



Research paper

Planning for Bus Rapid Transit in an island context. The challenges of implementing BRT in Malta

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ABSTRACT

In 2007 the Government of Malta commissioned a study into the feasibility of a Bus Rapid Transit (BRT) system to accelerate a modal shift from the ever increasing car ownership and use. The study concluded that the government's efforts to consolidate and improve public transport bus services could be well served by a BRT infrastructure over and above the existing bus network. Since then a public transport reform was implemented in 2011 ending a long held monopoly of bus owners which controlled and operated inadequately the network of services, and introducing competitive tendering. Following many years of decline bus passenger numbers are now growing due to the recent economic development, influx of foreign workers and increased tourism. This study investigates the implementation of a BRT in the main island of Malta by looking at key socio-demographic and infrastructural determinants. It also lists some of the barriers to implementation. The aim of the paper is to provide a preliminary assessment of BRT implementation in an island context and propose research in support of such infrastructures in islands facing similar transport-related challenges as in Malta.

1. Introduction

The high costs and negative impacts of many urban transport systems has been documented across a number of geographies. Small to large cities, at different stages of urbanisation and in different parts of the world, have increasingly fallen victim to an increase in car traffic, with the resulting challenges of system delays (congestion) and pollution, alongside other negative externalities. And whilst the 2020–2021 COVID-19 pandemic provided a tiny window of opportunity to view cities without traffic and pollution (see [Malpede & Percoco, 2020](#); [Nieuwenhuijsen, 2021](#); [Slezakova & Pereira, 2021](#)), many urban areas are feeling once again the pressures of unsustainable transport systems creeping back in as the world eases out of the health restrictions imposed on travel and mobility. The INRIX Global Traffic Scorecard shows the many hours lost by car occupants to congestion across a number of cities. And whilst at the top of the list for 2021, drivers in cities like Paris (France) and London (UK) waste over 140 h to peak hour congestion, in cities like Lyon (France), Rome (Italy) and New York (US) over 100 h were lost per driver to congestion in 2021. Many other drivers in much smaller cities waste over 50 h in congestion (e.g. Medellin in Colombia; Liege in Belgium; Limerick in Ireland; Graz in Austria). In many of these cities, traffic is still affected by COVID-19, even though some are

experiencing worst traffic conditions ([INRIX, 2021](#)). One study that looked at time lost in congestion in a small island context showed car drivers wasting up to 52 h a year (in 2012) in the small island state of Malta ([Attard et al., 2015](#)). According to [INRIX \(2021\)](#), another city in a small island recorded 20 h lost in congestion per driver in Las Palmas de Gran Canaria. Whilst Singapore (a similarly small island city state) reported a loss of 24 h.

Congestion affects cities and their populations in several ways. At the highest levels of governance, congestion affects economic activity and growth as well as impacts infrastructure provision and maintenance. It still affects pollution and climate change obligations, with cities increasingly finding difficulties to reach their carbon emission targets. [Björge and Ryghaug \(2022\)](#) report on how the Norwegian cities of Oslo, Trondheim and Bodø are struggling to achieve their climate goals primarily because of congestion, attributed in this case to increasing goods deliveries. At a social level it affects health ([Nieuwenhuijsen, 2021](#)) and well-being and creates injustices such as social exclusion, urban space distribution, accidents and road safety for those most vulnerable ([Attard, 2020](#); [Vasconcellos, 2018](#)). Over the years, and supported by mounting evidence, many cities have acknowledged the importance of a modal shift to more environmentally friendly and efficient transport systems, including the contribution of active travel in reaching climate

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goals (Brand et al., 2021) and the necessity of high-quality public transport to support mobility and economic activity with minimal impact on the environment and public health (Vajjarapu & Verma, 2022).

This paper looks at the case study of Malta, a European island state in the middle of the Mediterranean Sea, and its struggles with the governance and management of public transport services, and investigates the potential for implementing Bus Rapid Transit (BRT), in order to support increasing economic growth and mobility and to encourage the much-needed modal shift from high impact private means of transport to a more just and sustainable form of public transport. The study looks at secondary data to support the research, and reviews literature that examine islands and island transport systems.

This introductory section is followed by a brief literature review in Section 2. This is followed by a description of the case study of Malta and the islands' recent transport systems development and governance in Section 3. In Section 4 the potential for BRT will be presented with a discussion on the supporting infrastructure measures necessary to avoid saturation and further the transition to "green" transport. Section 5 will extend the discussion on the challenges of adopting sustainable transport practices and policies, whilst Section 6 concludes the paper and provides an agenda for more research in this geographic context.

2. Literature review

Island transport systems are influenced by social, environmental and economic factors which differ from other larger states or city regions. Enoch et al. (2004) identify some of the challenges of islands with transport-related problems. These arise out of a lack of investment in public transport and basic transport infrastructures, shortage of new vehicle stocks and geographies that are not always suited for sustainable urban transport systems due to dispersed archipelagos, topography or even challenging population densities. Attard and Dimitriou (2022) also factor in the challenges of a limited workforce to support public transport systems. Land transport systems in islands are also isolated and depend on maritime and aviation links to connect islands together and with the rest of the world. Transport is indeed a critical and challenging sector to support the mobility of locals and tourists alike.

