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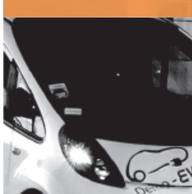
NATIONAL TRANSPORT MASTER PLAN 2025

MALTA



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Transport Malta

NATIONAL TRANSPORT MASTER PLAN 2025

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MINISTER'S STATEMENT

Over the last three years, Government has been working hard to sustain Malta's high levels of economic growth, to increase Malta's global competitiveness and to provide new employment opportunities. We aspire for Malta to be the first choice for business establishment, for our islands to retain their tourism appeal, charm and unique character and for Malta to be a pleasant, prosperous and healthy place to live in.

Our transport system is a vital enabler of economic growth and jobs - a lifeline link for our growing tourism, industry and service sectors. As a small peripheral island state, territorial cohesion within the European Union and the inherent distance-related costs of transport services will always present a challenge for Malta. To remain competitive, our airport, port and road infrastructure needs to be robust and capable of increasing its potential to handle future growth in passenger and freight demand. Our transport system needs to be resilient and flexible to bring increased efficiency to transport service provision and to ensure seamless connectivity to our international markets.

Malta, like many other countries, faces the challenges of lifestyle changes that have resulted in increased demand for personal mobility and more dependence on private cars. Today, more than ever, we need to strike a fine balance between protecting our environment, preserving our health and mitigating the negative impacts of climate change, on the one hand, and improving economic performance on the other. This will call for better quality and more reliable public transport, a shift to alternative modes and better integration between these modes.

If we do nothing about these issues today, then ten years from now our airport and external seaports will suffer capacity issues that will lead to increased congestion, longer journey times - and ultimately loss of competitiveness. Moreover, traffic levels on our road network will increase by 12%, the speed of buses would slow down to a little more than walking speed during peaks and greenhouse-gas emissions from transport alone would increase to 340,000 tonnes per year.

Overall, this would cost the Maltese economy €579 million in 2025 - a societal burden that we now aim to reduce significantly through the implementation of sustainable transport policies, measures and transport infrastructure plans contained in the overarching Transport Master Plan covering the next ten years.

The Transport Master Plan 2025 is intended to help transport stakeholders to better understand what the Government is seeking from the transport system. Developed within the longer-term framework of the National Transport Strategy 2050 and following extensive research and technical analysis, it brings together previously published thematic strategies and plans such as the Intelligent Transport System Action Plan 2013-2017, the National Road Safety Strategy 2020 - as well as sectoral master plans for 2020 prepared by the infrastructure managers of the Malta Freeport Terminals and the Malta International Airport. It takes into consideration the potential funding from national and private sector budgets, as well as the funding opportunities set out in the Programming of European funds for Malta 2014-2020 - Operational Programme I (ERDF /CF), Connecting Europe Facility and new financing instruments such as the European Fund for Strategic Investment which aim to mobilise private investment.

Your positive feedback on the operational objectives and potential measures during the public consultation process was most encouraging and several new ideas you had put forward have now been taken on board in the final Transport Master Plan 2025.

Looking ahead over the next decade, with a comprehensive national policy framework now in place and a clear plan for future transport investment, we look forward to working in partnership with transport stakeholders, transport consumers, academia, NGOs, Government entities and Local Councils to help us develop a national transport system that we can be proud of.

JOE MIZZI
Minister for Transport and Infrastructure

CHAIRMAN'S STATEMENT

This is the first-time Malta has an over-arching, multi-modal national Transport Master Plan. The Transport Master Plan 2025 comes at a time when Malta is experiencing robust economic growth and record employment levels, with demand for transportation steadily expanding. This Plan is a catalyst to ensure that Malta takes the necessary, coordinated steps in proper transportation planning, identifying the right policy mix of measures whilst ensuring that economic progress and infrastructure development move steadily while managing the effect of transport on the environment, public health and climate change. Fundamentally, it is about improving the quality of life of our citizens.

Today, we know what will happen in future if we do nothing. We know the perils of not taking the appropriate action. We can anticipate our own mistakes. The national transport model has been built as a scientific tool used to support the development of the Master Plan. With this technology, we can predict future mobility levels and its effects on public health, safety and the environment and we can also quantify the benefits of adopting a more sustainable transport policy framework. This is perhaps one of the strongest tools the Transport Master Plan wields, a tool that will assist policy makers and stakeholders in shaping better their actions for a number of years to come.

The Transport Master Plan 2025 is positively biased in favour of cleaner, safer and smarter transportation. It identifies the funding required for infrastructural schemes, highlights the resources needed to implement the measures in the Plan over its 10 year life span; while laying the foundations for the necessary cultural change, through advocating increased use of public transport, cycling and walking for everyday commuting.

This is all in the context of the ever increasing challenge of traffic congestion, with its wide array of negative effects on society.

We are convinced this Plan represents a quality leap in the right direction. We are also convinced that the setting of this Plan fulfils the requirements for the comprehensive transport plan as set out in the ex-ante conditionality for accessing the EU funding (2014-2020) to be used for road, sea and air transport projects in Malta. This requirement was a bold, yet necessary, measure taken by the European Union, which helped to provide the necessary impetus to facilitate national coordination towards achieving an important plan of action that, in places, touches on sensitive issues. Indeed, we are very proud with the quality and extent of the national public consultation held and with the quality of comments and suggestions received.

Finally, I would like to personally thank all of those individuals and organisations who have contributed to the formulation of this Transport Master Plan. Particular thanks go to the team from JASPERS who have patiently reviewed, critiqued and provided guidance to the Transport Malta over these past two years from the plan's initial concept to its completion; to Ingeniería y Economía del Transporte, S.A., Systematica S.r.l. and Adi Environmental Consultants Ltd who have supported the Plan's development process with their technical expertise. And, last but not least, I would like to compliment my team of dedicated staff from the Integrated Transport Strategy Directorate who have coordinated the compilation the Transport Master Plan 2025 and its various supporting documents. They presented the findings and endeavoured to meet with all of the transport stakeholders, NGOs and interested parties to better understand and document the specific challenges that we are facing in Malta today to collectively plan for a better transport system in the future.

We now have a structured well planned way forward to ensure sustainable mobility for our citizens.

JAMES PISCOPO
Chairman and CEO Transport Malta

THE CORE TEAM

Ingeniería y Economía del Transporte, S.A (INECO)

Systematica S.r.l.

Adi Associates Environmental Consultants Ltd.

Integrated Transport Strategy Directorate, Transport Malta

EXECUTIVE SUMMARY

WHAT IS THE PURPOSE TRANSPORT MASTER PLAN?

The Transport Master Plan 2025 builds on the strength of long-term vision, goals and guiding principles established in the National Transport Strategy 2050.

The Master Plan sets out the framework and the overall priorities which will guide transport investment in air, sea and land transport sectors over the next 10 years. It defines clear project pipelines for studies, operational changes, infrastructural and organisational measures and identifies where funds from national, European Union and other financing sources can most effectively be invested, where needed, in our transport system so as to help attain the long range strategic targets.

The Plan will serve to guide transport's contribution to the physical, environmental, social, economic development of the Maltese islands, while focusing on delivering a safer, secure, more sustainable and healthier transport system over the short-medium term, for the ultimate benefit of citizens, businesses and visitors to our islands.

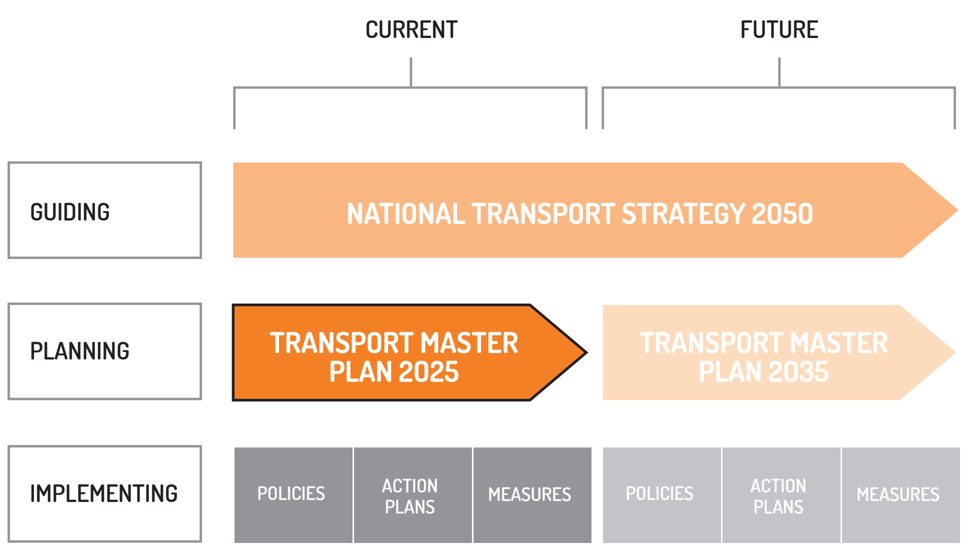


Figure i.
Purpose of this Document

THE MASTER PLANNING PROCESS

The Transport Master Plan 2025 has been developed by Transport Malta with assistance from the INECO-Systematica Consortium and with strategic support and guidance being provided by the Joint Assistance to Support Projects in European Regions (JASPERS)[1].

Throughout the development process of the Transport Master Plan 2025, there has been a significant level of evidence-gathering and analysis of the performance of road, public transport, maritime and air transport sectors. This underpins the identification of the challenges faced and the actions and measures required to address the needs of the different travel modes.

This technical analysis has been supported by rigorous modelling of current and future travel demands using transport model. The modelling process was highly technical and time-consuming but it has helped to accurately quantify the issues that currently affect the different modes of transport and enabled the clear understanding of their true causes. The process also allowed Transport Malta to examine the likely impacts of population, employment growth and their spatial distribution across Malta and Gozo over the next 10 years; and how this will impact on our transport system should there be no change in the current transport policy framework and should there be no further investment in transport infrastructure.

[1] *JASPERS is a partnership between the European Commission, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD).*

HIERARCHY

The Transport Master Plan is a planning and implementation document, with measures in the short to medium term (10 years) in duration. The master plan aims to achieve the goals set by the National Transport Strategy 2050 and the strategic framework set out in it.

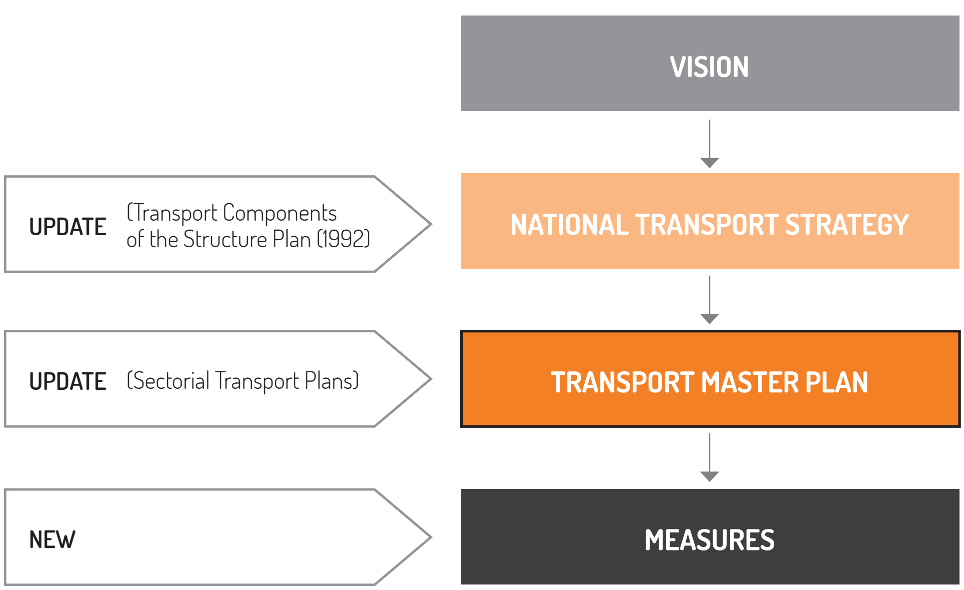


Figure ii.
Hierarchy of the Strategic and Planning Framework

WHAT DOES THE TRANSPORT MASTER PLAN CONTAINS

The Transport Master Plan 2025 is organised into nine chapters.

Chapter One provides a summary of the extensive diagnosis of the transport systems in Malta. It draws conclusions from the issues and challenges that have been identified in road, public transport, intermodal, maritime and air transport sectors.

Chapter Two sets out the process that has been followed to set the operational objectives for the Transport Master Plan 2025 that led to the identification of measures to address issues identified. The second part of this chapter is structured according to the travel mode. The rationale behind the operational operatives is explained in some detail as well as a description of the measures needed to achieve these objectives.

Chapter Three overviews the assessment process used to identify and select the major capital project measures that should be prioritised for investment and implementation in the short-term.

Chapter Four explains the policy scenario testing process that has been used to quantify and qualify transport master plan measures in terms of relative contribution to long-term strategic goals set out in the National Transport Strategy 2050. Two alternative future policy scenarios that contain packages of measures with varied levels of support for alternative transport modes and transport infrastructure improvement are simulated. The results are subsequently compared with a do-minimum reference scenario.

Chapter Five contains a summary of the environmental aspects considered in relation to the implementation of the Transport Master Plan 2025 and an explanation of how these have been addressed for both the Strategic Environmental Assessment and the Appropriate Assessment.

Chapter Six sets out the preferred transport policy approach for addressing the main transport issues over the next ten years. It also sets out estimates of costs and the timelines of the respective measures.

Chapter Seven outlines the process that shall be undertaken for the ongoing monitoring of the implementation of the Transport Master Plan; in terms of targets as well as in terms of impacts – both economic and environmental.

Chapter Eight outlines the monitoring process that is being established and the indicators against which the transport master plan will be monitored.

Chapter Nine concludes this report by summarising the process, content and methodology utilised to develop this Transport Master Plan.

Finally, the Annexes include the following:
I – List of Supporting Documents
II –Documents referred to when compiling this Master Plan.

TRANSPORT MASTER PLAN TARGETS

Since the National Transport Strategy 2050 sets the long term targets and a number of mid-term strategic targets, these have necessarily been incorporated into the Transport Master Plan with a 2025 timeline.

KEY PRINCIPLES GUIDING THE TRANSPORT MASTER PLAN

The Principles Guiding this Master Plan:

- **Efficient Utilisation** of the Existing Transport System - Traffic Management, Logistics Planning and Enforcement
- Creating **Modal Shift**
- **Integrated Approach** to Planning and Design
- Encouraging use of **Greener Fuels and Vehicles**
- **Modernisation**, Development and Revitalisation of the Strategic Transport Network to improve Territorial Cohesion
- Investment in **Education, Information and Human Resources**
- Making Room for **Innovation and Research**
- **Sustainable Financing** and Fair Competition

THE CONSULTATION PROCESS

As much as the research and analysis carried out has informed the development of this document, it was also necessary to consult with all the entities working within the different transport sectors as well as government ministries and organisations so as to receive additional input based on relevant expertise from a wider possible perspective. A number of important consultation meetings were organised with key players and representative bodies to help gain greater insight into the operational issues currently facing the transport sector.

Extensive consultation with stakeholders, constituted bodies, civil society and the public on draft operational objectives and potential measures was organised. The public consultation process was launched by the Minister for Transport and Infrastructure in June 2016 and consultation documents were published on Transport Malta's website and were supported by a similar publication on the consultations website of the Ministry of Social Dialogue, short slots on the media to draw attention and social media. The public consultation was extensively reported in the mainstream media.

The public were invited to communicate by phone, email or in writing and a significant level of feedback was received by Transport Malta from various stakeholders (in excess of 500 comments and suggestions). A similar level of discourse was noted on the social media and main public media comment boards.

The feedback received and our commentary as to how we have addressed the feedback has been summarized in the Transport Master Plan – Supporting Document I - Consultation and Commentary, which is available at:

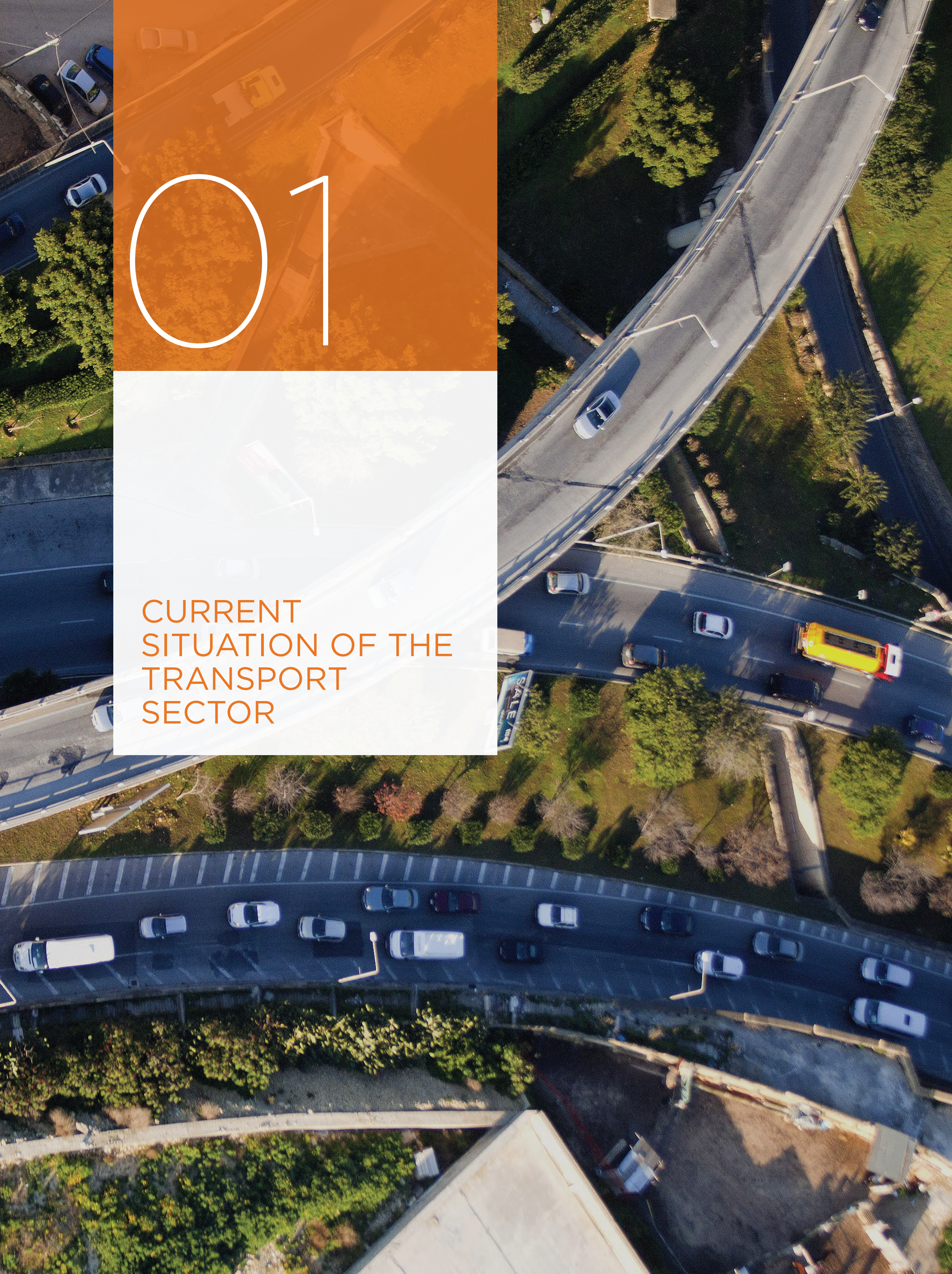
http://www.transport.gov.mt/transport-strategies/strategies-policies-actions/national-transport-strategy-and-master-plan

Further information:
http://www.transport.gov.mt/transport-strategies

THE SEA
CONSULTATION PROCESS

Similar to the Public Consultation process, extensive consultation with stakeholders, environmental bodies, civil society and the public on the Environmental Report accompanying this Master Plan is being carried out.

The consultation process was launched by Transport Malta in September 2016 and the consultation documents are published on Transport Malta's website, supported by short slots on the media to draw attention and social media.



01

CURRENT SITUATION OF THE TRANSPORT SECTOR

This chapter provides a diagnosis of the transport sector in Malta and draws conclusions from issues and problems highlighted in the Existing Conditions and Data Diagnostics Report[2] . It comprises a **concise and thorough analysis of all transport subsectors** that are herein proposed separately.

