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Databases: ASCE, Google Scholar, ResearchGate, TRID, TRB, TRR, ScienceDirect, Taylor & Francis, Springer, EBSCO, First (LMS), Springer Link.

Search Terms: Rural areas, social costs, full demand service, paratransit (US), Demand responsive transportation (DRT), Demand responsive service (DRS), Dial-A-Ride Transit (DART), flexible transport services, dial-a-ride system, demand responsive transit, autonomous mobility on demand, many-to-many demand responsive transportation system, Dial-A-Ride Service, rural transport, ageing population, social inclusion.

1. A methodological framework for assessing the success of demand responsive transport (DRT) services

Papanikolaou, A., Basbas, S., Mintsis, G., Taxiltaris, C.
Transportation Research Procedia, 2017, Volume 24, pp. 393-400

This paper examines the modelling and decision-making issues related to Demand Responsive Transport (DRT) services at strategic, tactical and operational levels, providing an alternative categorization of the main implementation problems, in order to support transit authorities in their effort to understand the methodological steps for assessing potential transport investments of such services. Building upon the knowledge gained from a critical overview of the literature, this work aims at contributing to a better understanding of the crucial factors that influence the successful implementation of DRT systems as well as at the identification of the missing methodological elements, bridging theory with practice. (ScienceDirect)

2. Agent-driven variable pricing in flexible rural transport services

Emele, D. C., Oren, N., Zeng, C., Wright, S., Velaga, N., Nelson, J., Norman, T. J., Farrington, J.

PAAMS 2013: Highlights on Practical Applications of Agents and Multi-Agent Systems, pp. 24-35

The fares that passengers are asked to pay for their journey have implications on such things as passenger transport choice, demand, cost recovery and revenue generation for

the transport provider. Designing an efficient fare structure is therefore a fundamental problem, which can influence the type of transport options passengers utilise, and may determine whether or not a transport provider makes profit. Fixed pricing mechanisms (e.g. zonal based fares) are rigid and have generally been used to support flexible transport services; however, they do not reflect the cost of provision or quality of service offered. In this paper, we present a novel approach that incorporates variable pricing mechanisms into fare planning for flexible transport services in rural areas. Our model allows intelligent agents to vary the fares that passengers pay for their journeys on the basis of a number of constraints and externalities. We empirically evaluate our approach to demonstrate that variable pricing mechanisms can significantly improve the efficiency of transport systems in general and rural transport in particular. Furthermore, we show that variable pricing significantly outperforms more rigid fixed price regimes. (Springer Link)

3. An extended demand responsive connector

Lee, A., Savelsbergh, M.

EURO Journal on Transportation and Logistics, 2017, Vol. 6, No. 1, pp. 25-50

The need for viable public transit systems has been well documented and so has the role that so-called flexible transport systems can play. Flexible transport services offer great potential for increases in mobility and convenience and decreases in travel times and operating costs. One such service is the demand responsive connector, which transports commuters from residential addresses to transit hubs via a shuttle service, from where they continue their journey via a traditional timetabled service. To access this service, commuter and service provider agree on an earliest time the commuter must be available for collection and a latest time the commuter will arrive at a transit station. We investigate various options for implementing a demand responsive connector and the associated vehicle-scheduling problems. Previous work has only considered regional systems, where vehicles drop passengers off at a predetermined station; one of our contributions is to relax that restriction and investigate the benefits of allowing alternative transit stations. An extensive computational study shows that the more flexible system offers cost advantages over regional systems, especially when transit services are frequent, or transit hubs are close together, with little impact on passenger convenience. (TRID)

4. Barriers to implementing flexible transport services: An international comparison of the experiences in Australia, Europe and USA

Mulley, C., Nelson, J., Teal, R., Wright, S., Daniels, R.