Despite their diversity in geography and economic development, a number of islands are sharing challenges related to traffic and congestion (Attard et al., 2015; Daily Express, 2019; Papaioannou et al., 2020). And in the case of Malta and Cyprus, two European island states, the lack of strategic and integrated transport policy which prioritises public transport, from an operational and governance point of view have been blamed for the high and unsustainable levels of motorization and car dependence (Attard, 2005). The recent reforms to adopt competitive tendering in public transport suggest some positive developments in what otherwise authors describe as lack of strong policy for sustainable transport (Attard, 2012; Papaioannou et al., 2020).

Bus Rapid Transit (BRT) is a high-quality bus based transport system that delivers fast, comfortable, and cost-effective urban mobility through the provision of segregated right-of-way, technology driven infrastructure, rapid and frequent operations, and excellence in marketing and customer service. BRT emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost (Wright & Hook, 2007). Under the right conditions, BRT can also be influential in inducing urban redevelopment and shaping urban growth in more sustainable formats (Cervero & Dai, 2014). Potential social benefits of BRT include increased accessibility and opportunity, and improve equity and justice in the transport system. In European contexts some have preferred the use of the term Buses of High Level of Service (BHLS) (Heddebaut et al., 2010; Hidalgo & Gutierrez, 2013), described as an evolution of bus priority measures designed and implemented as early as 1937 throughout the world. The different European approach was based on improving passenger experience rather than supplying the BRT components (Finn et al., 2011). In

this respect, Europe had already a long, established tradition of innovation and development in bus lanes, bus only roads, and traffic management measures to prioritise buses, long before the first full-feature BRT was implemented in Curitiba, Brazil in 1982 (Lindau et al., 2010). This however is not particularly the case for islands like Malta where the bus service still struggles with priority, in the context of high levels of traffic congestion (Attard, 2012; Attard et al., 2015).

Although BRT has been hailed as an alternative design for high-level of service systems (Ishaq & Cats, 2020), challenges have also been identified which affect the successful implementation of BRT services (Kumar et al., 2011; Poku-Boansi & Marsden, 2018). Currie and Hidalgo (2018) report on a number of issues with BRT implementation, especially when compared to rail. Among these are its flexibility which can lead to poor quality outcomes and perceived lack of permanence. Success of BRT systems has also resulted in capacity constraints for some relatively new systems, and thus the difficulties in planning future capacity requirements. Additional challenges described in Munoz and Hidalgo (2013) point to the careful design of stations and intersections, performance in terms of service time and real time headway control. The report also points towards the need for better contracts, institutional settings and enhanced policies that leverage BRT implementation as systems continue to develop globally. To date, BRTData reports on 187 cities that have implemented BRT systems covering a total length of 5,618 km (BRTData, 2023).

BRT systems across different parts of the world differ significantly in terms of standards and practices (Merkert et al., 2017). Whilst on one hand open systems allow for patronage to come from neighbourhoods using dedicated route sections, on the other hand closed BRT systems allow passengers to take conventional buses to the dedicated BRT infrastructure and use interchanges to board vehicles using dedicated sections of the BRT system. For a full review of BRT characteristics see Deng and Nelson (2011). Merkert et al. (2017) list a number of determinants that affect BRT systems, including operation type, GDP and population density, whilst Hensher and Golob (2008) evaluate 44 BRT systems for cost and carrying capacity. Finn and Muñoz (2014) provide further discussion and a set of key findings which tackle the challenges, success factors, the institutional and policy structures of the urban environment in which BRT is implemented and the need for public acceptance among others. They also point towards differences between mature and emerging systems in the developed and the developing world.

Although not many BRT systems have been implemented and investigated in island settings (e.g. the Nouméa line in New Caledonia), a comparative at the urban scale is a reasonable approach to look at determinants of success. Urban, coastal and tourist destinations where BRT has been implemented serve as a good measure for comparison. Toulouse and Lyon in France are very similar in population to Malta and have BRT systems. The work on Haifa in Israel (Ishaq & Cats, 2020) is also an interesting case study for review. More comparative research in these geographically similar locations however is required.

3. Transport in the islands of Malta

Malta is an island state just 316 km² in area, member of the European Union since 2004, and located in the middle of the Mediterranean Sea. The islands are rich in history because of their geography, strategic location and naturally sheltered ports which made them a prized possession of many conquerors in the history of the Mediterranean from the Romans to the Arabs, the Sicilians, the French and the British. The Knights of Malta known as the Order of St John or the Knights Hospitallers ruled between 1530 and 1798 and are known for most of the military architecture and human development of the islands. Then, after just two years of French rule, the islands became part of the British Empire (1800–1964). This contributed to the population and economic growth through further investment in port activities (fleet maintenance and ship building for the British and its allies during the wars) and

infrastructure. Part of that infrastructure included heavy investment in the construction of a road network and public transport systems. The British constructed the railway in the islands which operated between 1883 and 1931. Tramways were constructed alongside the railway to offer flexibility, however the introduction and popularity of the bus in 1905 led to the closure of the tramways in 1929 and subsequently of the railway (Lanfranco, 1999). The buses became a popular means of travelling and continued to record high levels of patronage up until the late 1980s (Childs & Sutton, 2008).