The diagnosis presented is structured in the way to point out the strengths, opportunities, threats and weaknesses of all the aforesaid transport subsectors. The different modes of transport present in Malta are considered separately in order to outline the general Maltese transport framework. The transport subsectors analysed are the following[3] :

- Road Transport (including road-based public transport);
- Intermodal Transport;
- Maritime Transport (including waterborne public transport); and
- Air Transport.

01.1
ROAD TRANSPORT

A high level summary of the SWOT analysis for road-based transport is presented below. This is then followed by a more detailed explanation of the main points.

STRENGTHS
Extensive experience in planning, design and implementation of TEN-T roads projects
Malta has a relatively good record in road safety thanks to the implementation of a number of measures and has a clear strategy and action plan for the 10 year period 2014-2025.
Strong commitment for deployment of Intelligent Transport Systems (ITS) to improve efficiency and safety on existing road network outlined in a clear Action Plan for ITS deployment (2013-2017).
The spatial distribution of town centres across Malta and the comparison between urban fabric extent and pedestrian catchment area can trigger a significant potential for walking.
National Transport Simulation Model now available to support policy development, planning and educational learning in the transport sector.
Short trip distances which favour active mobility such as walking, cyling and public transport.

[2] Transport Malta (2015), National Transport Strategy - Existing Conditions and Data Diagnostic Report, 2014
[3] Jaspers Guidance Note, Methodological support to the Preparation of National and Regional Transport Plans and related Ex-Ante-Conditionality to the 2014-2020 Programming Period with the additional Intermodality section as agreed with TM

WEAKNESSES
Deep-rooted car-oriented culture and transport system characterised by the general lack of accessible space provided for other alternative modes such as walking, cycling and public transport.
Malta has one of the highest road densities in Europe and traffic is heavily concentrated across the central section of the TEN-T Network and link roads in the main urban agglomeration area.
New road provision constrained by high urban density within built-up areas and physical and legal barriers to new infrastructure development outside of built-up areas.
Malta has high car dependency rates and low car occupancy rates.
Poor discipline on Maltese roads and poor compliance with traffic rules by road users disrupts traffic flows and adversely impact on road safety.
Hot summers and hilly terrain which may discourage active mobility such as walking or cycling and, possibly, public transport.
Existing road network is designed for vehicular traffic which creates difficulties in its adaptation to other mobility options.

OPPORTUNITIES
The setting up of a road infrastructure asset management system to facilitate holistic infrastructure programming, budget forecasting for capital and recurrent works and longer term budget sourcing.
To update road design and construction standards and specifications to introduce latest technologies, new materials and best practices in construction methodologies.
To improve freight distribution and logistics to reduce the impact of freight deliveries in urban areas.
To encourage soft modes such as cycling and walking in areas with a high concentration of short distance trips such as the Inner Harbour Region and North Outer Harbour Region through infrastructure provision and policy development.
To reduce reliance on internal combustion engines and to improve environmental performance of transport sector by promoting electromobility.
10 year National Transport Plan to increase awareness of the issues facing road transport, to clearly identify the infrastructure investments and to explain the rationale behind difficult transport policy decisions.
Improve coordination between road infrastructure managers, service utility providers and entities responsible for construction to minimise delays during works ensure realisation of full project life cycle.
Further development of synergies between academia, research agencies and road transport planning and engineering practitioners

THREATS
Steady and continuous economic growth and, in turn, increasing levels of disposable income leading to potential increase of car ownership and resulting road traffic congestion
Pronounced AM peak hour handling over 11% of daily traffic
Within the next 10 years, the modelled forecast of 5-6% traffic growth will result in serious peak hour capacity issues in the central section of the TEN-T network
Climate change impacts such as increased rain intensity and, more especially, sea level rise, could cause flooding issues on the road network near the coast.
Transport can have significant negative impacts on air quality and noise pollution.
The development of new roads, if not designed holistically, can hinder biodiversity.
The lack of a comprehensive strategy for parking management adversely affects the quality of life for those living and working in the busy urban centres.

The Maltese transport framework is characterised by the predominance of road-based transport, with private cars, buses, road freight, cycling and walking representing 98% of all internal travel movements in a typical day. The analyses performed have led to the identification of both strengths in the road transport that can be built on but also the main issues and problems that need to be addressed in relation to the supply and demand for road transport, the degree of utilisation and functionality of road transport and its organisation.

Supply of road transport in Malta comprises a **well-developed, existing strategic road network** with few missing links and, in general, provides an adequate level of connectivity between the main towns and from the smaller urban and rural settlements. The total extent of the Maltese road system is about 2,410 km, with approximately 762 km of roads/100 km^2; **this represents the densest road system in the European Union.**

Another important factor impacting on the road transport sector is population density. With an average of 1,341 inhabitants per square kilometre **Malta has by far the highest population density of any country in the European Union.** These unique factors, along with Malta's small country size, present practical difficulties when comparing the performance of Malta's internal transport system with that of the other EU countries. For instance, the short travel distances mean that marginalisation of rural communities is not a major issue compared with most other EU countries but, the lack of high-speed, inter-regional roads in Malta naturally gives rise to slower nationwide travel times and congestion levels which are more akin to congestion levels found in medium and large cities in Europe, rather than at a country level. Malta's very high road network density, high population density and urban agglomeration patterns result in a scarce availability of land for road network improvements, as well as conflicting needs between the road network and its surroundings.

The key strategic sections of the Maltese road network form the **Trans-European Transport Network.** Malta's original TEN-T[4] road network comprised 51km of strategic road in Malta and Gozo, main sections of which were upgraded through a series of investments supported by the European Union under successive programming periods since 2004. In 2013, EU legislation on the TEN-T was revised[5] and this had resulted in an extension of Malta's TEN-T road network to cover more than 112km.

The revised TEN-T network is divided into two components, the Core TEN-T Network which provides strategic connections between Malta's airport, the Port of Valletta (freight and passenger) and the Port of Marsaxlokk (freight) which is a subset of the Comprehensive TEN-T Network which connects the rest of the territory to the Core TEN-T network and the inter-island ferry port of Cirkewwa and port of Mgarr (Gozo). Currently, with the recent completion of the TEN-T Coast Road project, over 38% of Maltese TEN-T network has now been completed.

As the mandatory EU-wide date for completion of the TEN-T Core network is 2030 and TEN-T Comprehensive network is 2050, a clear and objective programme for the investment and implementation of both components of the TEN-T network needs to be established. The extensive upgrading of the TEN-T road network over the last 12 years is a result of efficient planning and design, quick mobilisation of resources and effective absorption of EU funds. Malta's experience in developing the TEN-T road network (strength) should be maintained and further developed during the operational programming periods covered under this Transport Master Plan, 2025.

The **quality of road infrastructure** on the strategic arterial and distributor road network has greatly improved as a result of important investment allocated for road refurbishment over the last decade. However, a significant portion of the non-arterial and distributor road network needs to be upgraded or repaired.

As **revenue generation from transport (i.e. vehicle licensing, fees and taxation) has no bearing to infrastructure** works or maintenance of infrastructure, national funds need to be sourced from central funds for road network repair, construction, reconstruction and operation. As with many other European countries, the availability of needed funds to carry out all the necessary works in the short-term is not realistic, therefore a clear and objective plan of priority actions needs to be established. In recent years, infrastructure investment has steadily risen to an average of 0.88% of national GDP. The Transport Master Plan identifies the OECD international benchmark of allocating at least 1% of national GDP for maintenance, repair, construction, reconstruction and operation of transport infrastructure as best practice, and as a realistic target to aim for.

It should be borne in mind that EU Cohesion funding for the development of the TEN-T road network in the next Operational Programming period (2021-2027) may not be as high as that in the current Operational Programme. The setting up of a road infrastructure asset management system will facilitate holistic infrastructure budget forecasting for capital projects, and recurrent works and budget sourcing (opportunity).

[4] *As per Commission Decision 661/2010/EU, later repealed.*
[5] *Regulation (EU) No 1315/2013.*

The survey of existing road infrastructure has highlighted that **road design in Malta is generally car-oriented and is characterised by the overall lack of space provided for all modes.**

This has led to a built environment which is generally not pedestrian friendly and often with infrastructure layout that is inaccessible to persons with restricted mobility.

The road network lacks dedicated infrastructure for public transport services and cycle network provision is largely fragmented and does not effectively penetrate the main urban areas (weakness). In the future, this will require a more integrated approach by urban planners and transport planners.

National road design and construction standards and specifications were developed in 2003 and the necessary legal provisions were subsequently put in place. These standards and specifications have led to significant improvements to design quality - resulting in safer and efficient road layouts; and to the type of materials and construction methodologies being used - resulting in better planned and longer-lasting roads. The road design standards and specifications are now, however, in need of review and revision. This updating of road design and construction standards and specifications will enable the authorities to introduce the latest technologies, new materials and best practices in construction methodologies as well as facilitating the changeover to euro codes (opportunity).

Freight distribution and logistics are not as well-regulated as other transport sectors. There has been a general lack of dedicated infrastructural facilities being provided for this sector and a low level of deployment of logistics in the daily planning of national freight operation and distributors.

The opportunity exists for the integration of safe off-street and overnight parking areas for trucks and communal logistics centres into new TEN-T infrastructure projects and into Sustainable Urban Mobility Projects, and to encourage more efficient operation through increasing awareness of new technological ICT developments in logistics (opportunity).

Demand analyses have shown that, in the absence of railway or inland waterway links, **domestic transport is mainly served by road** (internal sea transport representing less than 2% of total travel). This modal share, as reported by last National Household Travel Survey 2010 (NHTS 2010) revealed that around **74% of all internal trips are undertaken using private passenger cars.** Moreover, when considering trips by car, it is notable that only a small proportion of total trips are made as a car passenger (15%). In fact, **average car occupancy in a typical weekday has decreased from 1.33 persons per car in 1990 to 1.25 persons in 2014.** Car occupancy levels in Malta are now much lower than those typically found in European countries and cities. Over the next 10 years, particular attention needs to be given to increasing the average car occupancy rates, particularly during peak hours so as to increase the efficiency of usage of the limited road space available (threat).

In recent years, Malta has been affected by a trend of increasing traffic volumes. This is mainly as a result of three key growth factors: population, economy and tourism. From the demographic point of view, it is important to underline that today people are far more mobile than they ever were in the past. The average number of daily car trips performed by each driver in Malta today is 3.20, which is notably higher than the average number of car trips / person recorded in 1990.

With regard to the economic aspect, the main observation is that, over the past 25 years, transport growth for both passengers and freight has been closely linked to economic growth and land transport volumes have been growing at approximately the same rate as GDP. Additionally, the constant growth of the Maltese tourism sector has contributed to increased pressure on the road transport system, particularly during the peak tourist season. Efforts to decouple private transport growth from economic growth have so far failed (weakness) and needs to be addressed through further fiscal and other transport policy measures.

The predominance of road transport is confirmed by the **high rate of motorization,** which currently stands at 759 motor vehicles/1000 residents as at 2013 (NSO, 2015). This represents one of the highest per capita rates of the 28 EU member states. The highest increase in motorisation levels occurred in the second part of the 1990s and, although the percentage increase has reduced in recent years, the trend is still that of increasing vehicle ownership.

The increasing volume of traffic on the roads is closely associated with the year-on-year growth in private car ownership and usage. **Nationally, private cars account for over 83% of the vehicular traffic composition on Maltese roads during a typical weekday.** From the direct comparison between vehicle ownership growth and demographic trend, it emerges that the number of passenger cars has been increasing at a rate that exceeds population growth.

The increase in cultural car dependency is directly influencing levels of traffic congestion on the roads. The lack of integration of land use development and transport planning and the continued decentralisation away from the harbour areas that has taken place in Malta since the early 1990s, has generally had the effect of increasing the distance between homes and work places.

New development growth has taken place in isolation of the main bus network corridors and this has inevitably increased the level of car dependence to the detriment of public transport services over the past two decades. The lack of integration, between transport planning and land use planning, challenges the maintenance of sustainable mobility across the Maltese Islands (threat).

The road traffic congestion is manifestly problematic during the early morning period, particularly between **0730hrs and 0830hrs which accounts for 11% of the total daily traffic.** Traffic flows during this peak hour have increased across the network by around 55% since 1990; over half of these peak hour trips involve travel to work and travel to education (schools, University, MCAST etc.).

The existence of a highly pronounced and concentrated travel demand peak is an undesirable feature in any transport system. New road infrastructure needs to be designed to accommodate these maximum traffic flows during this short period of heavy congestion.

When this peak period is excessively disproportionate to the rest of the day, the cost of remedial solutions becomes artificially high and the design solutions become increasingly difficult to find (threat). This needs to be comprehensively addressed in the Transport Master Plan through policies and measures aimed to improve the management of peak hour travel by private cars. Measures should aim to encourage car drivers to avoid the need to travel during the peak hours, travel outside of peak hours and to create a modal shift onto more efficient modes of transport. In doing this high levels of mobility can be sustained, value for money of investment in new transport infrastructure guaranteed and more efficient utilisation of existing transport infrastructures facilitated.

One important characteristic of Maltese mobility **is journey length, which on average is 5.5km.** The private car is nowadays more commonly used for very short distance trips where, in the past, walking or cycling would have been the preferred mode. With an **average travel time of around 19 minutes for the private car during the morning peak and unrestricted, free parking available in many localities,** car travel has become the preferred modal choice for many travellers at national and inter-regional levels. In today's time-conscious society, the time taken travelling by bus (including walk to/from bus stop, waiting, changing buses and the ride time) is much slower than travelling by car for the equivalent journey. The time taken by car drivers cruising in search of an available parking space is highly unpredictable and seldom influences modal choice decisions. Cycle speeds compare favourably with those of the car, with an average trip duration being 11 minutes if travelling at 32km/h and 18 minutes when travelling at 18 km/h[6] . Studies have shown that in busy town centres, bicycle speeds are faster than those of cars.[7]

The heavy concentration of trip movements within the Inner Harbour Region (including Valletta and Floriana) and the North Outer Harbour region coupled with the relatively high proportion of short-distance trips within localities has the potential for further trips to be undertaken on foot or by bicycle. This could be further supported by developing the infrastructure and the policy framework to encourage use of these soft modes (opportunity).

Despite significant increases in motorisation, **Maltese roads have performed well in terms of road safety and, in recent years, Malta has retained one of the lowest per capita fatality rates in the EU.** This is largely the result of improvements to road design and management, the modernisation of the transport regulatory framework resulting from the adoption of EU legislation (e.g. vehicle type approval, vehicle roadworthiness testing, wearing of seat belts, driver training and testing etc.), the introduction of IT in enforcement (e.g. speed cameras, breathalysers etc.) and increased public awareness of driving rules.

[6] *Bicycle Advocacy Group, Malta*
[7] *Jensen et al. (2010). Characterizing the speed and paths of shared bicycle use in Lyon. Transportation research part D: transport and environment, 15(8), 522-524*

Road safety is given high priority at a national level and the recent setting up of the Malta Road Safety Advisory Council and the drawing up of a National Road Safety Strategy 2014-2024 aim to build on the past successes and provide clear targeted actions relating to specific road users (strength).

Another issue to consider when tackling Maltese transport demand is the rolling stock. In 2013, **66% of the licensed vehicles were older than 10 years and only 4% of vehicles were less than 2 years old. Recent trends do not appear to be favourable with the average motor vehicle age increasing from 13.80 years old in 2010 to 14.69 years old in 2015.** The average passenger car age is currently 13.89 years which is significantly higher than the European Union average of 8.6 years.

Again, EU country comparisons may not be particularly useful, given the sharp differences between average annual distance travelled by car in Malta and much higher average distances travelled in larger countries in the EU. However, for environmental reasons, these elements illustrate clearly that further efforts are needed to improve the quality of road rolling stock by reducing the average in line with EU average.

The rate of uptake of plug-in hybrid and electric rolling stock lags behind that of most other European countries and is significantly contributing to national fossil fuel consumption and deterioration of air quality. Given that the average daily travel distance is well within the range of a modern electric vehicle and that public charging infrastructure provision per square kilometre is now higher than most EU countries, the main impediment to further uptake of electric is the cost differential with conventional internal combustion engine vehicles.

The direct reduction of this cost differential through continued application of preferential national fiscal measures and indirect reduction of costs through the economies of scale of mass production of electric vehicles could enhance green mobility in Malta in the medium term (opportunity).

Malta is committed to increasing its efforts to decarbonise its transport sector and move towards cleaner alternative fuels. In line with the EU 2050 Transport White Paper, Malta has established indicative targets which it will strive to achieve subject to market developments, advances in technology and local specificities. In particular, Malta's aspiration to align itself to the EU Commission objective of shifting 50% of the urban transport away from conventionally fuelled cars by 2030 will largely depend on international development in this sector.

As far as the **degree of utilisation and general level of functionality** of Maltese road transport, the growing level of motorisation and the **increased dependency on private transport,** over the years, have both led to the development of a number of **traffic bottlenecks** at key sections of the strategic road network.

Given the high level of urbanisation (and associated difficulties in expropriation of privately-owned premises), the historical and environmental development constraints and the **limited availability of vacant land** (that is suitable for the provision of new roads), traffic bottlenecks have tended to be addressed by widening of local roads at junctions, grade separation and traffic management schemes rather than new bypass roads.

The distribution of traffic across the dense Maltese road network is mainly concentrated along the central section of the TEN-T Network and connecting roads around the Harbour region. The strategic road network accounts for only 4% of the length of the national road system, but accommodates around 38% of the entire vehicular mobility. Several critical sections and nodes on the strategic road network are approaching their practical operational capacities. Within the next 10 years, the modelled forecast is of 12.8% growth in traffic during the peak hours across the Maltese islands, taking all strategic roads closer to their maximum capacity. **The central section of TEN-T network (Triq Aldo Moro, Hamrun Bypass, Santa Venera tunnels and Tal-Qroqq junction), which already carries high volumes of traffic, will experience a further 5-6% traffic growth and will suffer major capacity issues during the AM peak by 2025.**

Without appropriate mitigation measures, the bottleneck along this section of the TEN-T will challenge sustainable mobility in the greater part of the island (threat), resulting in lost economic production, increased air pollution, greenhouse gas emissions and noise pollution.

The distribution of public and private car parking is highly fragmented across Malta and many areas lack purpose-built parking infrastructure of any sort. Also, very few managed parking facilities are provided within a convenient walking distance to the main urban and commercial agglomerations. Parking supply is therefore mainly on-street, and mostly unregulated, free of charge and operating on a first-come, first-serve basis.

The management of the supply of parking places for residents is inadequate. The continued increase in demand for **on-street parking** in residential areas often has a negative impact on traffic circulation through further narrowing of road carriageway and through the introduction of one-way systems which result in longer journeys. Additionally, the lack of space for road transport and lack of sufficient development control are also putting further pressure on the existing transport network. Integration of land use and on-street and off-street parking policy is lacking in practice. The lack of a comprehensive parking strategy to determine to optimal number of private and public off-street parking spaces, in conjunction with the supply of on-street parking spaces has led to over provision in many congested town centres. This has resulted in congestion on the approach roads which cannot support the increased levels of traffic, resulting in reduced reliability of bus services and the deterioration of urban fabric in many central areas. This lack of comprehensive strategy for parking management represents a challenge to the quality of life for those living and working in the busy urban centres (threat).

Significant investment is currently being made to facilitate the rolling out of **Intelligent Transport Systems** (ITS) in order to improve traffic management, safety and efficiency on existing strategic roads. National Action Plans for the Deployment of ITS have recently been published which aim to build on experience gained over the last few years from operation of automatic vehicle location devices (and real time information) in the bus service, vehicle activated road signs and the use of automatic number plate recognition equipment in the operation of speed cameras and access charging in Valletta. There is a focus and good political support for wide-spread deployment of ITS in the current transport system (strength).

Behavioural aspects also affect the functionality of Maltese road transport. Disruptions to efficient mobility can occur on a daily basis as a result of poor compliance with road traffic rules. For example, illegal car parking on bus stops, double parking by goods delivery vans and parents waiting for children outside schools located on or near the strategic road network is a frequently observed occurrence. Disruptions to traffic also result from poor traffic management planning in temporary road works.

The lack of discipline by drivers, including the correct use of overtaking lanes, non-observance of traffic rules at junctions and roundabouts, and slowing or stopping to answer mobile phones leads to diminished performance of links and flows in the network beside often resulting in accidents which themselves cause traffic congestion. This failure in the transport system needs to be addressed by more effective enforcement and stricter penalties for non-compliance (weakness).