Research in Transportation Business & Management, 2012, Vol. 3, pp. 3-11

Flexible transport services (FTS) are an emerging term in passenger transport which covers a range of mobility offers where services are flexible in one or more of the dimensions of route, vehicle allocation, vehicle operator, type of payment and passenger category. Research in New South Wales (NSW), Australia identified a number of barriers to the implementation of FTS and this paper explores the extent to which these barriers have been encountered and tackled in the USA and Europe where flexible transport services have been used increasingly as part of the public transport mix in areas where

demand is too low to support conventional public transport. Barriers include institutional frameworks such as policy and regulation; economic issues of funding and fares; operational issues of fleet and vehicles; as well as operator and community attitudes; and information and education. The paper makes recommendations to enable and encourage greater use of flexible transport services by transport service planners and providers through the sharing of best practice and information on overcoming barriers to implementation. (ScienceDirect)

5. Best practice demand-responsive transport (DRT) policy

Logan, P.

Information Services, 2007, Vol. 16, No. 2

People living in regional cities and towns around the world expect governments to deliver reasonable levels of public transport services in their local area. They understand that a small population base can limit the frequency and span of public transport, but want and deserve an acceptable minimum level of service that offers travel choices. Low patronage bases in these regional centres mean that many fixed-route bus services are unsustainable and greatly strain the public purse. Queensland public transport administrators and service providers are addressing this trend by considering changing the planning and decision making focus to include demand responsive solutions to address unsustainable public transport scenarios. This paper presents recent demand-responsive transport research and seeks to identify public transport delivery trends and best practice planning and decision-making approaches that could be applied in the Queensland context. The research indicates that this change in policy focus can be consistent with improved public transport service delivery in regional areas and can enhance community prosperity, safety and lifestyle in rural and regional areas. (ARRB)

6. Central West: regional transport plan

TFNSW, 2013, p. 64

The Central West region has strong east to west road and rail connections across the Blue Mountains to Sydney, through the Hunter Valley to Newcastle, and to the Western region through Dubbo and Parkes. There are also strong north to south links to the New England, Southern and Murray-Murrumbidgee regions by road along the Newell, Mitchell and Castlereagh highways. These highways play important roles in connecting the region. Transport demand is generated by a series of towns with different services that residents and visitors access including hospitals, universities, TAFEs and shopping centres. Buses, taxis, community transport, active transport and the rail and (FIRST) road networks all have a part to play in the integrated transport system for the Central West region. (FIRST)

7. Comparison of constrained and ad hoc demand-responsive transportation systems

Ronald, N., Thompson, R. G., Winter, S.

Public Transportation: Paratransit and Emerging Technologies, 2015, Vol. 4, pp. 44-51

Planning public transport services for areas of low population density is important to enable travel by those without convenient travel options. In such areas, transit vehicles frequently travel with few passengers or even no passengers on board and thereby incur more cost to the transport providers. Demand-responsive transportation (DRT) services are potentially an efficient mobility solution to this problem. The choice of a DRT scheme is important because different types of schemes may produce different performances in the same area with the same demand. Although many DRT schemes have some constraints (for example, a fixed route or fixed time), these impose additional constraints on users who are already constrained, for example, by a lack of access to a car or limited times to undertake activities. Removing the fixed constraint on time leads to evaluating the performance of an ad hoc system. This paper investigates the change in performance of two DRT schemes – a fixed-time but flexible route scheme and a completely ad hoc scheme – by using the multi agent simulation tool, MATSIM, a large-scale agent-based transport simulation, and real data from an existing fixed-time DRT service in rural Victoria, Australia. Experimentation showed that the schemes produced different outcomes for the operator and passengers; however, the optimization algorithm was less important in areas of low demand. Higher levels of demand led to extensive vehicle travel for an ad hoc service, but altering the headways between fixed-time services could achieve a middle ground for operators and passengers. This work is a first step toward developing a decision support tool to evaluate DRT schemes, in particular for those integrated with other modes of transport. (TRID)

8. Development of an integrated flexible transport systems platform for rural areas using argumentation theory

Velaga, N. R., Rotstein, N. D., Nelson, J. D.