Economic growth and increased standards of living, set off in the early 1990s alongside a growing investment in road infrastructure (Attard, 2005), saw a steady growth in car ownership and use. At the same time a sharp decline in bus usage was recorded, a decline which will see public transport (buses) struggle for almost two decades before passenger numbers start to grow again (Fig. 1). The growth was further supported by a sharp rise in Gross Domestic Product (GDP) recorded in the post-2013 years, attributed to the focus on specific industries such as online gaming and the construction industry, which attracted a considerable share of foreign workers, increasing the population in the islands and the overall mobility demands.

The development of public transport bus services in the islands underwent a considerable reform in 2011. What was previously a service run as a monopoly by a private association of bus drivers, heavily subsidised by government with very low service quality performance, a very old bus fleet and problematic working conditions for drivers, changed with the introduction of competitive tendering. As a European Union member state Malta adopted the public service obligations regulations (EC Regulation 1370/2007) which allow public authorities to grant exclusive rights and compensation to operators to run public transport services given rules on how the public service contracts are awarded and how the compensation is calculated (European Commission, 2007).

The 2011 changes included a new and modern bus fleet, new routes that reflected the changing urban form, improved working hours for bus drivers and ultimately a service level agreement which held the operator accountable for the service delivery. The islands' bus reform has been extensively covered by the works of Attard (2012) and Bajada and Titheridge (2016). Due to a number of operational challenges, the first

operator, a consortium led by international operator ARRIVA failed to deliver the promised service and led to a government buy out by 2014. During that year, services were nationalised and a new service tender was published, to be later awarded to Autobus de León, a Spanish operator which established Malta Public Transport Ltd to run the new bus service by July 2015.

In the run up to the 2011 reform, the Government of Malta started also assessing a number of alternative public transport systems for the islands. In 2007 Halcrow Group (UK) was commissioned to carry out a strategic level study into the scope of introducing Bus Rapid Transit (BRT) in Malta. The study aimed to focus on the main public transport corridors. Its conclusions pointed towards a significant potential for BRT in Malta with the promise of increased efficiency along the segregated BRT routes, making them as attractive (in terms of journey times) as journeys by private car (Halcrow, 2007). Halcrow (2007) also suggested that transfer to BRT would benefit from the introduction of demand management measures such as parking control which, up to today, remains unmanaged and free in most of the islands.

Following on from the 2007 BRT study, the government commissioned a further study into the feasibility of Light Rail in 2008 (Halcrow, 2008) and then much later, into the feasibility of an underground metro (Agius, 2021; ARUP, 2021). Light Rail Transit, trackless trams and underground metro proposals have all been included in recent political electoral manifestos of the islands' main parties (Balzan, 2022; Labour Party, 2022; Nationalist Party, 2017). This, alongside industry hinting at BRT as a viable solution (The Malta Chamber, 2019), indicate not only the interest but also the "appetite" for the implementation of a mass transit system in the islands.

4. Potential for bus rapid transit

This preliminary study will look at the principal determinants of demand for a bus rapid transit system in an island context. The key parameters taken into consideration are (i) population and tourist distribution, (ii) land use and economic activity location, (iii) distribution of socio-economic indicators among the resident population (e.g. income distribution, car ownership, demographics), (iv) existing public

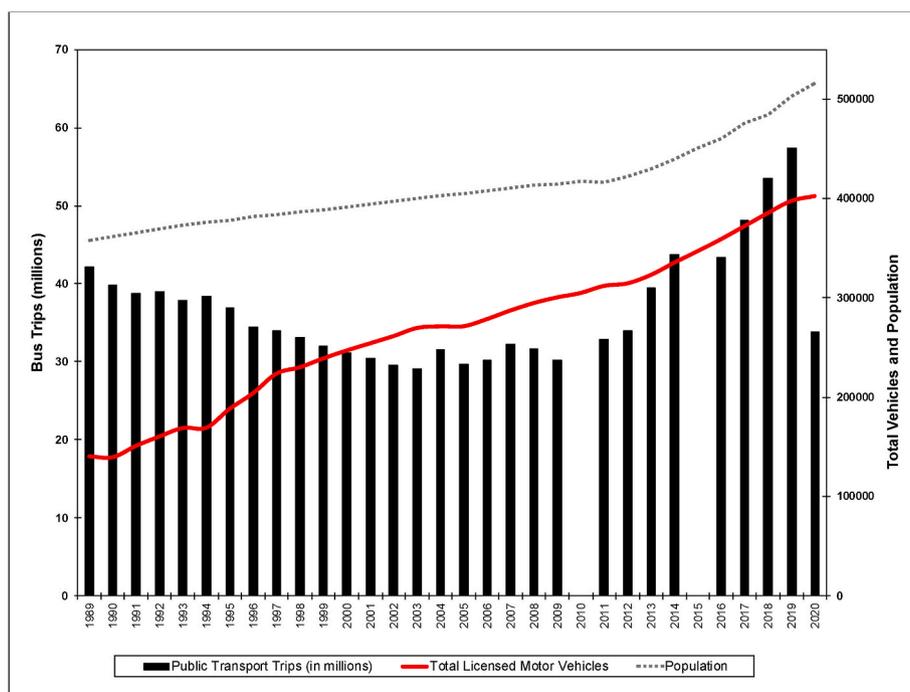


Fig. 1. Annual bus trips, number of licensed vehicles and total population in the islands.

Note. Compiled from the National Statistics Office. Public transport data for 2010 and 2015 are missing or incomplete.

transport infrastructure and (v) travel mode and distribution.