The impact of climate change on the road network also requires attention. Recent research at the Institute of Climate Change and Sustainable Development, University of Malta has shown that risks from climate change could affect coastal areas as well as areas prone to flooding as the frequency of extreme weather events (e.g. flash flooding) is set to increase. Attard (2015) identified that over 6% of the main arterial and distributor network would be affected by sea level increases following a 2m increase in sea level, whilst 10% of arterial roads, 6% of distributor roads and 7% of rural roads would be prone to flooding during rain events. (threat)

Within the **organisational** framework of Maltese road transport, one critical aspect that affects the road sector as well as other transport sectors is that transport policy and planning in Malta tend to be short-term in nature, with measures and projects **primarily focussing on new road construction or increasing existing road capacity at problematic locations in isolation rather than considering the wider strategic policy context.** The 20 year integrated transport strategy outlined in the 1992 Structure Plan for the Maltese islands has now reached the end of its life and needs to be replaced with a new National Transport Strategy which sets out strategic goals and targets for the development of inland transport over the long term and a Transport Master Plan which defines specific objectives and measures to be implemented in the short to medium term.

The development of a comprehensive National Transport Strategy supported by a 10 year implementation plan will increase awareness of the issues facing road transport, clearly identify the infrastructure investments planned for the next 10 years and explain the rationale behind difficult or less than intuitive transport policy decisions (opportunity).

Construction and reconstruction of road infrastructure **requires significant coordination between Transport Malta, Local Councils and service utility entities for electricity, water, drainage and communications and agencies responsible for preservation of heritage.**

Delays to the implementation of projects have occurred as a result of certain service utilities not having a clear understanding of where their buried services lie. Delays to the implementation of projects can also commonly occur when historically significant artefacts, buildings or structures are found during road excavations. The establishment of a clear ten year plan for road infrastructure investment will facilitate better integration and improved cooperation between entities and stakeholders at the planning stage (opportunity).

There is a **general shortage of qualified and experienced Transport Planners, Road Engineers and professionals specialising in Traffic Management and Traffic Signal Control** both in the public and private sectors. This is linked to the lack of local specialised educational programmes being made available in transportation and few long term career opportunities.
The awareness of the importance of research in transportation has recently come to the fore thanks to the work of local Institutions. The University of Malta (which has set up a Masters Course in Transportation Engineering) and Transport Malta have set aside resources to develop skills in specialised disciples such as transport modelling and design. Further development of synergies between education and research agencies (such as the University's Faculty for Built Environment and Institute for Climate Change and Sustainable Development) and road transport planning and engineering practitioners will propagate the continued curricula development in local educational courses leading to qualification in transport at undergraduate and postgraduate levels and increase availability of shorter specialised vocational training courses for transport professionals (opportunity).

Data collection in road transport is an extensive, time consuming process, but nonetheless a vital process required to fully understand the functioning of the road transport system. Traditionally, collection of data has been localised, labour intensive, fragmented and often not updated. The development of the National Transport Model supporting the Transport Master Plan has involved significant time and resources. The National Transport Model is now available as a planning, policy, research and educational tool and can be enhanced through linking to data automatically being electronically collected through road side camera equipment, automatic vehicle location devices and electronic ticketing data in public transport many of which operate in real-time (strength).

The last organisational aspect considered here is enforcement in which there seem to be grey areas. Enforcement should be carried out by Traffic Police, Wardens and Transport Malta officers; however, there are insufficient resources to effectively enforce road traffic regulations in Malta and Gozo and this challenges the organisation of the Maltese transport system (weakness). The operation of **enforcement** is also undermined by lack of appropriate equipment. This inadequacy also compromises important issues, like those dealing with freight sector in relation to dangerous and perishable goods, as well as compliance with traffic rules and regulations.

01.2
ROAD-BASED PUBLIC TRANSPORT

A high level summary of the SWOT analysis for road-based public transport is presented below. This is then followed by a more detailed explanation of the main points.

STRENGTHS
Concession contract with bus service operator clear and robust, with transparent compensation methodology to facilitate flexibility to modify, remove or add bus routes or adjust service frequencies to adapt to changing travel demands
Good organisation of bus repair, cleaning, maintenance and overnight parking through centralisation of facilities.
Fast boarding and reduction of cash handling through high uptake of pre-paid travel cards
High frequency and close proximity of bus stops within main urban areas
New, modern low emission and full accessible bus fleet
Increased bus patronage levels since 2011
Scheduled bus service ticket prices amongst the lowest in the EU

WEAKNESSESS
Lack of alternative forms of public transport to road-based buses
Inadequate bus shelter provision and inflexibility of contract with bus shelter provider
Poor quality pedestrian infrastructure reducing access to bus stops in urban areas
Low level of bus priority provision to facilitate better reliability and punctuality of bus services
Fare levels for certain unscheduled transport services are set too high to encourage usage by Maltese travellers

OPPORTUNITIES
Build on recent experience gained in upgrading the primary public transport infrastructure, to enhance this infrastructure and develop the secondary infrastructure
Optimise use of Pembroke Park and Ride facility and develop new park and ride sites at other key locations
Improve service information by rolling out deployment of real time infrastructure and better use of data to improve route logistics and service planning
Increase modal share of public transport through further improvements to the network and service quality
Better integrate public transport provision and requirements into the new spatial planning framework
Sustain levels of expenditure on public transport infrastructure through augmentation of national funds with EU funds and private financing initiatives
Offset the shortfall in resources to enforce public transport with new enforcement technologies.
More flexible forms of bus travel such as 'demand responsive Transport'.

THREATS
Traffic congestion will increase over time leading to reduced reliability and punctuality of bus services
Lack of road space allocated to the safe and efficient operation of public transport
Poor integration of the spatial planning of land use development with existing public transport provision encourages car dependency
Decreasing usage of unscheduled public transport services by the Maltese travelling public
Opposition to dedicated bus lanes by strong car lobby.

Maltese public transport is primarily road based and comprises both scheduled (Regular) services, which follow pre-determined routes and set times of day, and unscheduled (Occasional and Special Regular) services using minibuses, coaches and taxis which are more flexible in their operations.

Over the last 5 years both scheduled and unscheduled public transport sectors have been restructured in order to operate along more competitive, market driven lines.

There has been a complete overhaul in the operation of scheduled bus services in Malta and Gozo, while significant regulatory changes in several of the operations within the unscheduled transport sector have led to quantitative restrictions to market entry being replaced with more equitable qualitative restrictions. These radical transport reforms have had a profound effect on the operation of public transport in the last few years.

The analyses performed have led to the identification of both strengths in the road-based public transport that can be built on, but also the main issues and problems that need to be addressed in relation to the supply and demand for public transport, the degree of utilisation, functionality and organisation.

Public transport has the potential to transport more people than individual cars for a given amount of road space or without consuming any road space at all (in the case of off-road systems such as metros and surface rail systems). The promotion of public transport remains a fundamentally important congestion management strategy.

Public transport that provides a quality of service similar to that which car drivers have previously been used to, can maintain a high level of access throughout urban areas and can lead to a drop in overall car usage.

For the congestion mitigation potential of public transport to be realised, travellers must feel that the extent and quality of service provided are sufficient for them to forego using their cars for certain trips – especially those in peak periods.

Thus, actions taken to encourage a mode shift to public transport should address the perceived costs by the user, the ease and comfort of travelling by public transport as well as its reliability, safety and security.

There are many measures that can improve the attractiveness and performance of public transport systems (e.g. extending services, adapting fee structures, operational improvements, comprehensive travel information provision, etc.) but these measures come at a cost and, alone, will likely not be a sufficient congestion management response. Urban areas with high levels of public transport use often also have high levels of road traffic as well.

Public transport services, even when augmented by paratransit services, would most likely not be able to provide the level of service that car users enjoy in many lower density or peripheral urban areas, but provision of high quality bus services along the main corridors to the busy centres and extensive provision within these centres can encourage modal transfer from private car to public transport at the periphery of the built up areas.

The **Supply** of scheduled public transport services in Malta and Gozo comprises of two distinct networks of bus routes. In Malta, bus services are broadly divided into services operating to and from Valletta and between other interchange hubs, park and ride services, express routes and night time services. In Gozo, the service network is more a conventional hub and spoke layout with Victoria serving as a central hub.

Bus routes and frequencies of service have been reconfigured and fine-tuned in order to better meet today's complex mobility patterns and demands. Public transport has, over the years, rarely featured in land use planning decisions. Main development growth over the last 10 years or so has taken place in areas outside of the inner harbour regions in places such as Malta International Airport, Mater Dei, University, Smart City, Birzebbugia and Bugibba which were not particularly well served by public transport. Service inflexibility to meet changing demands that had characterised the old monopolistic bus service inevitably contributed to trends of increased car dependency and increased pressure to provide more parking spaces.

Following the radical reform of starting in 2011, today's bus network in Malta and Gozo retains an element of the traditional 'hub and spoke' system. The densest level of bus services are provided around the main urban agglomeration which then spread out along the main roads to connect outlying towns and villages and with good levels of convergence along most strategic corridors. The new bus network in Malta also provides good levels of public transport access to most new development growth areas and new public transport hubs have been developed at these locations which are now becoming highly patronised. The regulatory model has changed from an indefinite, rigid public transport contract to a finite, competitively-awarded, service concession contract which sets out a clear compensation methodology to modify, remove or add bus routes and change service frequencies (strength). This can be exploited to further enable a more timely response to demand changes through route and frequency adaptation.

There has been continued, significant investment in the upgrading of bus service infrastructure since 2009. For public transport to be considered as a viable alternative to the private car the quality of the facilities (comfort, safety, security and convenience) used for waiting and changing buses needs to be of the highest standard. The principal public transport hubs (Valletta, Bugibba, Malta international Airport, University, Cirkewwa, Mgarr and Victoria) were fully re-planned and designed to enable improved bus access, safe segregation between vehicles and bus users, shelter from the elements, seating and clear travel information. Secondary hubs at Mosta Techno park, Paola Square, Attard and Rabat were upgraded along the same lines with improved pedestrian provision for crossing busy roads with room for further enhancement. Recent infrastructure investment has resulted in a significant, systemic advancement in the quality of the main bus service infrastructures with the possibility to further develop infrastructures to include public conveniences and consider alternative forms of financing to ensure long term sustainability of these infrastructures (opportunity). Consideration could also be made to apply the same approach for the upgrading of tertiary infrastructures and add further convenience to facilities.

The bus service concession contract requires the operator to provide **centralised garage and organised repair and cleaning facilities for buses.** The centralisation of these facilities has marked a radical departure from past operations in which the 400 or so individual bus owner-operators would house their large vehicles overnight in private garages (commonly located in unsuitable, narrow village core or residential areas), often with little or no system in place for carrying out routine maintenance and repair.

The centralisation of operation has brought about better organisation, better account of vehicle repair and maintenance and less intrusive impact of parked buses in urban areas. It also enabled centralisation of maintenance, repair, cleaning and overnight parking (strength).

New **park and ride infrastructure** has been strategically introduced at the peripheries of the inner harbour region. These inter-modal interchange points are characterised by good levels of access from the strategic road network, well laid out parking spaces and high quality waiting facilities. Generally speaking, these park and ride facilities are mainly frequented by car drivers whose final destinations are localities where parking is difficult or where strict on-street parking control measures are in place. There is potential to increase the use of the Pembroke Park and Ride facility as a support parking facility to the Mater Dei, St. Julian's and the University of Malta area and to develop new park and ride infrastructure at other strategic points on the network (opportunity).

The bus ticketing system was radically overhauled in 2015 through the introduction of the pre-paid 'Tallinja' travel card. This pre-paid ticketing system has reduced cash handling on board the buses, has speeded up boarding times (and therefore journey times), simplified travel planning and significantly reduced the incidence of fare theft. The uptake of the 'Tallinja' card has been very high with over 230,000 cards now in circulation in Malta and Gozo. The use of the card has now penetrated across all the main bus user categories and its deployment over the past year is considered to be one of the main achievements of the present public transport service (strength).

Before 2011, it is fair to say that even the most basic of paper-based timetable information was not being adequately provided and there were clear organisational disputes as to whether such information should be provided by the service operator or by the regulator. The change of operational model now places the onus of responsibility for bus service information on the bus operator. This change had almost immediately ameliorated the travel information deficit characterising the old bus service.

Today, the travelling public are clearly guided on all aspects of the bus service and are able to plan their journeys in advance of travel through a user-friendly website application. Travellers are also informed in advance of any major permanent operational changes through the distribution of information brochures to households, on any temporary disruptions to the service through the various media and during their travel through accessible timetable information at bus stops and real-time information displays at main bus stops and on-board the buses. Information provision today is of the standard to be expected of a modern, well developed European public transport system. The use of roadside Real-Time Information (RTI) displays indicating estimated time of bus arrival at bus stops has now been successfully piloted on around 5% of the bus stops. The further deployment of RTI displays to other key parts of the bus network is now possible and better harnessing of the data acquired automatically during daily bus service operation though the on-board vehicle location devices and ticketing machines will improved service operation (opportunity).

Bus stops are well distributed across Maltese territory. The average distance of nearest stop is in the region of 450m and around the 75% of the surveyed population can reach the nearest bus stop in less than 5 minutes by walking (only 4% of the population is experiencing a walk longer than 15 minutes). The locations and frequency of bus stops are in fact well designed in relation to the distribution of main urban areas, biased towards where higher densities of population and employment occur (strength).

As far as accessibility is concerned, the infrastructure is not fully geared up for the needs of the mobility impaired. Footpaths which provide **pedestrian access to bus stops are often discontinuous and unsafe;** this has a direct impact on usage of public transport. Furthermore, to date **only 22% of all bus stops have adequate shelter provision from the elements.** Bus shelters are provided and maintained by a private company under contract with Local Councils and safe footpath provision also falls under the responsibility of the Local Councils.

In most residential areas there are resource and planning issues to the timely upgrading of these infrastructures (weakness).

In the **unscheduled public transport sector,** the lack of dedicated parking, waiting, boarding and alighting facilities outside schools, near hotels and at the main places of interest and tourist hotspots give little choice to operators other than to double park, with resultant localised traffic management problems. Taxi ranks are, on the other hand, well located and in close vicinity to the main tourist hubs, but these ranks could be better monitored to ensure proper usage.

Overall, infrastructure provision for unscheduled public transport is a challenge to the safe and efficient operation of this sector (threat).

The capacity to accommodate the **demand** for travel by bus is currently being provided through a fleet of 374 modern, lower floor, low emission (Euro 6 engine) and fully accessible buses. These buses are of different sizes and are deployed according to operating environment i.e. small buses for operation in villages where roads are narrow or on routes or at times of day where demand is low. All buses are equipped with closed circuit cameras (for security and incident reporting), passenger announcement and safety equipment. The current bus fleet conforms to the highest environmental, safety and accessibility standards (strength).

With regard to public transport demand and general patronage, the last decade illustrated a negative trend which turned into a positive one from 2010 until the present time. One of the main reasons for this trend was the former fragmented operational framework of the public transport service together with the constant increase of car ownership. **The overall public transport modal share was in the region of 16% in 2010** and, due to the constant increase of patronage recorded during the period 2011-2015, modal share today is most likely to be slightly greater. Continued improvement to the network and quality of bus services should support the increased modal share by public transport (opportunity).

Poor integration of the spatial planning of land use development with existing public transport provision challenges the sustainability of the road transport sector (threat). The Strategic Plan for Environment and Development which was approved in 2015 could better integrate public transport provision and requirements into the new Local Plan framework, move away from the piecemeal approach and holistically plan transport infrastructure requirements and transport services in specific growth areas through a Master Plan process (opportunity).

Traffic model forecasts highlight that by the year 2025 average bus speeds will reduce to 13km/h during peak hours unless there are transport policy changes. In critical parts of the road network, traffic is expected to grow by 5-6% during the peak hours over the next 10 years in a scenario with no further investment in road infrastructure, no further policies to discourage peak hour travel by car and no further implementation of bus priority measures. Bus journey times will increase, bus service reliability and punctuality will deteriorate and a likely undesirable modal shift from the bus back to the car will result. Along with this deterioration, policy inertia would result in a significant increase in traffic congestion and challenge the sustainability of the bus service operation (threat).

The unscheduled public transport system includes a large combination of services. With the exception of special regular services which operate during the morning peak (such as school transport and home-work transport organised by certain major employers), most unscheduled services operate as occasional services which are aimed at the tourist market (coaches, minibuses, open top buses, trackless train transport, taxis and mini-cabs) and mainly operate outside of peak hours. Unscheduled public passenger transport services operate in an open market with incentive schemes having been recently introduced to encourage fleet replacement by private operators with new, lower emission coaches and minibuses.

With more parents opting to take children to school by car for reasons of cost or convenience and an increased number of employees using their car to go to work rather than the alternative collective transport organised by their employers, the positive impact that unscheduled public transport once had on peak hour congestion is becoming less and less significant. The decreasing usage of unscheduled public transport services by the Maltese travelling public is a challenge to the sustainability of the sector (threat).

The bus services in Malta and Gozo share the road space with general traffic and this has the most significant impact on the **degree of utilisation and functionality** of service each day. The average ride time for bus users during the peak hours is around 22 minutes and, at an average speed of 15km/h during peak hours, bus services travel at approximately 33% slower than private cars. However, when other factors such as the time taken to walk to the bus stop and the time taken waiting for a bus or changing buses to reach the final destination are taken into account, average journey times increase to over 45 minutes.

As the majority of bus stops are with a five minute walk of most parts of the urban area, the main variable journey component is the waiting time. Analysis of the situation in 2014 had revealed 55% of main bus routes and

77% of secondary routes have a frequency of less than two buses an hour. Low frequency of service mainly occurs in the last section of a route in the outlying parts of Malta and Gozo.

However, as these routes approach and pass through the principal urban areas they often converge with other routes and form bus corridors. The combined frequency of different bus services along the bus corridors increases and waiting time is reduced substantially. A low frequency of bus service and long, tortuous routes in sparsely populated outlying areas are common features in most public transport systems. As discussed earlier in this section, park and ride services can help address this issue but also there is the opportunity to explore more flexible forms of bus travel such as 'demand responsive transport' which matches the service more closely to the customers' needs (opportunity).

Although low frequency of service was cited by many (in Eurobarometer survey 422a on the quality of transport published in December 2014), by far **the main reason cited for not using public transport was poor bus service punctuality and reliability.**

Bus services share the roads with other traffic, they get caught up passing through areas of traffic congestion but, unlike other traffic, buses cannot take short-cuts to bypass congestion. Most congested European cities provide clear priority for buses in traffic through the provision of bus priority measures (bus activated traffic signals, bus only streets, bus lanes, etc.) as buses use existing limited road space in a much more efficient manner than other traffic. In Gozo, levels of congestion are much lower than in Malta typically only occurring on the final stretch approaching Victoria terminus. However, in Malta the level of bus priority provision is comparatively low (weakness).

The National Transport Model indicates the **average degree of utilisation of the public transport system during the morning peak hour is 73% (with a demand of around 19,000 passengers), whereas during the PM peak hour it is in the region of 50%.** Having said this, the data used to calculate the capacity was quite general and does not reflect the full extent of localised bus service capacity problems. Capacity problems regularly occur at different times of day, along specific sections of bus routes as a result of a variety of complex factors such as traffic congestion, low vehicle speeds, sudden influxes of demand, seasonal demand variation and delays leading to 'bunching' of bus services. Data collected from bus service operation in real time, referred to earlier, could be used to better understand the nature and frequency of capacity issues affecting the service operation, with a view to improving service planning and route logistics (opportunity).

Bus service fare levels were restructured in 2015, as part of Government's initiative to promote the use of off-bus ticket sales through deployment of the 'Tallinja' bus travel card system. Public transport fare levels per kilometre in Malta and in Gozo continue to be amongst the lowest in the European Union. In fact, ticketing prices, availability of season tickets and simplicity of use came out positively in the previously mentioned Eurobarometer survey on bus operation (strength).

Fares charged in unscheduled transport particularly in collective transport to non-government schools (i.e. private and church schools), taxis and electric minicabs are not perceived by Maltese as being competitively priced when compared to the cost of using the private car for a number of reasons (weakness).

The **organisational** framework of Maltese scheduled bus public transport is clearly laid out in a restated concession tripartite agreement between Transport Malta (the authority), Malta Public Transport Services Ltd. (the operator) and Autobuses de León S.L. (the guarantor) entered into on 1st January 2015.