Research in Transportation Business & Management, 2012, Vol. 3, pp. 62-70

Flexible transport systems (FTS) offer a promising approach to improving the efficiency and performance of passenger transportation services. FTS aim to provide passengers with flexibility in choosing routes, times, modes of transport, service provider and payment systems. In order to achieve this additional flexibility, a well-designed FTS integrate different modes of transport, possibly spanning multiple service providers, to provide more sophisticated, comfortable and cost-effective transport opportunities. The concept of flexible transport is not new; many existing systems, including shared taxicabs, Dial-A-Ride services, and car-clubs, contain elements of such a system. In this paper, we concentrate on FTS within rural areas, which generally suffer from lack of service availability and demand uncertainties, and for which existing FTS solutions are not well suited. We present an agent-based flexible transport systems platform developed using argumentation theory. Formal argumentation is a powerful technique borrowed from artificial intelligence, and in this context is used to weigh-up the conflicting choices available to both passengers and service providers. The resultant platform for FTS in rural areas acts as a virtual transport market place that would more effectively match existing demand and supply for transport services than existing solutions. (ScienceDirect)

9. Enhancing the service quality of transit systems in rural areas by flexible transport services

Khaled, S.

Transportation Research Procedia, 2015, Vol. 10, pp. 514-523

Public transit services in rural areas need to be innovative to satisfy variable demand. In addition, travel demand is low and residents may have different destinations. Furthermore, rural communities vary widely within regions. Therefore, it is inadvisable to run a fixed schedule transit service. Government and local authorities have attempted to maintain public transit services in rural areas and improve accessibility to these services. Dial-a-Ride (DAR) systems are a form of flexible transportation for better service in rural areas by covering a relatively large area with respect to potential demand. The complexity of the problem makes the DAR problem an NP-hard problem, whose optimal solution is difficult to find in cases of medium and large-sized problems. As a result, most paper handling solution methods for a DAR problem are based on heuristic methods. Here, we provide a solution for the DAR service problem based on a mixed-integer formulation. This study mainly discusses enhancing transit service in rural areas with complex road network topographies where fixed services are less available or are cost ineffective. In addition, we discuss improving service quality with respect to different user types. More attention is paid to considering the social side cost by minimizing not only operating costs but also the total travel times of all travellers. Computational experiments based on real-life data from a locality in Gifu Prefecture, Japan were carried out to test the effectiveness of the proposed algorithm. The results show decreased mean waiting time and excess ride time by considering user costs. (ScienceDirect)

10. European national government approaches to older people's transport system needs

Johnson, R., Shaw, J., Berding, J., Gather, M., Rebstock, M.

Transport policy, 2017, Vol. 59, pp. 17-27

In the context of an ageing population in Europe, our aim in this paper is to establish the extent to which national governments accommodate mobility among older people by promoting specific, age-friendly qualities of transport systems. We identify 11 qualities that help to promote mobility, and hence independence and social/economic inclusion, for older people. We analyse national-level government documents across the EU, Norway and Switzerland to determine how far they address each quality and conclude that disproportionate emphasis is currently being placed on the tangible and easily understood aspects of safety, barrier freedom and affordability. For various reasons, mobility among older people might better be promoted with a more rounded approach. (ScienceDirect)

11. Exploring the propensity to travel by demand responsive transport in the rural area of Lincolnshire in England

Case Studies on Transport Policy, Volume 3, Issue 2, June 2015, pp. 129-136

Wang, C., Quddus, M., Enoch, M., Ryley, T., Davison, L.