The three main islands of Malta, Gozo and Comino are divided into six regions and 68 local councils. This study will focus on the larger island, Malta, as it is indeed the one with the largest land area, houses all the major economic land uses, and its urban area is home to the majority of the local and tourist population.

4.1. Population and tourist distribution

The population distribution of the five regions making up the island of Malta is shown in Fig. 2. The island’s rapid population growth over the past five years has been concentrated in the Northern Harbour, having also the highest population share, and the Northern Region. All regions experienced a slowdown in the population growth due to the COVID-19 pandemic which limited economic activity, most importantly the tourism and service sectors that attract and employ a large majority of foreign residents.

4.2. Land use and economic activity location

The island’s urban area is concentrated around the capital city Valletta (shaded area in Fig. 3). It grew organically from the main port areas and subsequently connecting the surrounding towns and villages. This urban agglomeration houses most of the land use and economic activity and reflects the main movements on the islands. The National Transport Strategy (2016) identifies this Valletta Region as the core area of activity and makes the island primarily a city state. It is characterised by high density development, few green spaces and is supported by a road infrastructure built closely to where people live and work. This provides very little space for transport infrastructure expansion with most recent roads’ projects incorporating grade separated junctions and flyovers in order to increase capacity.

The main locations identified in Fig. 3 include critical infrastructure for the island’s connectivity to mainland Europe and beyond, such as the International Airport located in Luqa, the Marsaxlokk Harbour at the South end of the island where the Malta Freeport is located (where most goods are delivered and shipped) and the Grand Harbour which provides primarily for sea passenger movements including cruise liner tourist arrivals, but also serves as the site for ship building and maintenance activity, and goods movements. Other important sites include Valletta and Floriana which are the seat of Government and where most public service offices are located. The walled city of Valletta, as one of many UNESCO World Heritage sites in the islands, attracts a high number of visitors and tourists on a daily basis. Sliema and St Julian’s host a high resident population and the highest density of tourist accommodation and facilities. Recreational and leisure activities in the area attract people from all over the islands, especially during weekends. The University of Malta and Main Hospital are located close to each other and provide for a significant amount of daily movements. At the far north, Mellieħa and St Paul’s Bay are locations where tourist activities

concentrate. Most of the beaches and tourism facilities located in the area generate significant amount of activity, especially in the spring and summer season.

4.3. Relevant socio-economic indicators

Population characteristics, such as age, income distribution, home and car ownership and tourism indicators play an important role in planning for public transport infrastructure. These factors affect demand and can significantly impact feasibility and long-term sustainability of public transport infrastructures. A selection of indicators by region is presented in Table 1. There are evident disparities between regions that can indeed affect public transport provisions however there are also opportunities brought about by density of population but also of some social conditions which favour public transport use over other modes.

The North Harbour hosts the largest number of households (over 70,000) compared to other regions such as the Western region (just over 22,000) and is home to the largest share of foreign residents (over 51,000). These have been attracted to the jobs created by the sudden economic growth in the islands, especially tourism, online gaming and construction (Baldacchino, 2017). Foreign residents depend on public transport services and locate very close to employment opportunities (Schembri & Attard, 2013). This is further supported by the age of the population in the Northern Harbour which is younger than in other regions. The Northern and Southern Harbour region have also a lower household disposable income with a fair share of people at risk of poverty, many of whom depend on public transport to reach opportunities for work, education and leisure. Here we also find the lowest number of students engaged in post-secondary education, as these are higher in the wealthier Western Region.

Work and other opportunities are reflected in the number of active businesses operating in the region. The Northern Region registers the highest share and therefore attracts a significant amount of commuting on a daily basis. This is then supported by the high number (79) of collective accommodation establishments in the region. The Northern Harbour region is indeed where most hotel and tourist activities are concentrated. And it tops the number of guests it accommodated both pre and post-pandemic, followed tightly by the Northern region. In contrast, both the Northern Harbour and Northern regions register the highest number of licensed passenger cars and driving licence holders. This presents the biggest challenge for the successful introduction of public transport services. It demonstrates access and availability to a private vehicle, making it potentially challenging to attract users to public transport infrastructures, unless they are highly competitive in terms of service quality.

These statistics provide a preliminary and very high-level indication of where investment in BRT services might focus in the context of the island. This of course, without any prejudice on current levels of public transport usage which is high due to the number of tourist movements in the area – traditionally supporting the high activity routes of Sliema and

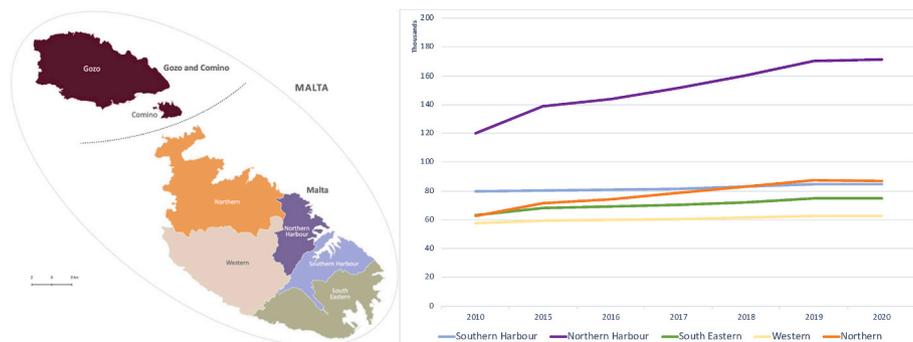


Fig. 2. The regions of Malta and population distribution per Malta region. Source: NSO, 2022.

