation Services. 2010.

28) Vasileios, M. 2019. “Demographic trends in EU regions”. s.l.: European Parliament Think Tank, 2019.

29) White, P. 2011. Equitable Access: Remote and Rural Communities ‘Transport Needs’. s.l.: ITF/OECD Discussion Paper 2011-19, 2011.