Local transport systems in rural areas worldwide are facing significant challenges. In particular, increased car ownership and usage as well as broader socio-economic trends such as ageing populations and cuts in public spending are combining to threaten the bus – the traditional means by which people without cars have accessed the services that they need. Consequently, Demand Responsive Transport (DRT) systems have

emerged in a bid to combine the benefits of bus-based and taxi-based services, to deliver a relatively cheap yet comprehensive level of public transport in low demand environments. Unfortunately, while attractive in principle, several barriers conspire to limit the effectiveness of such services in practice. This paper therefore investigates how individual level factors influence the use of DRT systems in rural Lincolnshire in England by applying an ordered logit model to a survey of DRT users in the county. The analysis shows that those who are disabled, travelling for work, or live in less densely populated areas are likely to travel more frequently by DRT. Men are found to travel less frequently than women when they are below pension age. However there are no significant gender differences once they reach retirement age. This highlights an emerging market potential from the retired male market segment. The implications for policy include recommendations that DRT systems should be designed to cater for such market segments through both traditional channels and through further engagement with employers. (ScienceDirect)

12. Facing equity in transportation network design problem: A flexible constraints based model

Caggiani, L., Camporeale, R., Ottomanelli, M.
Transport Policy, 2017, Vol. 55, pp. 9-17

In transportation planning, solutions designed to meet objectives of equity and social inclusion have to be achieved. From this standpoint, most of Network Design Problem (NDP) models aim at identifying the optimal layout of transportation networks by deterministic bi-level problems formulation to reflect the different goals of at least two decision makers (the network users and the planner). Considering the societal function of transport systems, the NDP, even at operational level, should be addressed also to the research of solutions in which the outcomes of the design (costs and/or benefits) are distributed as much as possible among the potential users or classes of users. Traditional approaches often neglect equity goals that, conversely, should play an important role or define some flows rebalancing problem. In this paper an Equity Based NDP is proposed, where the optimal layout of a road network is determined by minimizing the total system cost under flexible constraints, (jointly with rigid thresholds) by solving a single programming problem. It considers both horizontal and vertical equity criteria in the form of an equity constraint specified for uncertain variables or approximate reasoning environment: this result in a multi-objective fuzzy programming model that aims at maximizing user satisfaction according to all constraints, while taking into account the route choice behaviour of network users. A sensitivity analysis has been performed on a test network, and a comparison with a literature equity based model has been carried out; then, the proposed method has been applied to a real sized network, where an application of equity network design optimization is presented and the results discussed. (TRID)

13. Flexible transport services: overcoming barriers to implementation in low-density urban areas

Daniels, R., Mulley, C.
Journal Urban Policy and Research, 2012, Vol. 30, No.1, pp. 59-76

Flexible transport services include a range of passenger transport mobility offers, where services are flexible in one or more of the dimensions of route, vehicle allocation, vehicle operator, type of payment and passenger category. Although flexible transport services are used increasingly in Europe and the USA as part of the public transport mix where regular services are not sustainable, there are few working examples of these services in urban Australia, although there are many opportunities. Through a series of semi-structured interviews with key stakeholders in New South Wales, Australia, the article identifies barriers to greater use of flexible transport services in low-density urban areas. These five sets of barriers include: institutional frameworks such as regulation; economic issues of funding and cost; operational issues such as fleet and vehicles; operator and community attitudes, awareness and cultures; and information and education. The article makes recommendations to enable and encourage greater use of flexible transport services by transport service planners and providers as part of the public transport mix in low-density urban environments where it can be more difficult to provide regular and scheduled public transport. (Taylor & Francis)

14. Implementation guidelines for demand responsive transport systems (DRTs) in Japan

Takeuchi, R., Fujita, M., Otake, M.

TRANSED 2010: 12th International Conference on Mobility and Transport for Elderly and Disabled Persons, 2010

In this paper, the authors examined implementation guidelines for DRTs pointing to supply situation through case studies in Tohoku area in Japan. Firstly, the authors indicate the characteristics of DRTs by classifying service types (level of flexibility), and then indicate service area and optimum domain of operation for each operation types. Secondly, they indicate the cost structure and cost effectiveness of DRTs, through analyses of cost efficiency of travel dispatch centre (TDC), in which accepting trip reservations from each user, scheduling vehicles. Finally, they indicate appropriate area-width for DRTs with considering LOS of conventional rural bus and DRTs in Tohoku area in Japan. In conclusion, through comparing cost performance of each TDC systems, (manual dispatching and computed dispatching), the authors found computed dispatching are more cost effective than manual dispatching if number of users are over approximately 150 persons/day. In addition, they indicated the appropriate area-width comparing vehicle operation between conventional bus and DRTs, if they assume that appropriate frequency of DRTs is an hour. When residential areas are far enough from city centre (approximately more than 15 km) or dispersed to each direction, DRTs are not appropriate. (TRID)