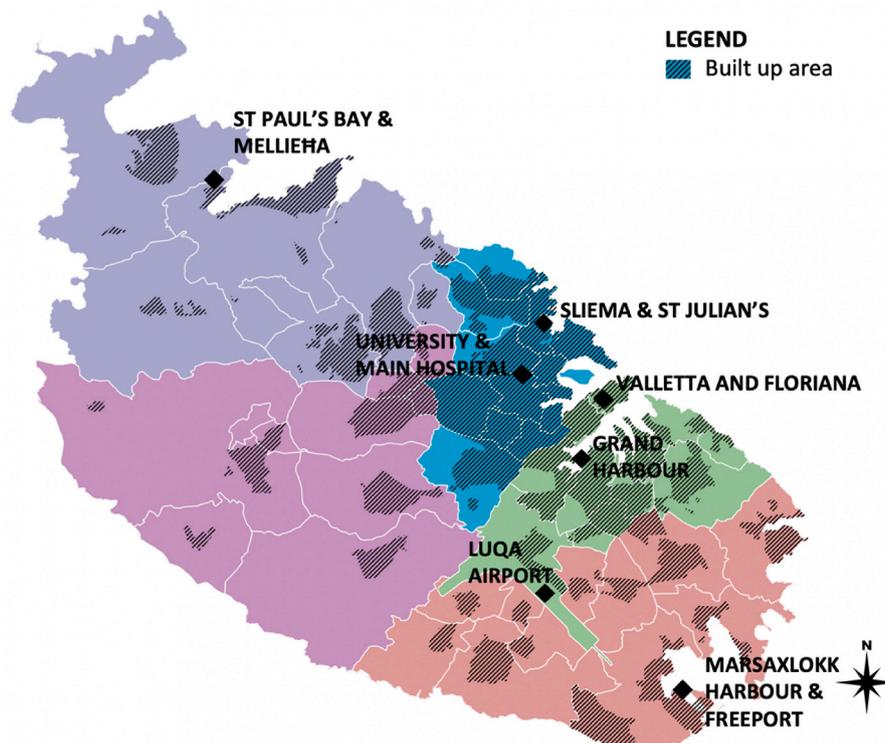


Fig. 3. Location of main economic activities in the island. Drawn by author.

St Julian's. Additionally, an analysis of "local" commuter traffic, supporting the residents and local employees would provide for a more integrated approach to defining demand and narrow the investment to specific corridors. The use of detailed passenger travel information, identification of trip and trip purposes, and route information would indeed be essential to establish the most viable of options for BRT investment.

4.4. Existing public transport infrastructures

The long tradition of public transport bus services in Malta is another major determinant to understand and establish the potential for BRT in the island. The service network tradition impacts mobility behaviour and travel patterns. Land use activities and related mobility patterns, although being in theory flexible, change very slowly over time. Long established bus corridors and land uses (including tourist and leisure hotspots) are part of the transport system legacy which needs to be catered for and cannot be dismissed that easily, or in a relatively short period of time. Indeed, some have pointed to radical changes to the bus network, as one of the weaknesses of the 2011 reform which sought to make a tangible step change in the provision of bus services after a long 100-year tradition (Bajada & Titheridge, 2016).

The publication of the bus service map in 2016 (Fig. 4) shows a wide and broad network coverage of the islands. Around 80 routes operate in the island of Malta and 15 routes operate in Gozo, covering 30 million km every year with a fleet of around 420 buses (Malta Public Transport, 2016; VisitMalta, 2021). The concentration of activities around the harbours and Valletta is reflected in the number of routes that converge as they approach the city. In both the Northern and Southern harbour regions a number of services overlap and compound the problems of congestion in the area. At the same time this provides the area with high frequency bus services, which reduces as one progressively moves away from the core of the urban agglomeration.

With very few dedicated bus lanes and poor enforcement of bus priority and illegal parking, buses are delayed as they approach the main network hub which is located just outside the walls of Valletta. And

despite all efforts to decentralise the system, through the creation of other hubs, for example at the University/Hospital, there is still a heavy reliance on the services leading to the City.

The potential to integrate a number of routes along specific corridors, provide segregation and invest in larger and higher capacity vehicles would also alleviate traffic and congestion. The 2016 Transport Strategy identified the area outside Valletta and the Northern Harbour region as having the highest levels of congestion (Transport Malta, 2016). And the 2007 Halcrow study did indeed focus their attention on the feasibility of the BRT line across the Northern and Southern Harbour regions (indicated in Fig. 5).

4.5. Regional modal split

In an attempt to understand the more cultural challenges associated with modal shift, an appreciation of the modal split is necessary. The growth in car dependence in Malta can be traced back to the mid-90s when a major shift was recorded from bus to car in the 1998 Household Travel Survey, when compared to the 1989 survey (see Fig. 6). The 2010 survey further consolidated that trend and showed an even greater dependence on private modes of transport. And whilst the November 2021 Household Travel Survey data is not yet published in detail, preliminary indications point towards a worsening of the situation, potentially affected by the COVID-19 pandemic which saw greater reductions in the use of public transport and a rise in private and active travel (Fig. 6).