The concession agreement grants exclusive rights for the operation of scheduled bus services in Malta and Gozo to the operator for a period of 15 years up to the year 2030.

The agreement sets out the public service obligations to be provided by the operator which society needs as parts of its general economic interest and which would not otherwise be commercially viable for the operator to provide. These include: the operation of unprofitable bus routes (for example to small, remote rural areas) which are needed for integration of marginalised communities; maintenance of a reasonable level of service during off-peak hours, weekends and public holidays to facilitate good levels of accessibility throughout the main part of the day; and the setting out of the maximum passenger fare levels and a structure of concessionary fares (children, students, elderly, persons with reduced mobility etc.) which aim to encourage mobility among economically disadvantaged groups. For the fulfilment of these public service obligations, the operator is paid public service compensation in accordance with the lex specialis methodology set out in Regulation (EC) No. 1370/2007 on public passenger transport services by rail and by road.

The agreement clearly sets out the obligations of the operator in respect of the bus services, bus network, equipment, buses, fares and ticketing, mechanism for fare and route adjustment, use of bus infrastructure (termini, P+R sites etc.), service performance requirements, employees, reporting requirements and the framework of penalties for non-compliance with the contract. The specific roles and responsibilities of the authority, as a regulator, are also clearly defined.

The change of bus service operational framework from the pre-2011 open-ended agreement based on revenue-deficit subsidies unrelated to performance to a concession contract that is fully in line with the requirements of the new EU legislative requirements on public passenger transport services by rail and by road has brought about increased competition, transparency, safety, efficiency, attractiveness and quality in the national provision of scheduled bus services.

The concession contract contains the necessary provisions which can bring about significant improvements to operational performance of the bus service over time and the necessary flexibility to adapt to changes in travel patterns and behaviour over the medium-term (strength).

The last four years has seen an **unprecedented level of national funding being committed to the upgrading and refurbishment of public transport infrastructure.**

Over the next five years further investment for infrastructure upgrade will be required. In this respect, there is an opportunity to augment national funding with EU funding through specific provisions and targets the operational programme 2014-2020; as well as other financial instruments (opportunity).

Poor Enforcement of illegal parking on public transport infrastructure, unauthorised route diversions by bus drivers and illegal use of bus lanes by non-authorised vehicles adversely affects the operation of public transport services. There is a lack of capacity to enforce all sections of bus route as well as the main hubs and, at the same time, ensure the proper use of road space designated for unscheduled public transport services. Today's level of technology provides the opportunity to offset the shortfall in labour intensive resources on the ground through further deployment of Intelligent Transport Systems on the road with centralised control of traffic management and bus operation (opportunity). Professional development programmes should focus on the development of skills and expertise in using IT in enforcement.

01.3 INTERMODAL TRANSPORT

Intermodality is the part of the transport system where passengers and freight services switch from one type of service or infrastructure to another. Interoperability is fundamental for the development of an efficient intermodal transport system, which in turn ensures good access for users across the whole network.

This section deals with the intermodal interface itself, but many of the measures have been grouped under road, maritime or aviation sectors in other parts of this document and reference should also be made to the respective sectors.

A high level summary of the SWOT Analysis is as follows:

STRENGTHS
An established network of intermodal links for passengers

WEAKNESSESS
Lack of appropriate intermodal links for freight
Limited journey planners lacking real-time data and difficulties in the synchronisation of timetables for the various transport modes
A passenger intermodal link between the two islands needs to be established in the inner harbour region.
Limited data availability on internal freight transport makes policy options difficult to determine

OPPORTUNITIES
Implementation experience and past lessons learnt can be applied to new intermodal transport hubs
Introduction of multi-modal pre-paid travel card
Low cost, high impact improvements possible for better accessibility of intermodal transport hubs
Potential to develop an integrated travel card covering all modes of transport
The potential to develop cycling as a key component of an intermodal transport network.

THREATS
Physical space limits expansion of intermodal hubs due to competing activities, especially in touristic areas
The dispersion of the population away from the harbour areas generates complex travel patterns which challenge efficient intermodal linkages

The **Supply** of Maltese Intermodal Transport is present both on a domestic and an international scale. The existing **Internal Intermodal transport** for passengers includes: 1) land private transport and land public transport at Park & Ride hubs in Floriana and Marsa; 2) internal maritime transport and land public transport at the quaysides in Cospicua, Lascaris, Marsamxett, and Sliema; 3) inter-island transport and land public transport at the Mgarr and Cirkewwa ports. This established **intermodal network for passengers** could be further developed (strength).

In the past, seaplane and helicopter operations existed between the Port of Valletta and just outside the Port of Mgarr. Mainly leisure or tourism related, these operations were not viable and the operations had ceased. Furthermore a limited number of passenger intermodal opportunities exist (threat).

Intermodal transport for freight had been provided between the Port of Mgarr and Sa Maison quay until 2015. This allowed the interchange of freight between the road network and the maritime inter-island service. Since the Sa Maison quay is being converted into a yacht marina, the internal sea freight transport between the two islands has ceased and alternative links for freight to the Inner Harbour Region remain to be identified (weakness).

External intermodal transport for passengers occurs between: 1) External maritime transport and land public transport at the passenger terminals in the Port of Valletta; 2) Air transport and land public transport at MIA Airport, and; 3) Air transport and maritime transport between MIA Airport and International Cruise Terminal: the airport-cruise connection is not direct and a transfer is needed at the Main Bus Terminus in Valletta. Private tourist taxi services are available.

External intermodal transport for freight is only provided at the main cargo terminals for both ports and the airport. No direct sea-air intermodal transport exists.

Limited data on freight movement patterns across the Maltese islands is available. This makes it difficult to analyse and suggest potential policy options to improve the use of maritime transport to move freight between the islands. This unclear understanding of freight movements is a challenge for the system (weakness).

From a **demand** point of view, even though some timetables e.g. those for inter-island ferries and scheduled public transport are synchronised, the real time details of vessel timetables are not available (weakness). Arrangements between the land and maritime services are not flexible enough to cater for possible delays.

Inner harbour ferry demand is limited to the walking distance catchment in the vicinity of the harbour. Due to the continued trend of dispersion of the population away from the harbour areas, the ability to utilise intermodal linkages as part of an efficient commute is limited (threat).

Improvements to the journey planner, synchronisation of timetables and possible incorporation of multimodal ticketing (to cater for all modes of transport), would improve the degree of utilisation.

Together with some form of integrated travel card, the improved timetabling information would provide a better seamless intermodal experience (opportunity).

There is great potential for the development of cycling as part of an integrated and intermodal transportation system (opportunity). This would entail improving bicycle infrastructure to and at public transportation hubs, improving both accessibility and the ability to securely park and/or store bicycles. Agreements must also be made with public transport operators enabling carrying or storage of bicycles in their vehicles.

Existing ferry landing places need to be improved in terms of accessibility. Experience has shown that low cost interventions can lead to an increased accessibility, thereby increasing the popularity of various transport modes with the public. This is thus an opportunity which can be exploited to improve the efficiency of the various intermodal transport hubs (opportunity).

The location of intermodal transport hubs frequently coincides with main tourism areas. The allocation of physical space for all the competing activities taking place in a particular area has always proved to be challenging for Malta, where the availability of public space is very restricted. This may lead to a limited provision of intermodal facilities (threat).

As far as the **general level of functionality** is concerned, Maltese intermodal transport needs improvement through the introduction of more intermodal transport hubs. The experiences learnt through the implementation of various P+R facilities, public transport interchanges and the improvement of ferry landing places create an opportunity to improve existing facilities and introduce more intermodal transport hubs, especially in relation to the identified main hub (opportunity).

01.4 MARITIME TRANSPORT

The Republic of Malta is an archipelago of islands and for this geographical reason, Maritime Transport is vital to provide connections domestically between Malta, Comino and Gozo (so called “internal transport”) and with the other countries of the Mediterranean and beyond (so called “external transport”).

The scope of the summary analysis of the maritime transport sector extracted from the Existing Conditions and Data Diagnosis Report, 2014 (as updated) presented here is both the internal and the external transport aspects. The report deals with all the Maltese TEN-T ports as well as various secondary ports. In brief, these are the TEN-T Core Ports of Valletta and Marsaxlokk, the TEN-T Comprehensive Ports of Cirkewwa and Mgarr, and other secondary ports such as the Port of Marsamxett.

In this section on maritime transport, this report outlines the key challenges for the ports as a transport node. The availability of port resources and facilities is obviously limited by the small size of the islands of Malta and Gozo when compared to the population and economic activity of the islands.

Within this context, the current administrative set up is limited by scarce resources and is challenged in providing complete and uninterrupted monitoring of the port operations, as well as of contractors and concession contracts that have been tasked or granted responsibility with in the ports.

For example, the continual monitoring of the correct use of quays and the respective enforcement of correct operations by users is also challenging and due attention could help ensure the longer term sustainable use of the port infrastructures.

This is particularly acute in the Port of Valletta, where numerous stakeholders interact, when compared to the Port of Marsaxlokk. The main reason for this being that the Port of Marsaxlokk hosts the Malta Freeport Terminals whose facilities are under contract to one of the largest transhipment companies in the world. Local expertise is spread thinly due to the limited resources invested and as a result the Port of Valletta is provided with a harbour master while the Port of Marsaxlokk is not.

The integration of maritime and land transport has scope for improvement. This however is challenged by the current policy framework that sees the responsibility of maritime policy seated within one Ministry, while the regulatory and operational aspects seated in another Ministry, albeit that the regulator (Transport Malta) reports to the latter. In this respect the ability of Transport Malta (as regulator of all modes of transport) is hindered by varying priorities of the different parts of government. For example, duplication of authorisations routinely need to be obtained for interventions in maritime and port policy or when developing legislation within the EU.

The following diagnosis of the Maltese maritime transport sector is tackled separately for External Transport and Internal Transport, and the latter also includes public transport services.

1.4.1
INTERNAL MARITIME TRANSPORT

A high level summary of the SWOT analysis of internal maritime transport is presented below. This is then followed by a more detailed explanation of the main points.

STRENGTHS
Malta’s coastline is indented with natural harbours and established ports that could facilitate the adoption of a local maritime public transport system
Availability of a large expanse of harbour surrounded by a densely populated urban area offers an opportunity for alternative ferry routes.
Continual growth in patronage of the inter-island ferry
Inter-island ferry price structure and convenient interchange facilities encourage use of public transport
Tourism demand and revenues have directly contributed to the growth in harbour ferry links
New inner harbour ferry services with easier access and increased capacity for commuters
Ferry concession contracts have defined minimum operational requirements for fares, timetables, etc

WEAKNESSESS
Asset management of maritime infrastructure is challenging
Routine maintenance, monitoring of ports' operations, monitoring of contracts and engineering management are challenging
Lack of meteorological data for the ports to record trends for planning and design as well as operational activities
Occasional operational conflicts arising between various operators and stakeholders operating in ports
The inner harbour ferry services (especially between Valletta and the Three Cities) are mainly used by tourists, while local commuters make limited use of it during peak hours.
Inadequate passenger facilities for the inner harbour ferry service
There are limited systems for demand management (pricing mechanism to spread peak demand or booking mechanisms) at main ports
There is a lack of resources and expertise in relation to maritime structural and engineering disciplines

OPPORTUNITIES
Internal maritime links in the harbour region can be further extended and improved to support daily commuting and other transport needs.
Some urban commuter routes could be serviced with internal maritime transport.
Allocation of funding based on a detailed analysis in order to identify the most effective implementation of periodic maintenance, infrastructure upgrade or new infrastructure.
Increased service frequency, direct landside links to ferry landing sites and in some areas pedestrian connectivity with the city centre could improve peak time travel by commuters.
Need to carry out demographic studies to better understand the low daily trip demand between Gozo and Central Malta/Harbour Region.

THREATS
Internal ports capacity is limited by physical limitations of ports and terminals, as well as environmental and heritage restrictions, which may lead may constrain growth of future demand.
Demand for shorter journey times between Gozo and the harbour regions of Malta might challenge the financial sustainability of the inter-island ferry.
Inappropriate use by port users causes damage to infrastructure and equipment reducing its useful life.
Increasing numbers of tourists are expected to put additional pressure on transport services and infrastructures.
Effects of climate change such as increased rain intensity, sea level rise, and extreme weather events could have an impact on the operations of ferry links.

From the point of view of **Supply,** the capacity of Malta's internal ports is restricted by space limitations that challenge the ability to provide additional quays, rather than limitations of the terminals (threat). At the Port of Mgarr, in Gozo, the ferry terminal has recently been upgraded and expanded (2004-2008). However, the quays and breakwater, which were constructed in the 1970s, have not seen refurbishment or upgrade for many years with the exception of routine maintenance (opportunity).

At the Port of Cirkewwa, the existing breakwater offers limited protection in certain weather conditions (particularly the wind from the North-East, "grigal") and this causes difficulties for passenger ferry operations **challenging the reliability** of the service (threat). At peak times, vehicles travelling between the islands spill over and occupy the road while waiting to board due to insufficient landside space for marshalling.

The situation for ferry passengers at the Port of Valletta is different; capacity is not limited due to the lack of space, but is limited by **the inadequate facilities** (shelters and seats) provided for the passenger service (weakness). The role played by the domestic ferry service linking the capital city of Valletta to Sliema and Three Cities is also restricted due to the **limited operational hours** during the winter months, and which may discourage use as the final trip may be too early for some commuters (weakness).

Finding ways to finance **general maintenance for infrastructure** remains an important challenge for Maltese internal ports. This is particularly the case at the port of Cirkewwa, due to its exposure to the prevailing storms including strong winds and sea currents (threat). At the Port of Mgarr preventive maintenance needs to be stepped up including dredging works and maintenance of fenders and navigational aids (weakness).

Finally, the inadequacy of facilities at the landing places in Comino is challenged by the environmental sensitivities of the area. However, there is the need to provide safer infrastructure to enable more resilient transport links (opportunity).

Demand analyses have shown that during 2015, the inner-harbour **passenger trips** increased by about 57% compared with 2014, up from 18% between 2013 and 2014 following the recent replacement to new, accessible and higher capacity vessels (strength). Albeit with such strong growth, the ferry service to Valletta remains **underutilised by commuters,** and is instead mainly used by tourists.

This continues to challenge the government in its efforts to reduce traffic flows at peak time by encouraging seaborne travel (opportunity).

The investment in the vessels has not yet been complimented with appropriately configured landing places that facilitate their optimal turnaround. Albeit that the **crossing time is very short** (5-10 minutes), the time taken to berth significantly increases total journey time. Improvements to the quayside infrastructure, passenger information and facilities would reduce journey time delay and enhance the attractiveness of this mode of travel (opportunity). The introduction of additional **landing places** close to land side public transport would also improve intermodal mobility and increase the effectiveness of non-road transport systems in the harbour regions (opportunity).

As port development tends to be supply-led, the **degree of utilisation** of some areas of the port have **scope to be upgraded** (such as the Marsa Menqa as well as Ras Hanzir areas) in line with the 2007 Ecorys report. With the improvements in the public transport system they also have scope to be **re-configured** to improve intermodality between land transport and internal maritime transport (opportunity).

Combined with tourism forecasts that indicate long term growth, these transport links are likely to be challenged by buoyant flows at off-peak times (threat). However, the revenues generated by these trips could support the service provision for commuter trips in the morning and evening transport peak hour (strength).

As far as the **general level of functionality** of Maltese internal maritime transport is concerned, the Malta-Gozo service has been **registering year-on-year growth** of passengers and vehicles (strength). The pricing strategy of the ferry as supported by free car parking at the Ports of Cirkewwa and Mgarr encourage travellers to leave their vehicle behind and travel on the other island by public transport. This is complemented by an interchange hub at each port with feeder and direct express services to serve ferry passengers (strength).

However, the land connection from the Port of Cirkewwa and the core urban areas around the Ports of Valletta and Marsamxett continues to challenge the end-to-end journey times for **commuters between the islands** (weakness). Opportunities to explore possible high speed ferry links exist between Mgarr and the Port of Valletta (opportunity).

Systems for inter-island **demand management** to spread peak demand (pricing mechanism or booking mechanisms) has not been implemented. Sudden short influxes of demand place significant pressure on the infrastructure at the ports and their approaches (weakness).

Transport of **freight** between the two islands has also been characterised by positive trends during recent years. However, since the Sa Maison quay will become part of a yacht marina, alternative facilities to improve internal maritime freight transport between the islands remain to be identified (weakness).

1.4.2 EXTERNAL MARITIME TRANSPORT

A high level summary of the SWOT analysis of external maritime transport is presented below. This is then followed by a more detailed explanation of the main points.

STRENGTHS
Malta sits in the middle of East-West Mediterranean routes and thus acts as a logical transhipment hub and provides local industry with effective global links.
The Maltese economy is growing and driving demand for freight.
Large number of private sector stakeholders demonstrating important economic activity
Strong international player established in Port of Marsaxlokk brings expertise
Recent infrastructure upgrades and dredging of the Port of Marsaxlokk
Steady growth of passenger traffic (cruise and ferry)
Soon to be completed Deep Water Quay refurbishment will provide significant new capacity

WEAKNESSESS
Limited hinterland space restricted by historical structures or urban priorities
Port of Valletta: Cruise liner passenger capacity reached in 2014, unitised cargo by 2030
Port of Marsaxlokk: Unitised and bulk liquid cargo near capacity limits of terminals
Congestion in the immediate port areas affect cruise and freight operations hindered by road design for access to ports
Complicated concessionaire agreements create market imbalances and reduce efficiency by increasing bureaucracy and costs

OPPORTUNITIES
Improved information on port assets and cost structures could enable improved efficiency and effectiveness
Further infrastructure improvements in Port of Marsaxlokk could enhance throughput
Logistics centres with warehousing could be established outside the port precincts thus freeing up space for port operations
Better links between Air/Sea interfaces with a customs free zone could be exploited
Improved weather forecasting and wave climate near the ports could improve capacity and safety.
Improvements in port equipment that lessens the impact on the surrounding areas could enable operations to work more hours in the day.

THREATS
Land side connections for passenger traffic limits the growth of cruise and ferry passengersh
Unless detailed ports studies and upgrade pipeline developed in the context of competition, the ports may lose market share
Port of Valletta dredging is not frequent and could result in environmental/archaeological issues.
The resilience of port infrastructures such as breakwater and some quays affected by environmental change and traffic growth
No studies on the need for alternative fuel supplies (such as LNG).

From the point of view of **Supply,** maritime transport is economically vital for Malta, with over 95% of freight by volume arriving or departing by sea. **Malta's economy is growing** and it lies on key strategic east-west Mediterranean liner routes, thus acting as a transhipment hub to short-sea feeder routes around the Mediterranean and providing good freight connectivity. This is seen as a strength. While a large number **of private sector stakeholders** are involved in port operations in the Port of Valletta (strength), a holistic integrated vision is lacking for its future developments and upgrading tends to be piecemeal which presents an (opportunity) to maximise potential.

On the other hand, there is **one major freight stakeholder** in the Port of Marsaxlokk (strength) but there are no detailed studies supporting future development plans or on how to handle future international developments (weakness). Finally, future demand is also difficult to forecast and appropriate levels of analysis are required to ensure that available financial resources are allocated efficiently.

In terms of **costs and maintenance** in 2014, information about operational costs and quality of routine and extraordinary maintenance was not readily available. This is due to the large and varied number of concessionaires and operators involved in this sector, who consider this data confidential and do not publish it (weakness). The economic and management framework of Maltese ports is quite **complex,** and without a clear understanding of the cost structures decision making by government is difficult at best. For this reason a comprehensive economic overview is required to support long term policy and decision making.

Clear information about **port costs** would also assist the Maltese Government in ensuring that the port operations are managed in the most efficient and effective way possible (opportunity). On the other hand, continuous review of the port infrastructures and their condition would enable Government to **establish priorities** for the maintenance of the infrastructures and thus minimise costs in the long run.

Dredging maintenance in the inner part of the port is not carried out regularly and there could be environmental and archaeological issues (weakness).

The Freeport at Marsaxlokk has recently carried out renovation works (strength) but there is still a need of further maintenance to improve throughput, such as the quay wall between the Terminal 1 and 2.

Handling goods is a multi-phased-operation requiring substantial space for warehousing, however there are no logistic centres and warehousing activities occur within the port area which is very confined and results in congestion of port operations. A past study conducted by Ecorys (2007) identified the importance of having a logistics centre with warehousing to be located somewhere between Valletta and Marsaxlokk (thereby freeing up space at the ports in order to improve their capacity). In this regard, Government has recently announced the development of a maritime hub located at the former Shipbuilding site in Marsa (opportunity).