15. Investigating the contribution of Demand Responsive Transport to a sustainable local public transport system

Ryley, T. J., Stanley, P. A., Enoch, M., Zanni, A. M., Quddus, M. A.

Research in Transportation Economics, 2014, Vol. 48, No. 0, pp. 364-372

Various studies have advocated the potential for Demand Responsive Transport (DRT) services to deliver sustainable local public transport. This paper investigates the sustainability credentials of DRT services using evidence from UK-based research. More specifically, six potential DRT market niches were identified, including those which offer

potential commercial opportunities (e.g. airport surface access) and those that meet social needs (e.g. non-emergency hospital trips). Mode share of these DRT services, against car or bus travel, was simulated from mixed logit models within a panel data modelling framework estimated from survey data. The survey was conducted of over 400 respondents in urban (Rochdale, Manchester) and rural (Melton Mowbray, Leicestershire) areas. Experience shows that it is particularly difficult to make DRT services financially viable. Of the DRT services investigated, those targeting airline or train passengers offer potential. However, they are in direct competition with the car, and so their success depends on the cost and availability of parking spaces. Some of the DRT schemes explored meet social needs, such as to access shopping facilities or hospitals, but they face cost challenges. In addition, institutional barriers for new DRT schemes need to be overcome in order to develop a sustainable local public transport system. (TRID)

16. New England North West: regional transport plan

TFNSW, 2013, p. 52

The Long Term Transport Master Plan was released in December 2012 to provide a comprehensive blueprint for the future, complete with more than 220 short, medium and long term actions. To support the Master Plan, we recognise that the state's 14 key regional centres have more specific local transport needs and priorities which should be considered and planned for. The New England North West Regional Transport Plan outlines specific actions to address the unique challenges of the area and includes the things you told us were important to you during consultation in 2012. Residents in the New England North West region will directly benefit from the Regional Transport Plan's commitment to upgrading the New England Highway near Tamworth to address congestion issues. We are also committed to ongoing improvements to the highway at Bolivia Hill, south of Tenterfield. The Newell Highway will be upgraded to include extra overtaking lanes between Narrabri and Moree. (First)

17. Northern Rivers: regional transport plan

TFNSW, 2013, p. 52

The Northern Rivers region is the north eastern region of NSW, bordered by the New England and Mid North Coast regions, the east coast, and Queensland to the north. Travel to, from, and within the Northern Rivers is focused in two north-south corridors along the Pacific Highway, Summerland Way and the North Coast Rail Line, and an east-west corridor along the Bruxner Highway. The Port of Yamba services the Northern Rivers District and provides a link to Norfolk Island and the south west Pacific region. Major trades include timber, live animals, manufactured items, kit houses, boats, explosives and general cargo. (First)

18. Passenger transport in rural and sparsely populated areas in France

Saroli, C.

Organisation for Economic Co-operation and Development (OECD), 2015, p. 33

French legislation, in particular the law known as "LOTI" (domestic transport orientation law – Framework law on inland transport), enshrines the right to transportation. However,

the application of this law is challenging in rural or remote areas, since conventional public transport services, highly dependent on high-volume transit, are not always suitable for a widely dispersed population. It is also becoming more difficult for these services to meet increasingly complex and individualized mobility needs. A broader range of approaches must be taken to find innovative transportation solutions for the local population, given the fact that such towns have to deal with increasingly diverse transportation needs, in terms of both time and space. One solution is to make public transport services more attractive in terms of transport supply and quality of service. Population density is a key factor, since it usually prohibits the development of “heavy” public transport systems. Indeed, faced with the challenges of sustainable development, noticeable changes are being made to transport policies. The objective is no longer to adapt supply to ever-fluctuating demand, but to try to concentrate and direct this demand towards economical, efficient and environmentally friendly forms of mobility. From this point of view, different actions are developed in France. The range of actions includes planning tools, mobility management and different transport solutions. (TRID)