A more detailed investigation into the 2010 regional distribution of the modal split shows some differences between regions, and highlights relatively high existing patronage for public transport in the Southern Harbour Region (25% of trips), and to a lesser extent the Northern Harbour Region (15% of trips) (Table 2). This could reflect the socio-demographic characteristics of the region, as highlighted earlier, but could also reflect upon the high level of bus service provision in the inner harbour regions which experience higher frequency of buses along the converging and busy corridors.

It is therefore evident that whilst the BRT has a higher chance of

Table 1
Selected indicators by Malta region. Source: NSO, 2022.

Southern Harbour	Age	Total	0–19	20–39	40–59	60–79	80+
	Total Population	84,901	14,868	24,665	20,366	20,166	4836
	Foreign Population	8286	1053	5117	1779	296	41
	Nos. of Households	32,934					
	Avg. Household Disposable Income	28,344					
	Persons at risk of poverty	19,068					
	Students in post-secondary education	602					
	Average gross annual basic salary	17,362	Males	18,127	Females	16,261	
	Nos. of Active Businesses	8876					
	Nos. of Licensed Passenger Cars (2021)	51,352					
	Nos. of driving licence holders (2021)	44,355					
	Nos. of accommodation establishments	39					
	Nos. of guests in collective accommodation	Resident	Non-resident				
	2018	6977	126,598				
	2021	14,587	67,803				
Northern Harbour	Age	Total	0–19	20–39	40–59	60–79	80+
	Total Population	147,985	27,438	60,970	18,213	33,798	7566
	Foreign Population	51,423	6402	30,009	11,348	3250	414
	Nos. of Households	71,646					
	Avg. Household Disposable Income	28,318					
	Persons at risk of poverty	29,515					
	Students in post-secondary education	1308					
	Average gross annual basic salary	19,509	Males	21,479	Females	17,067	
	Nos. of Active Businesses	18,510					
	Nos. of Licensed Passenger Cars (2021)	85,055					
	Nos. of driving licence holders (2021)	71,698					
	Nos. of accommodation establishments	79					
	Nos. of guests in collective accommodation	Resident	Non-resident				
	2018	51,243	834,676				
	2021	75,373	353,188				
South Eastern	Age	Total	0–19	20–39	40–59	60–79	80+
	Total Population	74,831	14,645	23,202	19,462	15,004	2518
	Foreign Population	11,486	1671	6507	2670	555	83
	Nos. of Households	28,503					
	Avg. Household Disposable Income	37,059					
	Persons at risk of poverty	9018					
	Students in post-secondary education	739					
	Average gross annual basic salary	19,048	Males	19,333	Females	18,660	
	Nos. of Active Businesses	5524					
	Nos. of Licensed Passenger Cars (2021)	47,563					
	Nos. of driving licence holders (2021)	43,539					
	Nos. of accommodation establishments	12					
	Nos. of guests in collective accommodation	Resident	Non-resident				
	2018	930	21,086				
	2021	1777	12,537				
Western	Age	Total	0–19	20–39	40–59	60–79	80+
	Total Population	62,927	11,436	18,329	16,346	14,162	2654
	Foreign Population	4441	480	2555	1131	220	55
	Nos. of Households	22,766					
	Avg. Household Disposable Income	38,365					
	Persons at risk of poverty	8894					
	Students in post-secondary education	777					
	Average gross annual basic salary	20,845	Males	22,198	Females	19,219	
	Nos. of Active Businesses	6965					
	Nos. of Licensed Passenger Cars (2021)	45,585					
	Nos. of driving licence holders (2021)	39,967					
	Nos. of accommodation establishments	13					
	Nos. of guests in collective accommodation	Resident	Non-resident				
	2018	3293	22,586				
	2021	3827	9174				
Northern	Age	Total	0–19	20–39	40–59	60–79	80+
	Total Population	87,272	16,283	29,296	23,804	15,203	2686
	Foreign Population	24,128	3107	12,471	6179	1970	401
	Nos. of Households	37,170					
	Avg. Household Disposable Income	31,192					
	Persons at risk of poverty	14,476					
	Students in post-secondary education	942					
	Average gross annual basic salary	18,137	Males	19,104	Females	16,892	
	Nos. of Active Businesses	8976					
	Nos. of Licensed Passenger Cars (2021)	56,488					

(continued on next page)

Table 1 (continued)

Nos. of driving licence holders (2021)	47,002	
Nos. of accommodation establishments	46	
Nos. of guests in collective accommodation	Resident	Non-resident
2018	77,810	737,611
2021	100,428	273,655