Finally the limited areas of the port that could sustain further freight activity (such as Deep Water Quay, Ras Hanzir) require continued investment to ensure that Malta's external freight transport links remain on par with similar ports in the Mediterranean region. Port resilience is also under threat from environmental changes and forecast growth and could potentially cause a bottleneck. Harbour breakwater systems therefore must be refurbished and upgraded to be able to provide the needed resilience and safety that such growth would entail.

Demand analyses have shown that generally freight movements are difficult to forecast, due to the unstable political and hence economic situation affecting many of the North African countries, previously exchanging with Maltese international ports. The Freeport at Marsaxlokk for instance has experienced constant growth during the last years but this could be volatile (threat). Another important growth was registered in international passengers traffic at the Port of Valletta (strength), where the increasing demand of cruise passengers during the last ten years have had, and is having, a high impact on landside connections (threat).

The intention to promote **sea-air traffic** between the Port of Marsaxlokk and Malta International Airport has been mooted, along with a number of potential new Free Zones to facilitate this process (opportunity). This represents one of the first signs of a renewed attention towards an integrated transport system that would enhance the quality and the efficiency of Maltese international freight transport sector.

Weather and pollution issues deserve specific attention when related to the Port of Marsaxlokk. This port continues to experience issues due to weather conditions. The container terminal suffers down time of about 10 days a year due to high winds and the oil terminal registers down time about 22 days a year because of rough seas and swells. However long term data collection, collation and dissemination of **wave climate and weather** near the ports is not available (opportunity). Noise and light pollution are monitored but improvements are needed in order to limit the environmental impact of the Freeport on Marsaxlokk and the surrounding area (opportunity).

As port development tends to be supply-led, the **degree of utilisation** is one of the most important aspects that affect their development. In the **Port of Valletta** the facilities for cruise liners have reached capacity in 2014, while those for unitised cargo are expected to reach capacity in 2030 (weakness). This is due in part to a number of factors including the current extensive upgrade of Deep Water Quay which will restore the current capacity from 50% back to 100% (strength). However the limited availability of rail superstructures-cranes at Laboratory Wharf and the general lack of hinterland space for freight handling operations is also a factor. On the passenger side, the potential volatility of the cruise liner business also hinders investment in long term infrastructures.

Indeed, one of the most significant constraints at the Port of Valletta is the lack of **land-side space** in the vicinity of the quays and the presence of historical structures that, on the one hand represent a precious heritage to be preserved and on the other hand act as physical limitation to the much needed scope of development of port infrastructures. A number of the quays date back to the 1500's and the present configuration does not match the contemporary needs of maritime transport in the Port. At the Port of Valletta, **warehousing and associated operations** on the roads around the port often cause temporary congestion that increase during the peak cruise days creating bottlenecks, due to the high demand and competing operations (weakness). Furthermore, while generally the Port of Valletta does not need dredging, the infrequency of dredging the inner part of the port could result in environmental and archaeological issues if it is needed for **capacity improvement** (threat).

While the **Port of Marsaxlokk** does not have to deal with limitations of historical structures, it is currently also close to capacity both for containerised cargo as well as bulk liquid. Further development of capacity also depends on the landside facilities provision, and in turn it is related to availability of space in the vicinity of the port (weakness).

This issue is also relevant since landside access is restricted by the current road network configuration in the vicinity of the port, as this was not planned to handle the **volumes (and weight) of vehicles** now servicing the Freeport (weakness).

As far as the **general level of functionality** of Maltese external maritime transport, both the Port of Valletta and Malta Freeport Terminals are considered to be at capacity. The effective operation of the Malta Freeport Terminals has led to a rapid growth in containerised traffic using the port of Marsaxlokk. Their functionality is currently limited due to **lack of facilities** to manage the existing demand. Detailed studies would be needed to analyse the available infrastructures and assess whether equipment should be improved, upgraded and/or replaced. Long-term project pipelines need to be developed and major investment financing would be required to be able to implement (threat).

The long term development and refurbishment plans for the Ports of Valletta and Marsaxlokk have run their course and need updating.

In the Port of Valletta, for example, a **holistic integrated vision** for future development and upgrading has yet to be developed, and current plans tend to be piecemeal. In the Port of Marsaxlokk while future expansion to handle international developments is envisaged, demand forecasts or studies to support the developments and to ensure that they are sustainable or in the interest of the country need to be further developed.

Limited studies on the **provision of alternative fuels** for shipping have been carried out (only a shore-supply study in 2015) and no analysis of the needs of fuels such as LNG has yet been carried out (threat).

The issue of inadequate resources appears to be a major issue and the Maltese maritime transport sector requires human and financial resources, with staff needed to ensure proper operational monitoring activities to ensure long run cost effectiveness.

Generally, it can be stated that there is the opportunity to further exploit the **inter-modality between sea and air transport**, due also to the close location of the main ports (Port of Valletta and Port of Marsaxlokk) and Malta International Airport. Increasing the level of inter-modality among modes of transport would result in growth opportunities for the external transport sector.

01.5 AIR TRANSPORT

Air Transport is one of the key transport sectors linking Malta to the rest of the world, together with the “external” maritime transport.

A high level summary of the SWOT Analysis is as follows.

STRENGTHS
Air transport is a key facilitator of a large proportion of Malta's GDP including tourism and business travel.
MIA has developed a reputation for being an award winning airport providing good levels of passenger experience.
The Air Traffic Control and runway subsystem has capacity to handle significantly more aircraft traffic, if the appropriate maintenance of the assets is carried out.
The airport is licensed to ICAO standards and will be certified to the new EU standards by 2018.

WEAKNESSESS
Operational aspects tend to reduce the capacity of the infrastructure to handle their potential maximum capacity.
Multiple policy responsibilities complicate the strategic planning of the aviation sector
Limited availability of infrastructure for Maintenance, Repair and Overhaul (MRO) business development
Continued challenges to attract skilled technical resources in the sector
Poor data availability (collection, collation, dissemination) affects the ability for policy decisions to be made rapidly and efficiently
Port of Marsaxlokk: Unitised and bulk liquid cargo near capacity limits of terminals
Congestion in the immediate port areas affect cruise and freight operations hindered by road design for access to ports
Complicated concessionaire agreements create market imbalances and reduce efficiency by increasing bureaucracy and costs

OPPORTUNITIES
A large number of stakeholders could benefit from improved airport operations
Passenger and freight volumes have been steadily increasing in recent years and are expected to continue to do so
New technologies are expected to impact aviation positively
Improved data availability can facilitate low cost, high impact measures

THREATS
Increasing numbers of arrivals but limited space for the terminal to expand to handle demand.
Space limitations for parking of aircraft on aprons with efficient links to terminal facilities may hinder growth.
Small number of specialists in the aviation sector, with high career mobility
Terminal and aerodrome development of only €28m out of a total published €78m planned investments in the airport planned from 2016.

Supply of Maltese air transport infrastructure is only available at Malta International Airport (MIA). The Republic of Malta is in fact served by **one international airport** providing the main gateway for people movements to and from abroad. Malta International Airport has one passenger terminal including general passenger services for both commercial and business aircraft. MIA is one of the few European airports that does not have a curfew and can currently operate 24/7. The airport is licensed according to ICAO Annex 14 Vol. I & II standards. Preparations are also underway to ensure that it will be certified according to Regulation (EC) No 216/2008 and Commission Regulation (EU) No 139/2014 by end 2017.

The passenger terminal **can handle up to 5 million** passengers annually before deterioration of quality of service, and a **separate freight terminal** (converted from the previous passenger terminal) along with other service providers based inside or on the perimeter of the airport. MIA has recently won a number of awards for quality and passenger experience.

It also contributes strongly to the tourism product in Malta, as well as providing Malta's burgeoning services businesses with **efficient links** across Europe and via hubs to the rest of the world. The Air Navigation Service Provider, Malta Air Traffic Services Ltd, provides good quality navigation services to both aircraft overflying Malta as well as those landing in Malta (strength).

The island of Gozo is provided with a heliport at Xewkija that used to be connected to MIA with domestic helicopter flights, but this service went out of business a number of years ago. **No other domestic air transport** exists, apart from flights involved in training or aerial photography, surveys and similar activities.

From the **demand** point of view, the main markets for passenger air traffic are the United Kingdom (30%), Italy (17%), and Germany (15%). Passenger demand has been increasing steadily in recent years albeit with some difficult political tensions just south of Malta (opportunity).

Freight demand has not been thoroughly investigated in this study since the available data is aggregated in a way that requires further analysis to be able to make appropriate proposals. This data issue needs to be addressed by conducting more research and surveys as to the different types of cargo passing through MIA (weakness). Furthermore, difficulties in aircraft parking management on aprons in the proximity of the freight terminal (and similar for passengers in respect to the passenger terminal) may limit growth of the two sectors. This space limitation is particularly considered to be a challenge to possible future growth in the freight market (threat).

While aircraft registered in Malta has seen an increasing trend of the number of registered aircrafts since 2000, this does not directly affect the airport operations.

Considering the airport handled 4.6 million passengers in 2015 the estimated **degree of utilisation** of the terminal area subsystem is considered to be at **85% of its capacity** and fast approaching volumes that would result in deterioration of the passenger experience. With published plans to develop the airport by investing €78m in the coming years, MIA seems to have only identified €28m of these to improve passenger terminals and airside infrastructures and systems. This is considered to be a challenge if not addressed in a way to manage the capacity constraint (threat).

The airport saw an average of 17 movements per hour in 2014, and similar runways with a parallel taxiway manage a maximum sustained capacity of around 40 movements per hour. This means that the **runway subsystem** is considered to be at **42.5% of its maximum capacity** (strength). General upgrades are however required to remove existing limitations and improve the declared capacity of 15 movements per hour in 2013.

Analysis has shown that MIA **capacity is sometimes limited due to operational aspects** and not necessarily infrastructure. In particular the arrangements for parking and taxiing appear to be a key hindrance. However, a more detailed analysis of potential for more efficient operations would be needed so as to optimise the entire airside operation. **Far more demand could be handled** by the runways and air traffic control without these limitations. In addition, other restrictions are currently imposed to the manoeuvring area and taxiways whose layout around the main runways tends to increase runway occupancy which could be addressed by a parallel taxiway system (weaknesses).

As for the general **level of functionality** of Maltese air transport, MIA experiences some limitations at peak times with passenger departure clearance and arrivals handling experiencing some delays.

The increasing passenger traffic (also use of wide body aircraft which intensifies the demand) makes the efficient use of airside services more complex, with possible spill over effects on freight transport. Additionally, **the lack of space** within MIA boundaries is threatened by competing non-aeronautical business interests which impact airport operation especially due to the existing physical constraints of the areas surrounding the airport, including the road network (weakness).

Various other private sector entities are involved in the provisions of services at the airport, including ground handling, general aviation and crew training.

Malta has been developing a research and innovation capacity in the aeronautical sector and the opportunities arising from these technologies are expected to support the increased efficiency and effectiveness of aviation (opportunity).

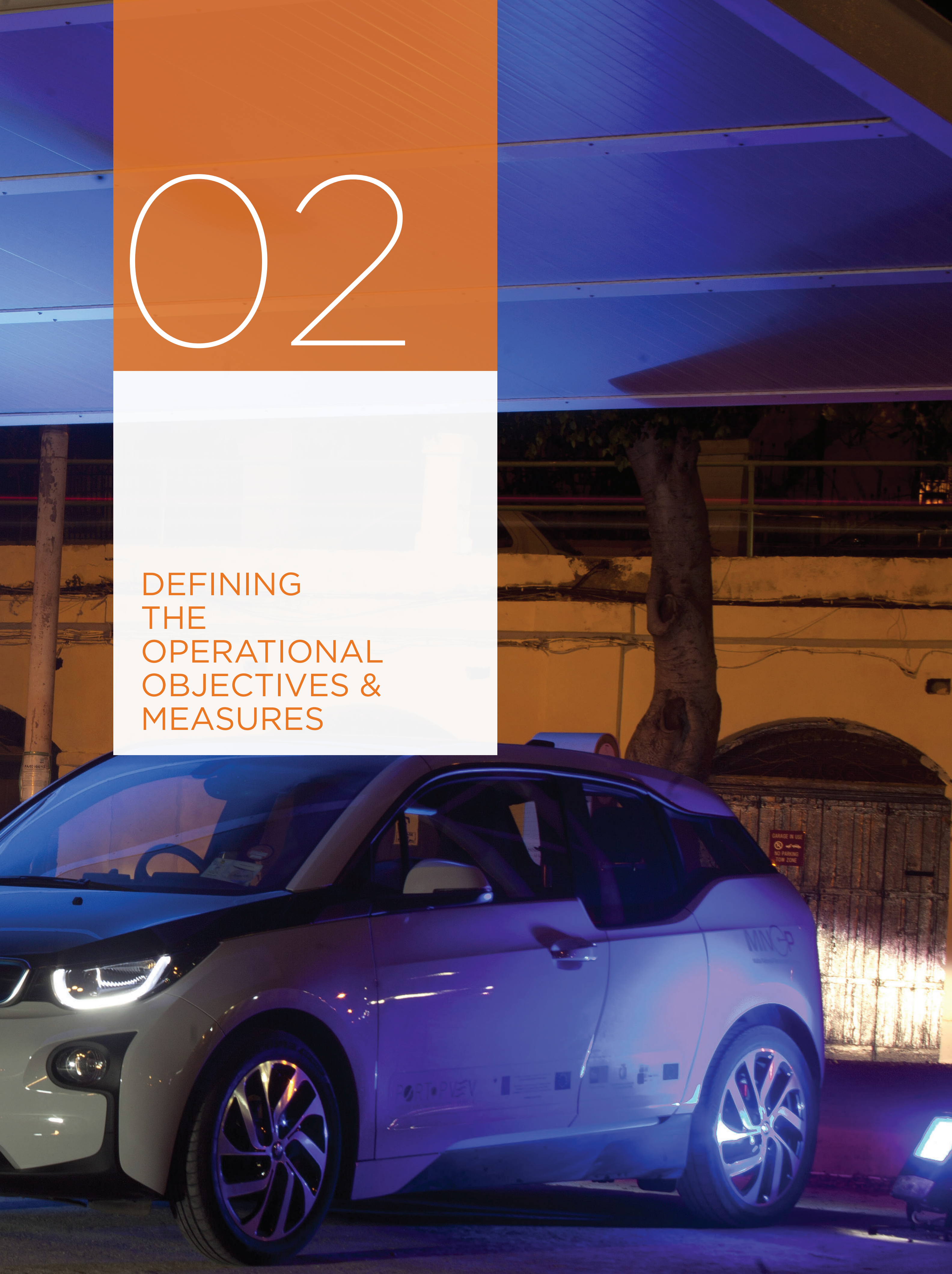
From the **organisation** point of view, the aviation sector operates within various governance and legal frameworks: the policy responsibility for aviation is within the Ministry for Tourism, while the regulatory responsibilities of Air Transport within Transport Malta falls under the Civil Aviation Directorate (CAD); passenger and freight terminal operations and maintenance are part of the concession agreement with Malta International Airport plc (regulated by Transport Malta). Some spaces in the airport boundary fall within the responsibility of Malta Enterprise or Malta Industrial Parks Ltd. This complex policy and responsibility framework has scope to be simplified.

As for costs and maintenance, clear information about operational costs and maintenance as at 2014 is not readily accessible and hinders the ability for Government to direct the prioritisation of airport improvements to ensure that the commercial enterprise remains in line with the national priorities. **Monitoring and review** of the airport infrastructures do not seem to be a regular part of the asset management and for example the runway bridge (road tunnel beneath runway 31/13) is considered as critical infrastructure, but does not appear to be under continuous review. The need to address potential data gaps by collection of data within a single airport can be low cost and high impact (opportunity).

The limitation of air transport to one airport is considered a challenge that needs to be carefully managed to safeguard the **efficient and effective mobility** to and from Malta (threat), in particular by passengers. The capacity of the runway and aprons is not readily available, making estimates of the ability of the runways to cope with future demand difficult at best.

The **regulation of the sector** is carried out by a small team of specialised personnel in the Civil Aviation Directorate. This **policy and organisational structure** that the regulator works within is challenging. Resources, both in terms of quality and quantity, continue to be challenging, with difficulties in attracting the right personnel due to the high level of specialisation required, and subsequently the attraction for trained staff by industry once they are qualified and experienced (threat).


ATM-001
Muscats Motors Ltd



02

DEFINING THE OPERATIONAL OBJECTIVES & MEASURES

02.1
PROCESS FOLLOWED TO SET THE OPERATIONAL OBJECTIVES AND TO IDENTIFY THE MEASURES

The six Strategic Goals and the eight Guiding Principles set out in the National Transport Strategy 2050 define the strategic direction for the development of the different transport sectors over the longer term. The SWOT analysis outlined in the previous Chapter objectively identifies the Strengths, Weaknesses, Opportunities and Threats currently facing each of the transport sectors in Malta. However, these are abstract concepts and it is thus difficult to measure performance against them. In order to develop an implementation plan that is **S**pecific, **M**easurable, **A**ttainable, **R**ealistic and **T**ime-bound (SMART), detailed SMART Operational Objectives have been identified for each of the transport sectors.

2.1.1
OPERATIONAL OBJECTIVES

In determining the Operational Objectives, an "issues-oriented" approach has been adopted. This approach has involved the exhaustive qualitative identification of problems and issues facing each transport sector, which has been based on the invaluable input of various internal and external actors who are directly or indirectly involved in the operation, regulation, planning and management of the different transport sectors (refer to the Existing Conditions and Data Diagnostics Report).

This was followed by an extensive analysis and quantification (where possible) of the extent of these problems today and in the future, should Malta adopt a laissez-faire approach (see *Base Year Model Report*[8] and the *Forecasting Report*[9]).

Having different actors involved gives rise to different perspectives on the nature and extent of the problems and issues facing each transport sector and diverging views on the possible solutions needed to tackle these problems and issues. Sometimes views are conflicting and often solutions are overlapping.

The "issues-oriented" approach to the development of the Operational Objectives has been based on the following logical framework process.

The measures include studies, works (infrastructural interventions), operational improvements and policy, regulatory and any institutional changes needed to achieve each Operational Objective. These have been described in detail in the second part of this chapter. The proposed measures have been classified using the following colour coding and using the following symbols denoting whether the measures are:

[8] *Transport Malta (2015), National Transport Strategy – Base Year Model Report, 2014*
[9] *Transport Malta (2015), National Transport Strategy – Forecasting Report*

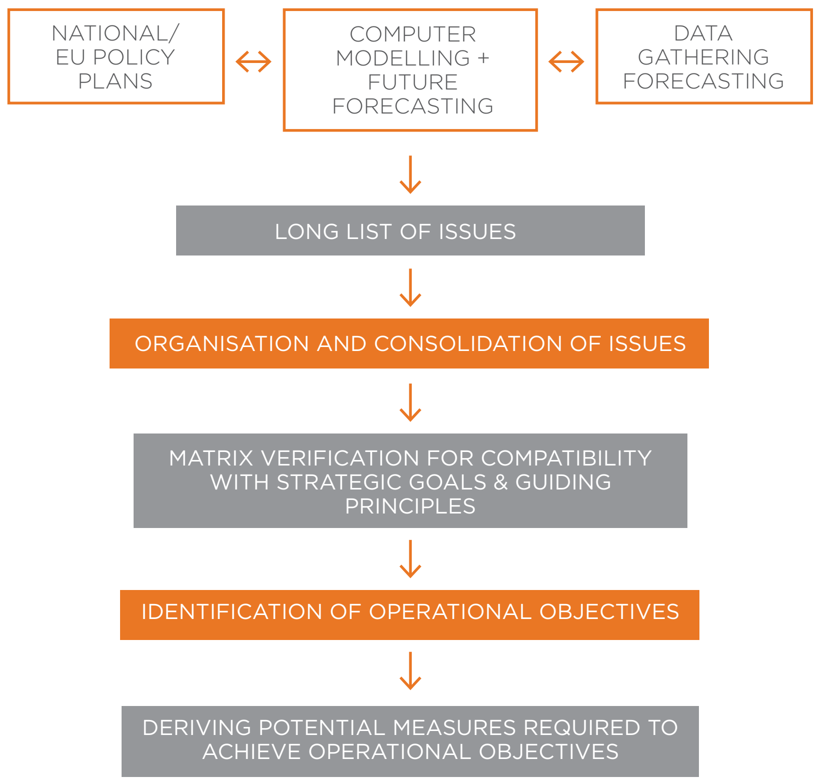


Figure 1.
The Master Planning Process

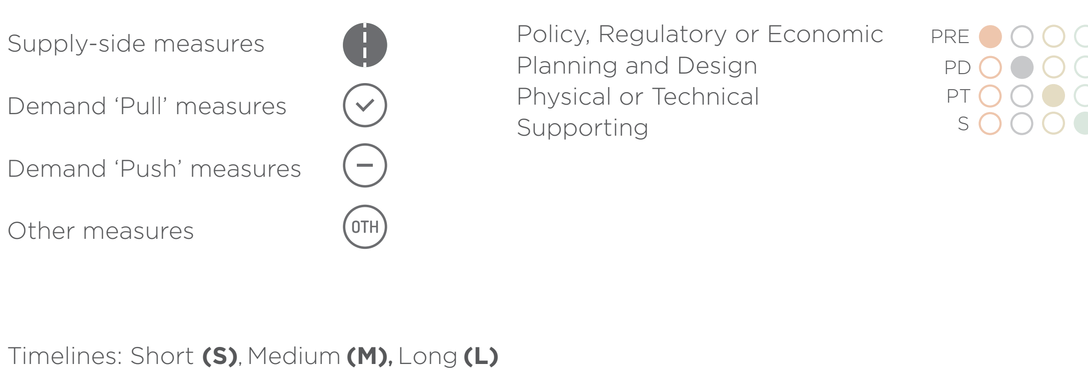


Figure 2.
Classification of measures

In this exercise, Short is defined as within 5 years (by 2020), Medium is 5-10 years (between 2021 and 2025) and Long is beyond the timeline of this master plan or 2026 onwards.