19. Recent developments in flexible transport services

Nelson, J. D., Wright, S., Masson, B., Naniopoulos, A.
Research in Transportation Economics, 2010, Vol. 29, No. 1, pp. 248

This paper focuses on recent experiences in the evolution of Flexible Transport Services (FTS). It describes how previous manifestations of FTS provided dedicated solutions for special groups, often in parallel to the conventional public transport network, but highlights that in numerous countries across Europe there is now a discernible trend towards open access FTS providing services for the whole community and often feeding the conventional public transport network to provide wider access and opportunities. This is as a result of policies intended to mainstream services for people with disabilities and moves to tackle social exclusion amongst other groups while at the same time reducing the very high costs per trip associated with STS. To meet these policies, and the higher expectations and different travel behaviours of citizens' to-day, it is suggested that FTS will need to radically reposition itself in terms of scale, so that there is mass coverage and ability to function as a full transport mode. This will require breakthroughs in concepts; business models; organisational and operational models; and in supporting technologies. A proposed solution to this is the Flexible Agency for Collective Mobility Services (FAMS) which provides an organisational structure and business model for FTS that incorporates the required supporting technologies. (ScienceDirect)

20. Rural transport and social inclusion: The Dales Bus Initiative

Liddle, J., McElwee, G., Disney, J.
Local Economy; February 2012, Vol. 27, Issue: Number 1, pp. 3-18, p. 16

The importance of rural transport in addressing social exclusion has been acknowledged for some time. We report and comment on one particular case in North Yorkshire, a predominantly rural county in England, of how state, non-state and third/societal sectors worked together to market and improve public transport links and reduce social exclusion. The article examines the outcomes of a SIS (Stimulating Innovation for Success) project: a leisure-based public transport network located in North Yorkshire. It

comments on the efficacy of this relationship and in particular with one agency, the Dales and Bowland Community Interest Company. (EBSCO)

21. The design, management and operation of flexible transport systems: Comparison of experience between UK, Japan and India

Wright, S., Emele, D., Fukumoto, M., Velaga, N. R., Nelson, J. D.
Research in Transportation Economics, 2014, Vol. 48, pp. 330-338

Flexible transport systems (FTS) can offer an alternative to fixed route fixed schedule bus services in situations of low and dispersed demand. Although it is widely recognised that these on-demand services provide a better level of service to passengers at a lower operating cost than the infrequent fixed route services which they often replace, they still require significant financial support to cover their costs. As local authority budgets to support public transport continue to be reduced the sustainability of these services is being brought into sharper focus. In this paper we compare and contrast the development of FTS in UK, Japan and India. In particular we examine the extent to which new technologies are being used to contribute to a reduction in operating costs in the UK and Japan and whether these developments point to a future model for sustainable flexible service provision in developing countries, using India as an example. (ScienceDirect)

22. The potential role of flexible transport services in enhancing rural public transport provision

Velaga, N. R., Nelson, J. D., Wright, S. D., Farrington, J. H.
Journal of Public Transportation, 2012, Vol. 15, No. 1, pp. 111-131

This paper explores the existing context of public transport provision in rural and remote areas illustrated with experience from Scotland. A critical review of existing Flexible Transport Services (FTS) in rural areas is provided and illustrated with selected case studies, with the objective of identifying the extent to which FTS can enhance the public transport offer. Findings confirm that FTS offers considerable potential to contribute to and support the public transport system in rural areas; however, the paper also identifies the many challenges in successful development or enhancement of FTS in rural areas.