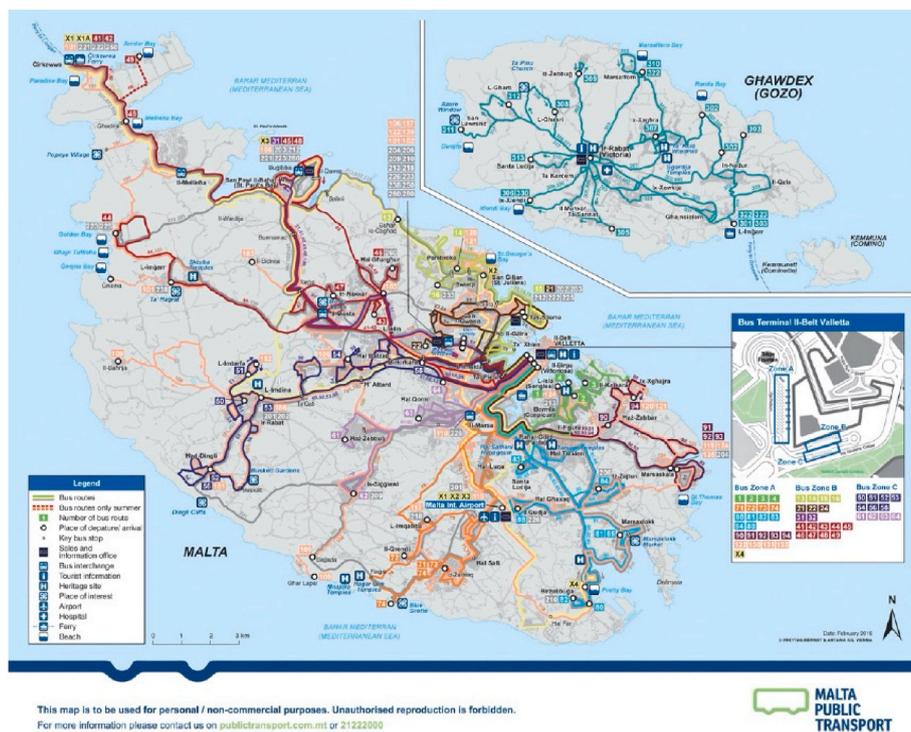


Fig. 4. Bus network map. Source: Malta Public Transport.

success in the harbour regions through existing patronage, it must also provide and support for further capacity over and above the existing services – to encourage modal shift and reduce congestion. A detailed modelling of the carrying capacity and travel time benefits of potentially larger vehicles and segregation is necessary to establish the supply required to ensure all services and service levels provisions which are replaced by BRT can be fully supported. This would further support the case for BRT and estimate the overall impact on mobility by also modelling impact on travel time, pollution and accident levels, and potential improvements in accessibility and inclusion (see Hidalgo et al., 2013 for a similar evaluation).

Furthermore, the literature point towards the impact of supporting infrastructure as a means to avoid saturation and delay. Connected bicycle paths, walkways, feeder bus routes and urban landscape improvements around BRT stations and stops all support the implementation of BRT. And although this preliminary work does not investigate these aspects, their importance is highlighted here and the extensive literature (see for example Babalik-Sutcliffe & Can Cengiz, 2015; Ramos-Santiago, 2022).

5. Discussion

The literature on Bus Rapid Transit systems shows a potential for the implementation of an efficient mass public transport systems at reduced costs, when compared to other similar surface rail options. These systems and benefits have been widely transferred to almost every continent globally, with new systems being rolled out each year at varying degrees of ambition (see for example, the Transcarioca Bus Rapid Transit in Rio de Janeiro ahead of the 2016 Olympics). The system

infrastructure, costs and effectiveness allow for a relatively short period of implementation and is suited for areas with varying levels of demand – indeed in many cities with high levels of motorization and car dependence, BRT systems are implemented as a first step to encourage modal shift and achieve the step change in public transport ridership in support of more complex, more expensive systems (see for example one of the conclusions of the 2007 Halcrow Report for Malta).

This study has looked at the context of a small island, similar in structure and form to a medium sized coastal city. The differences noted here, which might not be that relevant in other, larger urban areas include: (i) the limited land resources and the limited road space within a very tight historical urban environment where a more effective manner of moving people around is necessary to stop the growth in demand for more roads for cars and limit the effects of car dependence; (ii) the opportunity provided by BRT systems that can be designed to fit into different road types – especially those which do not include, for most part, wide, long stretches of roads and highway infrastructure; and (iii) the levels of patronage and the relative costs and benefits when compared to other, more expensive, alternatives for the islands, including rail.

However, some of the research investigating the success and failures of BRT systems point towards a number of barriers that inhibit and challenge the implementation of such systems. Lindau et al. (2014) provide the most comprehensive of these “governance” challenges and list them as planning and implementation barriers.

- Institutional complexity and technical capabilities
- Lack of stakeholder/community engagement