2.1.2 MODELLING FRAMEWORK

While there are other methods used to estimate travel demand in urban areas, travel demand forecasting and modelling remain decisive tools in the analysis of transportation plans, projects, and policies. Modelling results are useful to those making transportation decisions (and analysts assisting in the decision-making process) in system and facility design and in operations and to those developing transportation policy.

In general, transport models belong to a relevant segment of abstract models, namely mathematical models, characterised by the attempt to efficiently replicate a particular system of interest and its behaviour by means of mathematical equations, based on specific theoretical statements.

Years of experimentation and development have resulted in a general structure which has been called the classic transport model commonly referred to as a Four-Stage Model.

Four Stage models are built on a sequential process of four distinct steps for estimating transportation demand; namely: trip generation, distribution, modal split and assignment. Four stage models have been effectively used since the 1960s and the basic principles behind such models have largely remained unchanged, modelling software has on the other hand changed drastically with advances in computer technology.

In summary, the analytical approach used in the four stage transport model for Malta first considered the extent of the study area and defining the multi-modal network operating within that study area i.e. road network, public transport network and internal maritime connections (supply side).

The study area was subsequently divided into logical and appropriately-sized transport zones and each zone was populated with most recent economic activity data (including employment and, if available, shopping space, educational and recreational facilities), demographic data and travel demand data. Additional traffic data were collected to assist the calibration and validation process which took place in the later stages of model development (demand-side).

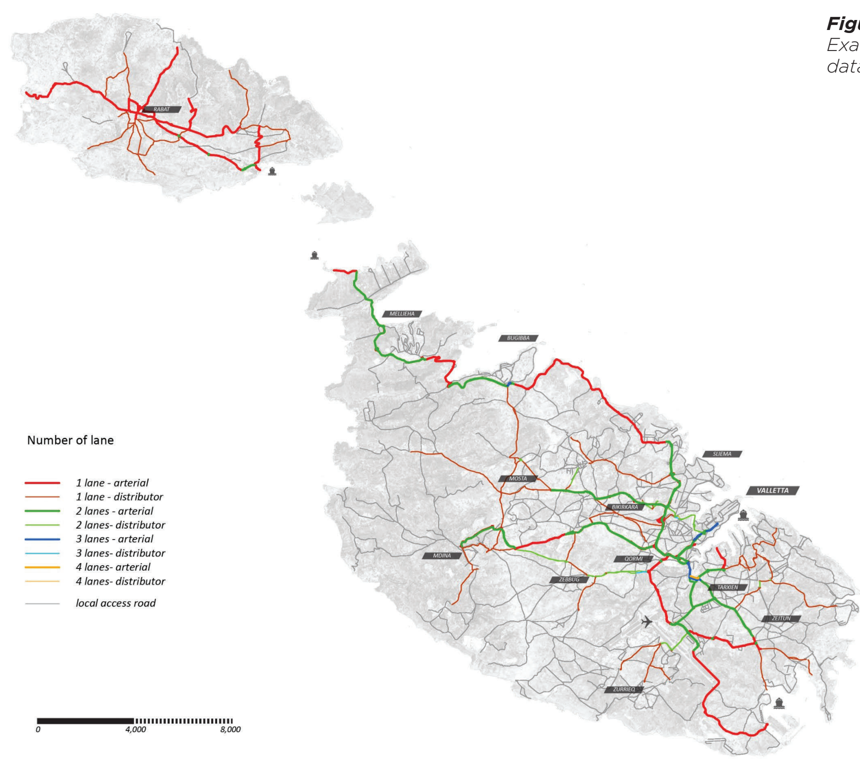


Figure 3.
Example of "supply" data captured in the NTM

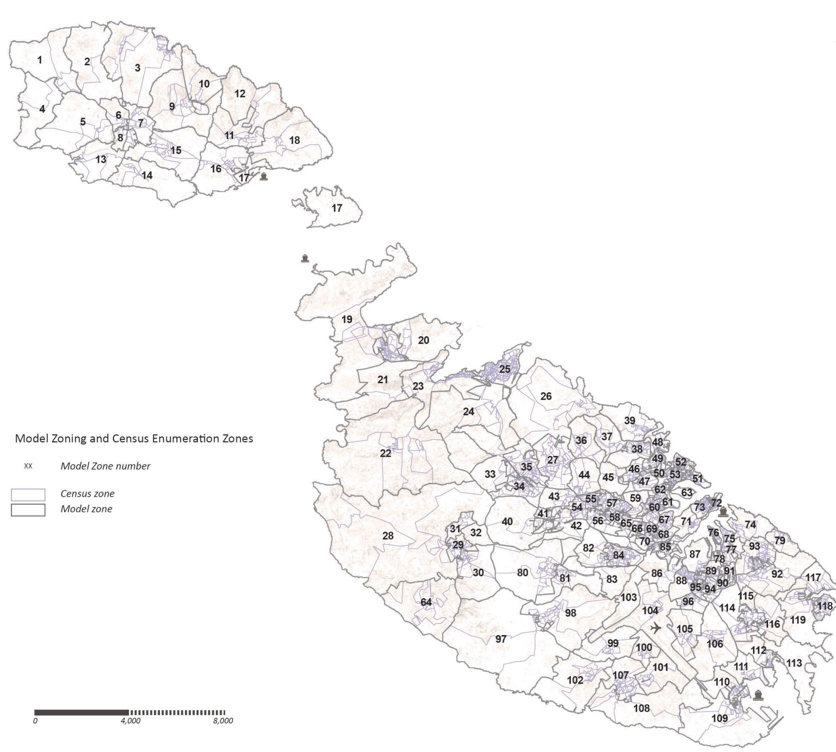


Figure 4.
Transport Zones in the NTM

These data were then used to estimate a model of the total number of trips generated and attracted by each zone of the study area (trip generation); and these trips were allocated to particular destinations, in other words their distribution over space, thus producing a trip matrix (trip distribution).

The next stage involved modelling the choice of mode, resulting in modal split, i.e. the allocation of trips in the matrix to different modes (typically road sector, public transport systems and other modes as cycling and walking).

Finally, the last stage in the classic model approach involved the assignment of the trips by each mode to their corresponding networks.

The National Transport Model has been used in the Transport Master Plan to analyse the existing transport system and for subsequent work on the quantification of following assessments of the following socio-demographic trends, land use developments and transport policies and measures:

Assessments Using The National Transport Model
Assessing the overall impact of predicted traffic growth
Assessment of new residential and employment developments
Developing land use and transport planning framework for Local Plans and Master Plans
Assessment of changes in population, employment and tourism
Assessment of new strategic highway schemes
Assessment of measures to promote use of public transport
Assessment of potential for Mass Rapid Transit
Assessing the impact of a new policy such as car restraint policies
Assessing impact of road tolls e.g. Malta-Gozo fixed link

Figure 5.
Examples of Assessments that can use the NTM data

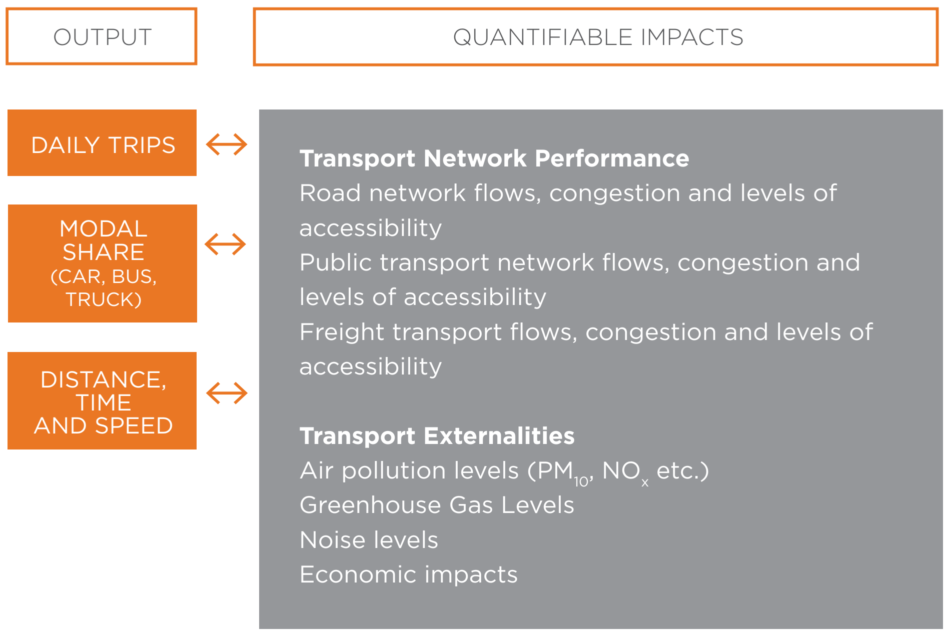


Figure 6.
NTM outputs and use in impact assessment

The outputs from the model at a strategic level are now being used to guide policy makers on settlement, employment and transport and planners and engineers on the likely impact appraisal of land use and transport plans and measures as illustrated in Figure 6.

2.1.2.1
Examples of Model Outputs for Base Year 2014

This model output in figure 7 shows the current volume of traffic flows by direction during the AM Peak hour between 0730-0830 hours. The red lines indicate a traffic flow in excess of 1,500 vehicles per hour.

The model output in figure 8 highlights the speed of buses on the network during the AM peak hour. The speed of buses is directly affected by road traffic congestion. The most critical sections of road where buses are delay are coloured in red. Here the operating speed of buses is less than 30% of the free-flowing speed of traffic.

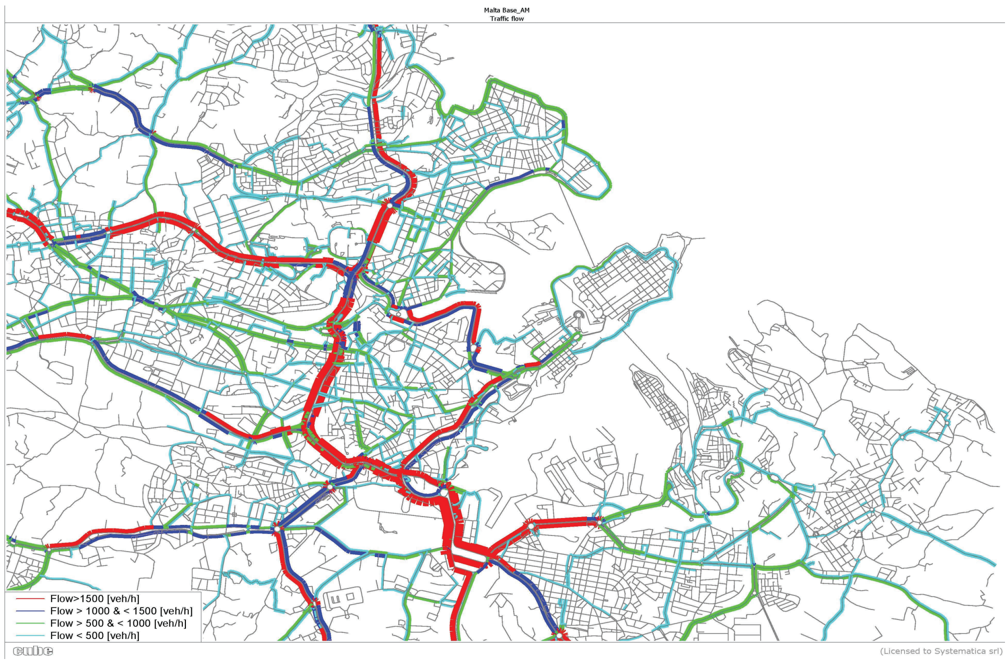


Figure 7.
2014 (base year) traffic flow at AM peak hour

The model output in figure 9 shows the level of congestion on each section of the road network. It compares roadway demand (vehicle volumes) with roadway supply (carrying capacity) - Volume-Demand to-Capacity Ratio (V/C). The V/C ratio is a conventional level of service measurement for road networks. The V/C ratio of 0.8 and above highlighted in black indicates very congested conditions at a threshold point where systems operations begin to deteriorate.

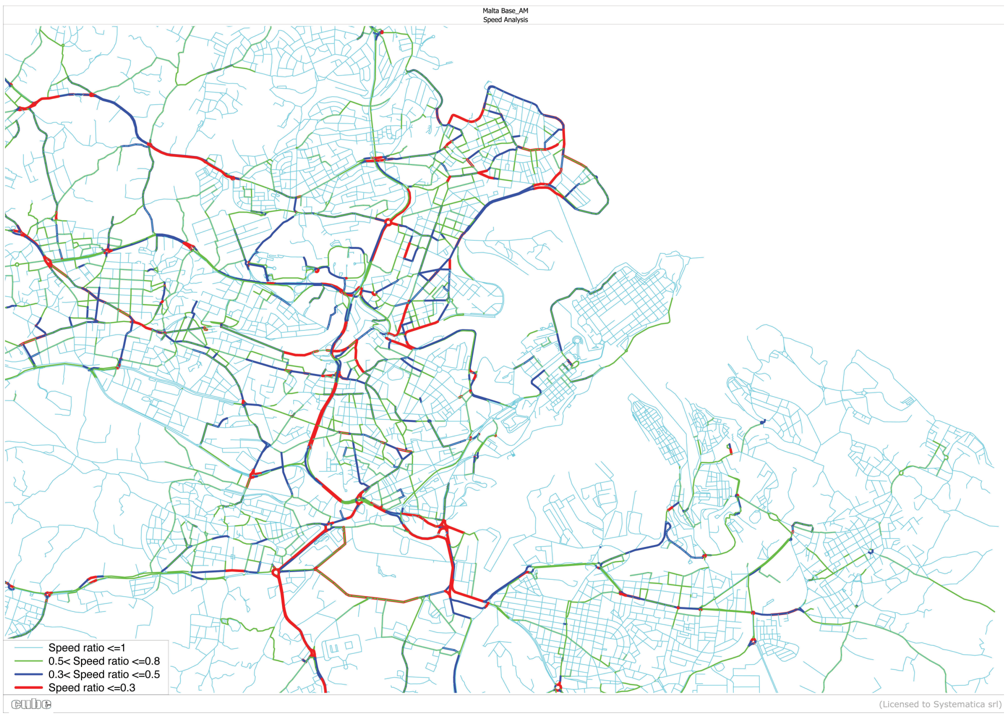


Figure 8.
2014 (base year) Public Transport speed ratio at AM peak hour

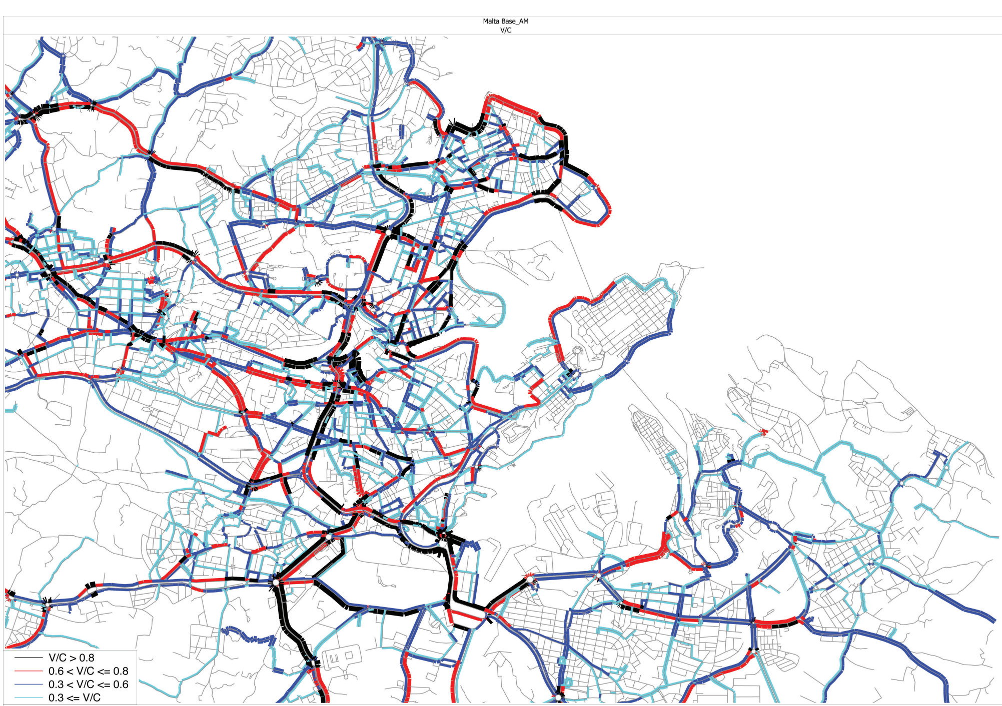


Figure 9.
2014 (base year) volume-demand/ capacity at AM peak hour

2.1.3
FUTURE FORECASTING 2025

The forecast years are the horizons considered in the development of the scenarios in the National Transport Model (NTM), the National Transport Strategy and the Transport Master Plan. Modelling and analysing the forecast years' results provide a vision of Malta in the future and the interaction of transport and mobility supply and demand.

The results of the NTM and the forecasting activities supported the development of the National Transport Strategy and Transport Master Plan Development in Malta. Therefore, they need to be consistent with the different planning and operational timelines in Malta.

The time horizon of 2050 for the development of a National Transport Strategy that will "set out the long-term vision and strategic direction" and will guide this direction by showing expected trends. The time horizon of 2025 was used to develop the Transport Master Plan that will "focus on the short to medium term measures" to be subjected to technical transport modelling.

The definition of a strategic planning is highly dependent on the socio-economic and land-use changes likely to take place in Malta and its surroundings over the next decades. These variables are decisive to forecast future travel patterns and usage.

In order to deal with this uncertainty, the final scenarios of the Transport Strategy will be assessed according to 3 growth scenarios A, B and C (called pessimistic, most likely and optimistic respectively) in 2050 based on the socio-demographic and economic growth.

Growth scenario	
Short term (2020)	B
Medium term (2025)	B
Long term (2050)	A
	B
	C

Figure 10.
The Growth Scenarios in Short, Medium and Long Term

The Growth Scenario used in the development of the Transport Master Plan, which has a time horizon of 10 years, is B 'Most Likely'.

The dataset to be forecast for each modelling zone refers to the main explanatory variables used in the demand stage of the Base Year Model:

- **Socio-demographic information**: number of resident persons for each one of the 25 base user-categories, which are a combination of the age group (0-10, 11-17, 18-40, 41-60, 61+) and the labour status (workers, students, retired, taking care of the house/family, other)
- **Economic information**: number of employees related to each one of the 3 sectors identified in the base-year model (education, accommodation and food services activities, other)

In addition to the dataset to be forecast for each modelling zone, namely the required population and employment variables used within the generation step of the 4-stage demand model, additional data is also required to forecast future passenger external movements as well as internal and external freight flows:

- The **GDP growth rate** predictions are necessary to forecast the internal freight movements and the domestic maritime freight.