23. Quantifying the role of a flexible transport service in reducing the accessibility gap in low density areas: A case-study in north-west Sydney

Mullea, C.
Research in Transportation Business & Management, 2012, Vol. 3, pp. 12-23

Bus services can be difficult to provide in low density areas on the urban fringe, with low residential density, dispersed development and high car use. Service planning guidelines often encourage coverage, but the result in low density areas is bus kilometres are spread thinly over a large area with poor frequencies. Flexible transport services offer an opportunity to redesign services to improve access and efficiency. The paper quantifies the role of flexible transport services in improving access to public transport within the existing subsidy budget. The Richmond–Windsor area of north-west Sydney is used as a

case-study to present how a flexible transport service could be provided. The paper shows that the existing bus network could be redesigned to focus more on frequency by providing fixed trunk routes with a flexible transport service providing access to these trunk routes. Within the existing budget for bus service km and service hours, this provides a greater accessibility to public transport services and an opportunity to grow public transport patronage with higher frequency trunk route services. (ScienceDirect)

24. Simulating demand-responsive transportation: A review of agent-based approaches

Ronald, N., Thompson, R., Winter, S.

In light of the need to make better use of existing transport infrastructure, demand-responsive transportation (DRT) systems are gaining traction internationally. However, many systems fail due to poor implementation, planning, and marketing. Being able to realistically simulate a system to evaluate its viability before implementation is important. This review investigates the application of agent-based simulation for studying DRT. We identify that existing simulations are strongly focused on the optimisation of trips, usually in favour of the operator, and rarely consider individual preferences and needs. Agent-based simulations, however, permit incorporation of the latter, as well as capture the interactions between operators and customers. Several areas of future research are identified in order to unify future research efforts. (Taylor & Francis)

25. Sustainable Demand Responsive Transportation systems in a context of austerity: The case of a Portuguese city

Gomes, R., Pinho de Sousa, J., Dias, T. G.

Research in Transportation Economics, 2015, Vol. 51, pp. 94-103

In a time of economic austerity, more pressure is being put on the existing transport systems to be more sustainable and, at the same time, more equitable and socially inclusive. Regular public road transportation traditionally uses fixed routes and schedules, which can be extremely expensive in rural areas and certain periods of the day in urban areas due to low and unpredictable demand. Demand Responsive Transportation (DRT) systems are a kind of hybrid transportation approach between a taxi and a bus that try to address these problems with routes and frequencies that may vary according to the actual observed demand. Demand Responsive Transportation seems to have potential to answer the sustainability and social inclusion challenges in a context of austerity. However, DRT projects may fail: it is not only important to solve the underlying model in an efficient way, but also to understand how different ways of operating the service affect customers and operators. To help design DRT services, the authors developed an innovative approach integrating simulation and optimization. Using this simulator, the authors compared a real night-time bus service in the city of Porto, Portugal, with a hypothetical flexible DRT service for the same scenario. (TRID)

26. Sustainable flexible transport services: a solution against social exclusion

Ashurst Lodge; Ramazzotti, D., Lois, A.

Fourth International Conference on Sustainable Development and Planning, 2009

This paper describes how studies have demonstrated that inadequate transport services may create barriers and limit individual and group participation in the normal range of activities. Availability of sustainable transport services can potentially play a very important role in influencing many factors that are enveloped by the concept of social exclusion; in most circumstances inclusion means participation in processes and activities and participation strongly depends on the physical access to facilities. The right to mobility must be guarantee to mobility-impaired people (children, the elderly and the disabled) even in low demand areas and in the presence of a fragmented public transport service. The Public Transport Authorities (PTAs) can and have to influence and encourage the diffusion of IT based flexible transport systems, being able to link and optimize demand and the offer of transport. (TRID)

27. Transport-related social exclusion amongst older people in rural Southwest England and Wales

Shergold, I.