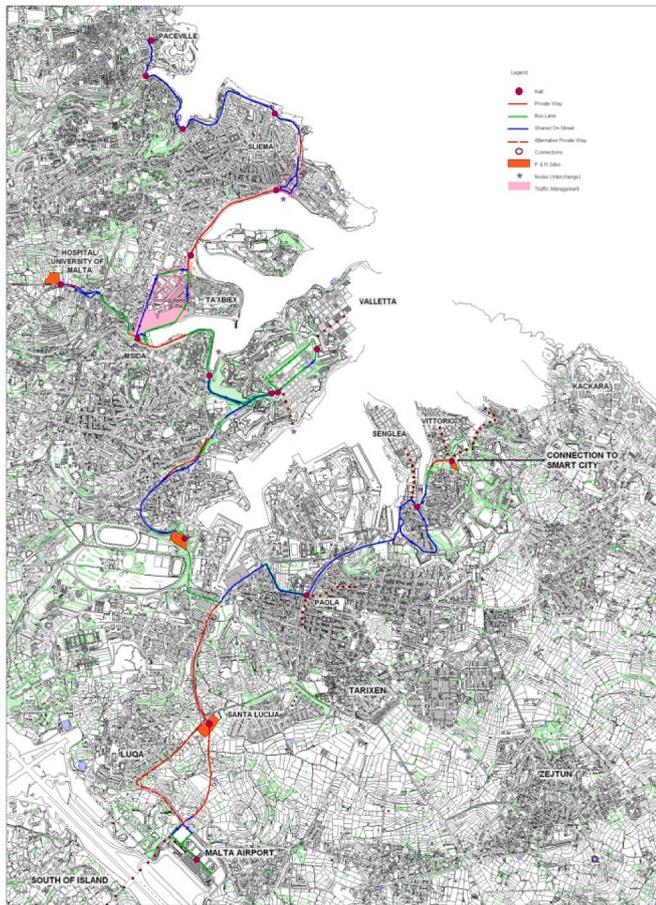


Fig. 5. BRT proposed route map. Source: Halcrow (2007).

- Promoting competing modes and bias towards vehicle capacity rather than people flow
- Perception of BRT as a low-quality mode
- Opposition from operators
- Environmental issues and land expropriation for BRT vs roads
- Discontinuities and disruptions due to political cycles
- Lack of national policies supporting BRT development
- Insufficient funding for adequate implementation

According to Poku-Boansi and Marsden (2018) these issues remain much understudied. And whilst this paper has tried to establish the potential for BRT in Malta using objective indicators, it assumes an institutional structure and governance that is able to support public transport reforms and BRT implementation. Indeed, some of the challenges identified by Lindau et al. (2014) remain valid and pertinent in many contexts, including that of the case study.

Malta's historic challenges with public transport, described in Attard and Hall (2003), Childs and Sutton (2008) and later in Attard (2012) would suggest that such barriers, as identified in the literature, could well be stumbling blocks for the islands to take the bold step of investing in a mass transit system which would require, for example, segregated lanes and road space re-allocation from private vehicles. Political and community perceptions of the bus are indeed associated with low quality public transport (see for example Nationalist Party, 2017), and there seems to be an aversion towards a type of service that continues to fail (Zammit, 2023). Malta however, has some conditions which could allow for such challenges to be overcome. Initially, a strong political champion would be required to push through the necessary implementation and bring on-board the communities and stakeholders. This has been very clearly demonstrated in the adoption of road pricing in the capital city Valletta in 2007 (see Attard & Ison, 2010). The investment in high quality bus services, change in operating speed and high-end buses, similar to the dedicated fleets in Amsterdam (Zuid-Tangent) and in Nantes (BusWay) (Heddebaut et al., 2010), would appease some of the concerns related to perceptions of low quality. And since Malta's national bus system is entirely operated by one single bus company under strict competitive tendering rules, extending the services as part of the existing concession would reduce any operator concerns. The flexibility and relatively speedy implementation of a BRT system could also overcome the short political cycles which plague any long-term investment or project in the islands.

6. Conclusions

The islands of Malta display suitable and sufficient levels of growth, population density, economic activity and political appetite to embrace BRT. The paper has provided an overarching review of the potential for BRT by highlighting the key determinants and identifying where the potential of BRT lies in the small island city state. The study also tried to review some of the challenges associated with BRT implementation amongst which the politics of transport – which in the case of small island states where policy arenas and networks are very small, play a very

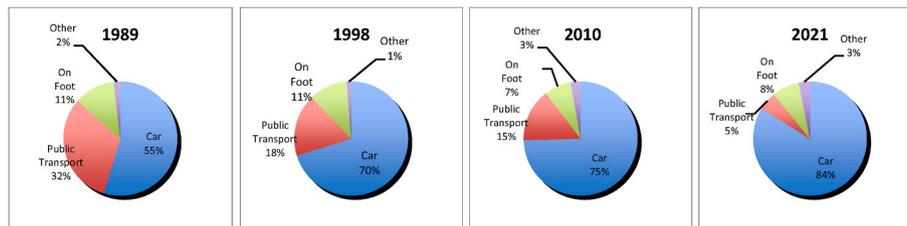


Fig. 6. Modal split for Malta 1989–2021. Own workings from Transport Malta data.

Table 2
Modal split by Malta region. Source: Transport Malta (2010).

REGIONS	MODAL SPLIT						
	Private car	Bus	Foot	Ferry	Motorcycle	Cycle	Other
SOUTHERN HARBOUR	66.94	24.89	7.09	0.04	0.69	0.12	0.23
NORTHERN HARBOUR	76.33	14.70	7.69	0.00	0.89	0.17	0.22
SOUTH EASTERN	75.99	13.43	8.68	0.00	1.11	0.32	0.47
WESTERN	80.52	11.31	6.65	0.00	0.60	0.46	0.47
NORTHERN	74.32	13.20	8.68	2.32	0.58	0.39	0.51

critical role.

The study also highlighted the need for further research, not only in the network design and development, but also into the comparison and transferability of determinants of success between islands or geographies that share common criticalities.

CRedit authorship contribution statement

Maria Attard: Conceptualization, Methodology, Data curation, Visualization, Investigation, Writing.

Declaration of competing interest

I declare that I have no conflict of interest in the submission of this work for consideration by the journal *Research in Transportation Economics*.

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