- For the other components of the demand, forecasts are based on traffic growth rates assumptions and trending.

The development of the Operational Objectives and the list of Measures have been based on the quantified modelled outputs under the **Do-Minimum Scenario** which includes all the recently implemented supply changes to the transport network as of 2015 and assumes that no further transport policy changes that would significantly affect the supply or demand of transport for the next 10 years.

2.1.3.1

Examples of Model Outputs for the Future Forecast Year 2025 under the Do-Minimum Scenario

The 2025 forecast model output for volume of traffic flows by direction during the AM Peak hour between 0730-0830 hours illustrates an increase in flows in a number of critical areas within the Inner and Outer Harbour Regions. Traffic flows on the central section of TEN-T network are expected to rise by 5-6% over the coming 10 years.

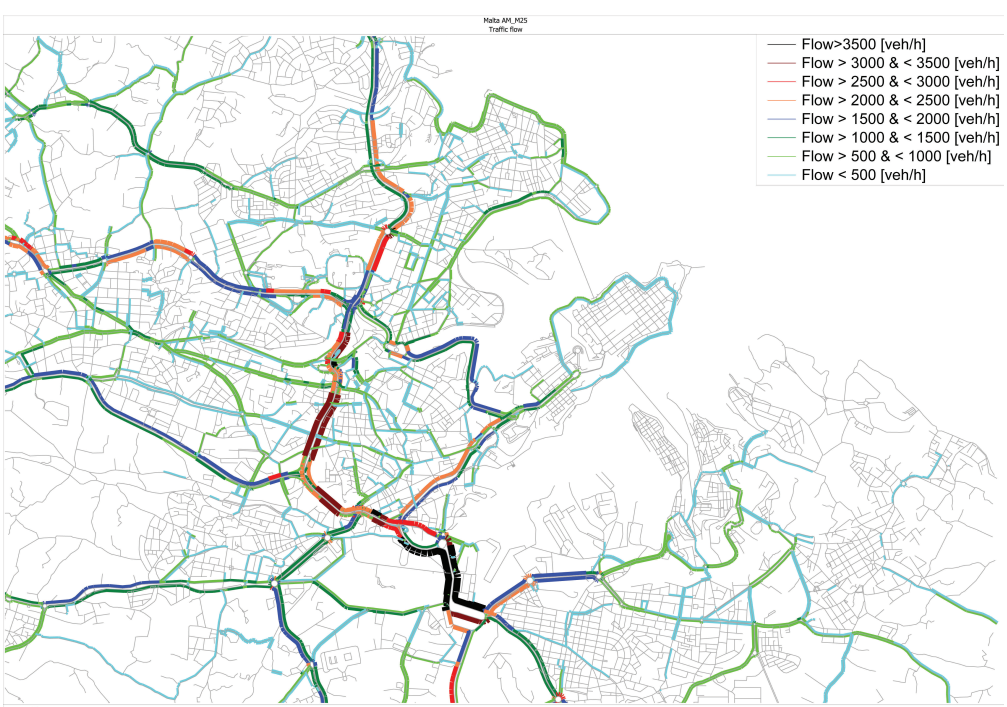


Figure 11.
2025 vehicle flow at AM peak hour

Without appropriate mitigation measures, the forecast increase in traffic over the next 10 years is expected to adversely affect the bus operating speeds across the network. The increase in bus journey delay is particularly notable in the Sliema and Marsa areas.

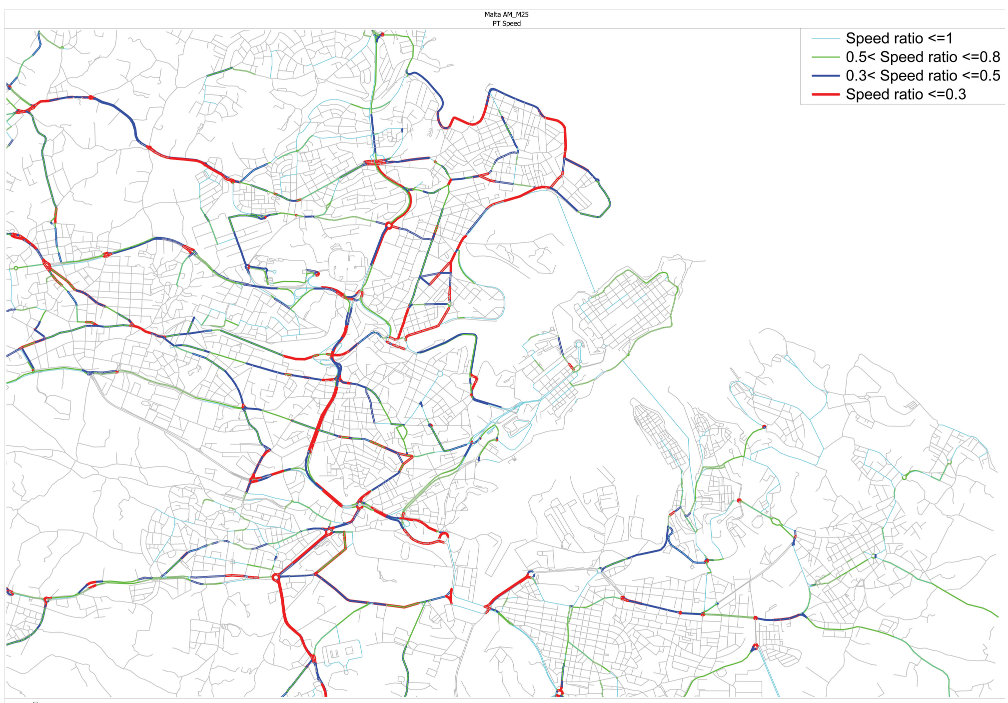


Figure 12.
2025 Public Transport speed ratio at AM peak hour

The 2025 forecast V/C measurement of road performance highlights that there could be very severe congestion on the road network and that certain key sections of strategic road network will reach their operational capacities, if no further mitigating measures are undertaken in the next 10 years.

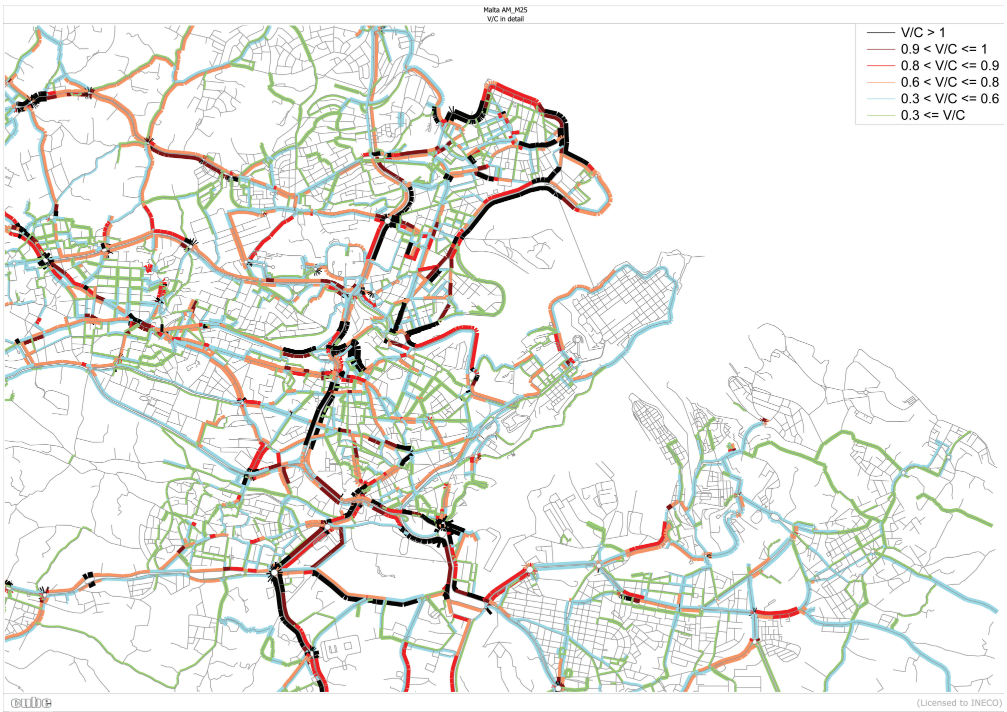


Figure 13.
2025 volume-demand/capacity at AM peak hour

2.1.4
CAPACITY BUILDING

The capacity to deliver the studies, projects, policy measures, etc. is subject of a separate report on "Administrative Capacity needed to implement the Transport Master Plan 2025".

02.2
ROAD TRANSPORT OPERATIONAL OBJECTIVES

For the purpose of this document Road Transport is understood to include vehicular mobility as well as active and alternative mobility modes using the road network (strategic roads and local streets) such as cycling and walking.

Demand for transportation follows the general economic theory of supply and demand. The proposed measures relate to both the supply of road transport infrastructure and to the management of demand to maximize the efficiency of the urban transport system.

Transport demand management measures aim to influence traveller behaviour in order to reduce or redistribute travel demand. These comprise both "demand pull" incentives (carrot measures), such as improved travel options, and "demand push" disincentives (stick measures), such as parking control to reduce, discourage or redistribute travel demand.

These measures are also influenced by so called "supporting" measures of education and enforcement.

2.2.1 IMPROVE INTEGRATED AND LONG TERM STRATEGIC TRANSPORT PLANNING AND DESIGN

Issues

This objective has been defined since historically, it can be seen from experience that the approach to transport planning and policy in Malta has generally been more short-term (4-5 years) in nature. The lack of importance given to long-term planning means that a long-term integrated plan based on solid analysis with clear objectives and targets is lacking. This has resulted in the lack of strategic direction and the inherent inability to address difficult issues such as private vehicle restraint.

There is a strong reluctance for Maltese society to change but this is in contrast with the need for communal actions to address the traffic problems existing now and in the future. This results in the Maltese traveller expecting that everyone else will change their travel habits so that they can continue to drive their car.

Additionally, there is a general lack of concern amongst Maltese society regarding the impact which travel behaviour has on economic, environmental and health issues.

The lack of integrated and holistic planning means that projects are generally not developed in relation to a national integrated set of objectives. This is also true with regard to the co-ordination and integration of transport, land use planning and development and environmental goals, which in essence does not occur. The current local plans for example, may permit development of land at a given density which is then not permissible due to the traffic impact.

Different planning priorities and timelines exist for transport planning, land use planning as well as planning for utilities and services infrastructure. Therefore, long term planning would not only benefit the future sustainable development of Malta but it would aid visibility of planned investment thereby supporting the construction market.

An important outcome of the analysis is that Malta's growth patterns create the opportunity to see Malta as a city state with one main urban area similar to a dense city centre. This main urban agglomeration spreads around the Harbour Regions towards the centre of the island. The Strategic Plan for Environment and Development (2015) has defined this as the Principal Urban Area (PUA) as illustrated in Figure 14. It can be said therefore, that Malta has one main centrality but it can also be seen as polycentric due to further growth of local hubs in other parts of the island.

Specific issues which have been identified due to lack of integrated and long-term planning are as follows:

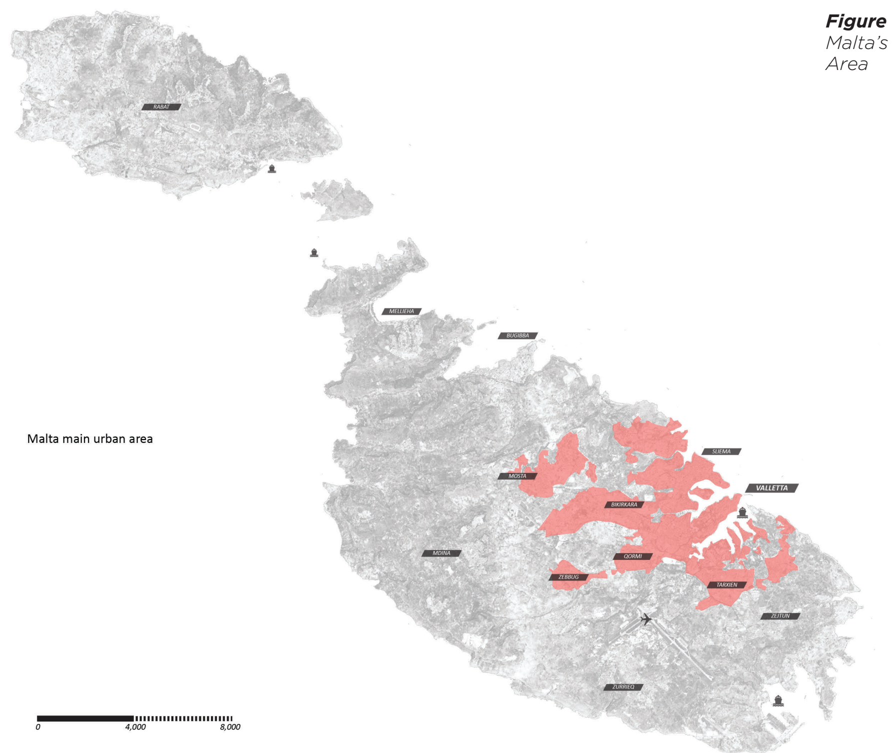


Figure 14.
Malta's Principal Urban Area

- Trend of increased spatial separation between homes, workplaces, places of education and places of entertainment resulting in decentralisation, highly complex travel patterns and increased levels of car dependency;

- The increase in urbanisation has led to capacity problems with service infrastructure leading to flooding during storms. A national flood relief project is being implemented;

- Lack of coordination of property development leads to individual trenching interventions for service utility provision in roads to the detriment of road condition;

- Project delays often occur due to archaeological discoveries during excavation works;

- Legal, financial and technical constraints to new road infrastructure provision resulting from environment and heritage protection laws and practical difficulties in expropriating private property in built-up areas;

- Contracting companies are small and economies of scale cannot be easily achieved in terms of onward procurement and expertise;

Measures

In response to these issues the following measures have been identified:

PD

2.2.1.1
IMPLEMENT AND MONITOR THE LONG TERM INTEGRATED NATIONAL TRANSPORT STRATEGY AND SHORT AND MEDIUM TERM TRANSPORT MASTER PLAN

(S/M/L)

The National Transport Strategy 2050 sets out the strategic goals, guiding principles and targets for the development of Malta's air, sea and land transport system. The 10 year Transport Master Plans identify the priority actions (physical infrastructure projects, regulatory, policy and capacity building) that will need to be implemented, prioritised and allocated according to financial resources available. The Transport Master Plan is aimed to provide clear medium term direction and stability for transport investment and visibility of project pipelines to counteract the size of contracting companies' limitations. The individual and collective effectiveness of the priority actions will be closely monitored. To this end a monitoring framework will be developed to ensure the implementation of Transport Master Plan and National Transport Strategy over the short, medium and long term.

This measure also covers the need to monitor environmental impacts as part of the SEA Process see Chapter 5).

PD

2.2.1.2
DEVELOP A FRAMEWORK WITH THE SPATIAL PLANNING PROCESS TO INTEGRATE LAND USE AND TRANSPORT PLANNING POLICIES AND MOVE TOWARDS TRANSIT ORIENTED DEVELOPMENT

(M)

This measure would aim to set up continuous discussions with the spatial planning process to move towards centralization and accessibility of facilities and review transport and development planning policies in relation to a Principal Urban Area with a central hub.

It would involve the reviewing and implementing of policies to integrate land use development and transport policy; particularly land use planning policies which favour public transport oriented development and encourage active mobility such as walking and cycling. Location and development of major employment and residential nodes need full integration with public transport networks, focussing on public transport corridors and in sync with the short, medium and long term plans to develop the public transport system.

This measure would critically assess whether planning gains are promoting sustainable mobility or whether they reinforce vehicular use.

It would also necessitate that the assessment of transport impact for development scenarios and review of parking standards for new developments be carried out during the preparation of local plans and master plans. The concept of double use of parking where the same parking spaces would be used by offices or retail establishments during the day and by residents at night could also be explored to retain accessibility by car for city functionality, but at the same time mitigate the negative effects of traffic congestion and parking clutter.

PD

2.2.1.3
MASTER PLAN FOR MRIEHEL AREA

(S)

The Strategic Plan for the Environment and Development envisages the re-designation of the Mriehel Industrial Area into an Enterprise Hub-Urban Regeneration Priority Area (URPA).

This change of area designation will have significant impacts on the land use composition, the size of the developments, and ultimately on the levels of traffic generation. The Mriehel Industrial Area is currently characterised by low traffic generating activities such as factories, showrooms, warehousing and small and medium sized industries but it re-designation, in part, to an Enterprise Hub will introduce a significant number of high traffic generating activities during the peak hours .

Access to the Mriehel Industrial Area by public transport is currently poor and the surrounding strategic road network regularly experiences severe capacity problems during peak hours. The location and layout of access roads within this area have been poorly planned.

From a transport perspective, the re-designated Enterprise Hub-URPA shall need sustainable planned to facilitate accessibility to and within the area and continued functionality of the TEN-T network. Appropriate mitigating measures will also need to be planned to ensure that the surrounding urban areas are not negatively impacted by traffic generation.

In this respect, in line with measure 2.2.1.2 a comprehensive Master Plan shall need to be drawn up for the whole area. The preparation of which shall involve testing of different land use development scenarios will be assessed for the enterprise Hub-URPA, forecasting trip generation, assessing impacts on the transport network and drawing up an appropriate transport strategy (including parking standards, traffic management, public transport and facilities for cycling and walking) to be implemented for the area.

PD

2.2.1.4 MASTER PLAN FOR PACEVILLE, ST. JULIAN'S

(S)

In 2015, Government had announced plans for the comprehensive designation of Paceville as a Business Hub –Urban Regeneration Priority Area, with the aim of promoting high quality business use, in particular in the tourism sector.

Over the last decade or so, the fragmented development of the Paceville area and the lack of coordination between land-use planning and transport network development have resulted in Paceville becoming a disorganised area, which lacks clear identity and which experiences severe traffic congestion at various times of day and night. The poor integration of parking supply management between off-street parking and on-street parking also has a strong negative impact on the public realm.

A number of new major developments (tourism, offices and residential) have been identified for the Paceville area, but without proper organisation of the area, these are likely to become high quality enclaves in an otherwise haphazard surrounding. With the current level of transport infrastructure provision and service, any major new land use development in the Paceville area will have significant traffic impacts that extend well beyond the Paceville area.

A comprehensive Master Plan for Paceville in line with measure 2.2.1.2, is required to establish the suitable carrying capacity to holistically define the traffic network.

The preparation of which shall involve testing of different land use development scenarios, forecasting trip generation, assessing impacts on the transport network and the identification and programming of local transport measures (including parking standards, traffic management, public transport, park and ride, and facilities for cycling and walking) to be implemented for the area.

PD

2.2.1.5 MASTER PLAN FOR SLIEMA

(S)

In recent years, there has been substantial intensification of office, retail, tourism and residential development in and around the commercial centre of Sliema. This and other factors have contributed to the increased levels of traffic on the road network within the central area and to the high levels of conflict between traffic, parked vehicles, public transport and pedestrians along the waterfront roads.

To accommodate increased on-street parking, most of the local roads in the area today are one-way. Such provision, without appropriate management encourages the use of the private vehicle. Off-street parking is mainly provided within the commercial centre rather than on the periphery, often exacerbating traffic congestion levels on the access roads leading to and in the central area. At the current level of growth, by the year 2025, Tower Road and the Strand in Sliema will reach their practical operating capacities.

The Strategic Plan for the Environment and Development envisages the designation of Sliema centre as a Business Hub. In this respect, in line with measure 2.2.1.2, a comprehensive Master Plan needs to be drawn up for Sliema to better integrate future land use development with sustainable transport growth and provision. This would entail providing for and facilitating the use of alternative transport modes.

PD

2.2.1.6
DEVELOP A FRAMEWORK TO ENSURE THAT TRANSPORT PROJECTS ARE DEVELOPED BY INTERDISCIPLINARY TEAMS TO MAXIMIZE OPPORTUNITIES FOR SUSTAINABLE DEVELOPMENT

(S)

Transport infrastructure projects tend to be developed by road planners and traffic engineers who focus on the main objectives of removing traffic bottlenecks, road safety, pedestrian accessibility to cross road infrastructure and interface with public transport. The role of urban and environmental planners in road infrastructure planning and design process has never been fully exploited.