Journal of Rural Studies, 2012, Vol. 28, No. 4, pp. 412-421

Rural dwelling and older age are both associated with a higher risk of social exclusion, with accessibility identified as having an important facilitating role. The interactions between transport-related exclusion and older age, particularly in a rural context, are considered through analysis of quantitative and qualitative data collected from over 900 older persons living in rural areas of Southwest England and Wales. Although few respondents reported feeling excluded within their communities, more reported difficulties in accessing specific necessary and discretionary activities, including specialist hospitals and cinemas. Analysis revealed that car availability is not a strong indicator of overall inclusion, although non-availability was important in limiting access to particular types of location. It is concluded that the relatively short travel distances required to access community activities was a key factor in the high levels of community inclusion. However, the car-dependent nature of travel overall means that there is a rising risk of mobility-related exclusion in rural areas, particularly amongst the oldest old. Greater consideration needs to be given to more formalised lift-giving as a transport solution, along with greater attention to mobility needs by sector-specific service providers, such as the health sector. (ScienceDirect)

28. Towards large-scale flexible transport services: A practical perspective from the domain of paratransit

Finn, B.

Research in Transportation Business & Management, 2012, Vol. 3, pp. 39-49

Conventional transit generally does not cater for the large number of local, diffuse and inter-suburban trips in urban areas, which are made almost exclusively by car. It is clear that new paradigms of local transportation are required, responsive to the diverse travel needs, pervasive and frequent. European and North American cities do not have effective models for such mobility services, and the regulatory frameworks generally form barriers to their introduction. By contrast, there are many cases in Asia, Africa and South America of large-scale paratransit provision. In some they are the primary form of public transport, carrying more people every day than extensive metro systems in Western cities. These paratransit services are never ideal, but this reflects the environment in

which the services emerged, the lack of effective regulators, and having to work at the “penny war” end of the market. The constructive aspects of paratransit are usually overlooked, including their organisational capacity, the ability to make self-financing business and the ability to identify and respond to user needs as cities and travel patterns evolve. This paper examines characteristics of such services, presents relevant practice from case studies and concludes with suggestions for transfer of experience to more developed environments. (ScienceDirect)

29. Watching the Swiss: A network approach to rural and exurban public transport

Petersen, T.

Transport Policy; November 2016, Vol. 52 Issue: Number 1, p. 175-185

Public transport in rural and exurban areas faces major challenges, with low population densities making it difficult to provide high-quality, high-occupancy services. While demand-responsive transport is sometimes prescribed as an innovative strategy for service provision, the network planning approach to public transport suggests that integrated timed-transfer or pulse timetable networks should be explored first. This paper examines the rural network approach using examples from Switzerland, which has among the highest rates of public transport use in Western Europe, as well as nationally-coordinated Taktfahr plans scheduling that extends deep into rural areas. The basic Swiss pulse timetabling technique is reviewed, along with the application of the approach to a remote rural case study in Graubünden’s Lower Engadine and Val Müstair. Characteristics of pulse timetable networks and the wider rural network approach are considered, drawing broad lessons for their potential application elsewhere. (EBSCO)

30. Western Regional transport plan

TFNSW, 2013, p. 40

The NSW long term transport master plan was released in December 2012 to provide a comprehensive blueprint for transport in NSW over the next 20 years. Complete with more than 220 short, medium and long term actions. To support the Master Plan, it is recognised that the state's 14 key regional centres have more specific local transport needs and priorities which should be considered and planned for. The Western Regional transport plan outlines specific actions to address the unique challenges of the area and includes issues raised through community consultation in 2012. It takes into account an ageing population and the vast distances travelled by those who live in the region to access services and facilities. With driving the primary mode of transport in the region, the plan prioritises road maintenance and includes support for a heavy vehicle haulage bypass at Broken Hill to carry freight from the mining and agricultural industries. The plan ensures Western Region residents will have better connections to jobs, study and town centres both now and into the future. In the longer term it focuses on ensuring suitable travel options exist, whether by air, rail or bus for the community and also ensures adequate community transport services are provided. (FIRST)