Similarly, in the planning of public projects and new major developments, the focus is on providing the minimum number of parking spaces required by policy while access by other forms of transport (walking, cycling and public transport) is often an afterthought which arises when traffic congestion problems are identified in the assessment of traffic impact. Also public projects and major developments are often planned and designed in isolation of the urban context and regional traffic issues.

The lack of integration between the urban planning and design process and the transport planning and design process gives rise to sustainable development issues, many of which could be avoided if addressed earlier in the process.

Further emphasis needs to be placed on the identification of desire lines for cyclists and pedestrians at an early stage when defining the project design objectives. This should also include the identification of objectives which are not purely related to accessibility and mobility but would address the other Strategic Goals as identified in the National Transport Strategy. An example would be the identification of objectives to improve urban greening as an integral part of a project.

This measure therefore identifies the need to set up interdisciplinary teams to work together in the planning and design of road infrastructure and urban development to ensure that full consideration is given to urban, environmental and transport sustainability.

PD

2.2.1.7
IMPROVE CO ORDINATION AND PLANNING WITH SERVICE UTILITY INFRASTRUCTURE AUTHORITIES

(S)(M)

Road infrastructure is expensive to provide and Malta has experienced years of road reconstruction or rebuilding only for the newly laid road to be dug up within a short period of time. This may result from failures of buried systems, where the uncontrolled access by trenching by the service utilities has resulted in huge costs transferred to the road entities (Local Councils and Transport Malta). Better coordination of the road interventions is required so as to ensure that the design life of the road is maintained, or where interventions are absolutely necessary that the repair work also maintains the useful life. One way to address this would be to establish a coordination unit that brings together all service providers and their long term plans for infrastructure.

PD

2.2.1.8
CARRY OUT A NATIONAL HOUSEHOLD TRAVEL SURVEY BY 2020 FOCUSING ON DEVELOPING FURTHER ANALYSIS OF MULTI-PURPOSE TRIPS AND INEFFICIENT MOBILITY

(M)

This measure would facilitate the continuation of the analysis of trip patterns and travel behaviour which has taken place at 10 year intervals since 1990. The next Household Travel Survey is due in 2020. It will enable time-series trend analysis of the Maltese transport system and the statistical results can be used to quantify the impact of the various implemented projects, policies, and initiatives contained in the Transport Master Plan 2025. It will assist authorities to monitor compliance with strategic goals outlined in the National Transport Strategy, transport indicators and national and EU targets for the transport sector, at a mid-term stage.

PD

2.2.1.9
DEVELOP A FRAMEWORK FOR COLLATING MOBILITY DATA FOCUSING ON FURTHER ANALYSIS OF MULTIPURPOSE TRIPS AND EFFICIENT MOBILITY

(S)

The purpose of this measure is the development of a framework to promote innovative ways of collecting mobility data to understand travel behaviour by using new technologies and techniques. Also, integration of various sources of data to provide richer datasets shall also be considered. Further collaboration by Transport Malta and other public entities, government departments, commercial entities, research institutions and non-governmental organisations could be explored to enable information sharing across all users of mobility data.

2.2.2
PROVIDE ALTERNATIVES TO PRIVATE VEHICLES TO ENCOURAGE SUSTAINABLE TRAVEL PATTERNS AND REDUCE PRIVATE VEHICULAR DEMAND IN THE CONGESTED 'HUB' AREA

This objective has been developed since the data shows that about 50% of trips are under 15 minutes illustrating that mobility is produced at a local level on very short paths. This therefore creates the opportunity to increase the modal share for walking and cycling.

Additionally, the spatial distribution of town centres suggests an opportunity for increasing walking for daily facilities as most urban areas are within walking distance of a town centre. However, there is the need to promote and strengthen the quality of the pedestrian and cycling facilities and services within and around these town centres.

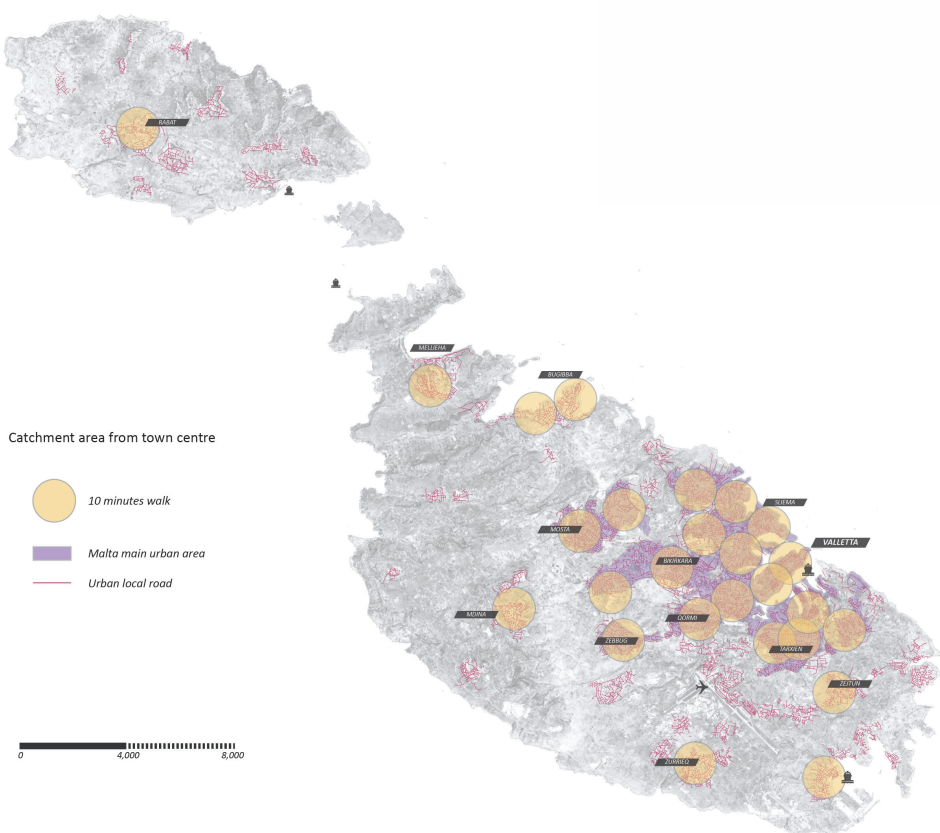


Figure 15.
Walking distances to local retail areas

In fact, the analysis shows that for trips made to two primary retail locations: Sliema and Fgura, the car modal share is much lower: 44% and 47% respectively within the walking catchment and 60% and 59% respectively within the cycling catchment. This illustrates the potential to prioritise walking, cycling and public transport modes within the walking and cycling catchments of these retail areas, thus relieving the need for travel by private vehicle.

However, a number of issues have been identified which do not support such mobility. Streetscapes are of poor quality from an aesthetic point of view and the lack of natural shade from trees exposes pedestrians to extreme temperatures during summer months.

The lack of public off-street parking structures requires that most roads are used to provide on-street parking which takes up precious space and diminishes the opportunity to provide adequate infrastructure for alternative modes. Where on-street parking is maximized, routinely the pedestrian footpath provision is either minimised or totally absent (Figure 17). Where footpaths are provided, they are often discontinuous due to garage ramps, protruding steps or simply in a state of disrepair. Overall, the space allocated for vehicles and pedestrians is not balanced and vehicles are given priority (Figure 18). This diminishes the walkability of urban areas and has reinforced the cultural mindset towards the use of private vehicles in favour of walking.

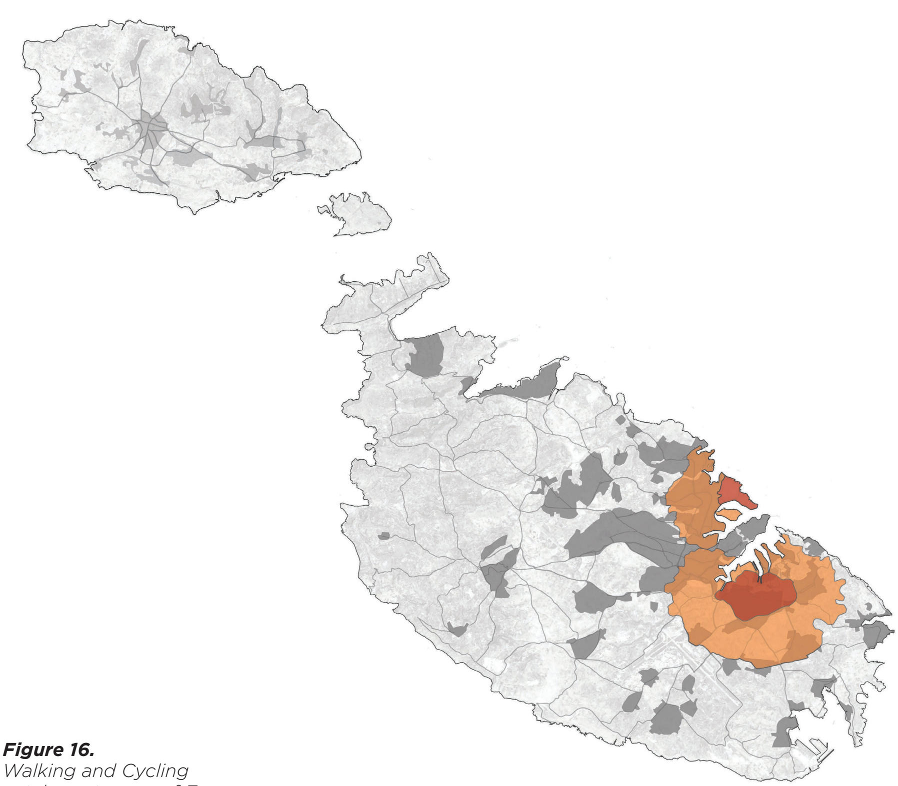


Figure 16.
Walking and Cycling catchment areas of Fgura and Sliema

Figure 17.
Example of on-street parking prioritisation detracting from pedestrian space

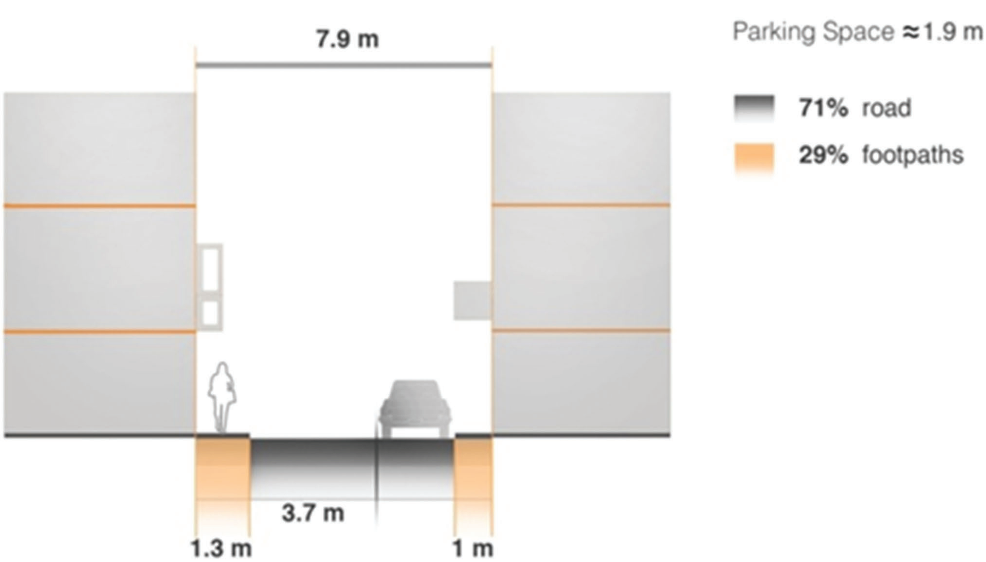


Figure 18.
Example of poor distribution of road space between vehicles and other road users

With regard to cycling, the provision of cycling infrastructure is fragmented and does not penetrate the main urban area (Figure 19). There is also a lack of comprehensive guidance on designing for cycling infrastructure or cycle friendly streets and the strict regulatory framework for cycling, and battery-powered two-wheelers, may discourage the uptake and use of such modes.

Electric mini-cab services were introduced in 2006 and operate in Valletta / Floriana region and mainly serve the tourism market.

In general, it can be said that there is a lack of awareness and promotion on the use of alternative modes e.g. marketing of routes suitable for cycling. While the European Commission is promoting the development of Sustainable Urban Mobility Plans (SUMPS), a framework for the development of SUMPs does not exist. There is also a lack of awareness regarding the impact of travel behaviour on health and environmental issues and their resulting economic benefits.

On the other hand, Malta's spatial composition represents an opportunity. Despite continued decentralisation over the years, Malta can still be seen to have a spatial composition similar to a hub and spoke pattern when overlaying urban development and transportation patterns.

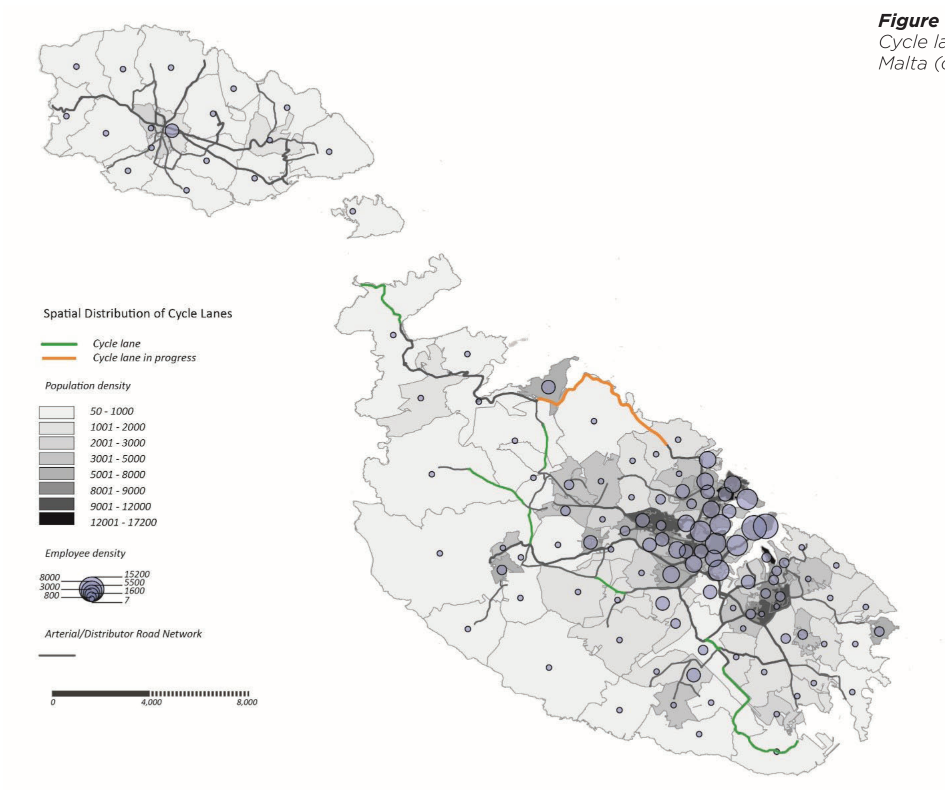


Figure 19.
Cycle lane network in Malta (only extra-urban)

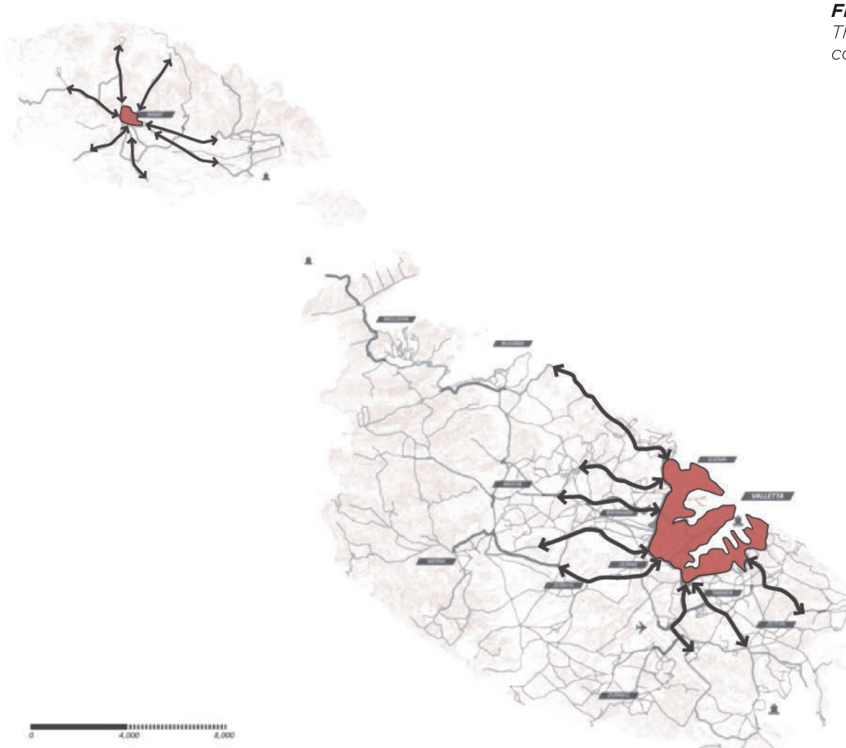


Figure 20.
The transport hub and its connectivity

A regional analysis of movement trips was carried out to further understand the significance of this 'Hub'. Figure 21 shows this analysis. The regions were chosen based on the NSO classification but a further subdivision of the North and Southern Harbour regions was made such that the analysis would be more relevant to the analysis of the 'Hub'. The results start to identify three regions which have a higher density of movements when compared to other regions; namely: the region of Valletta and Floriana; the North Inner Harbour Region and the North Outer Harbour Region.

When these are compared the congestion outputs form the national transport model, it is clear that the locations with highest densities of trips broadly coincide with the sections of road network exhibiting the heaviest levels of congestion. This area is highlighted in Figure 22.

A more detailed analysis of trips attracted during the morning peak hour identifies a finer agglomeration of zones with the highest trip density in Figure 23.

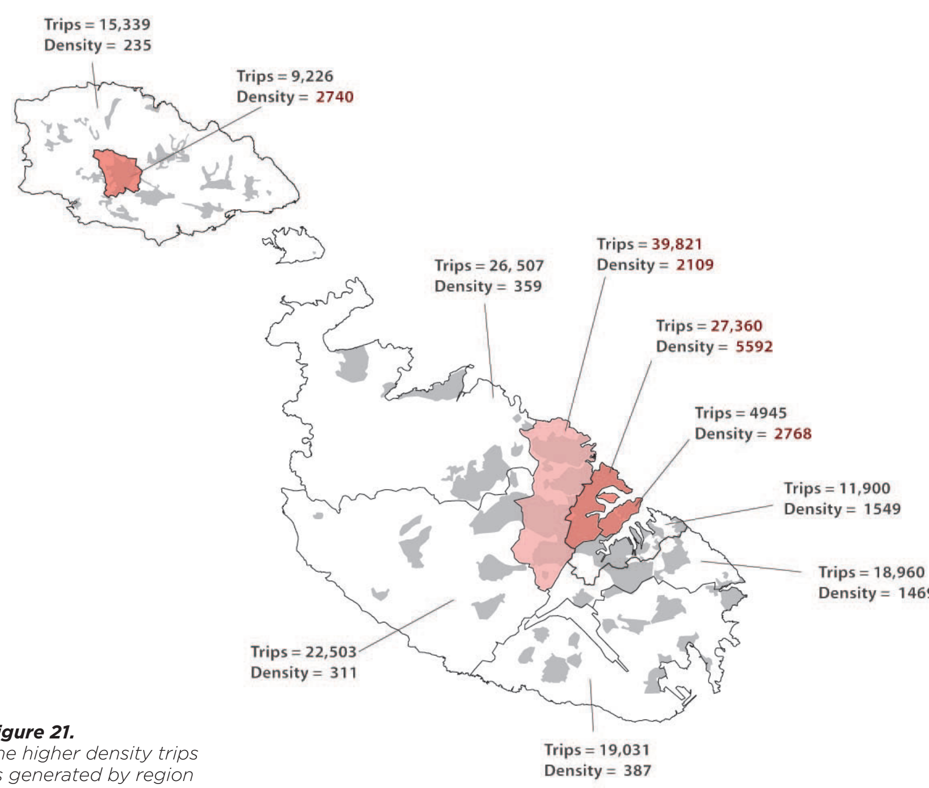


Figure 21.
The higher density trips as generated by region

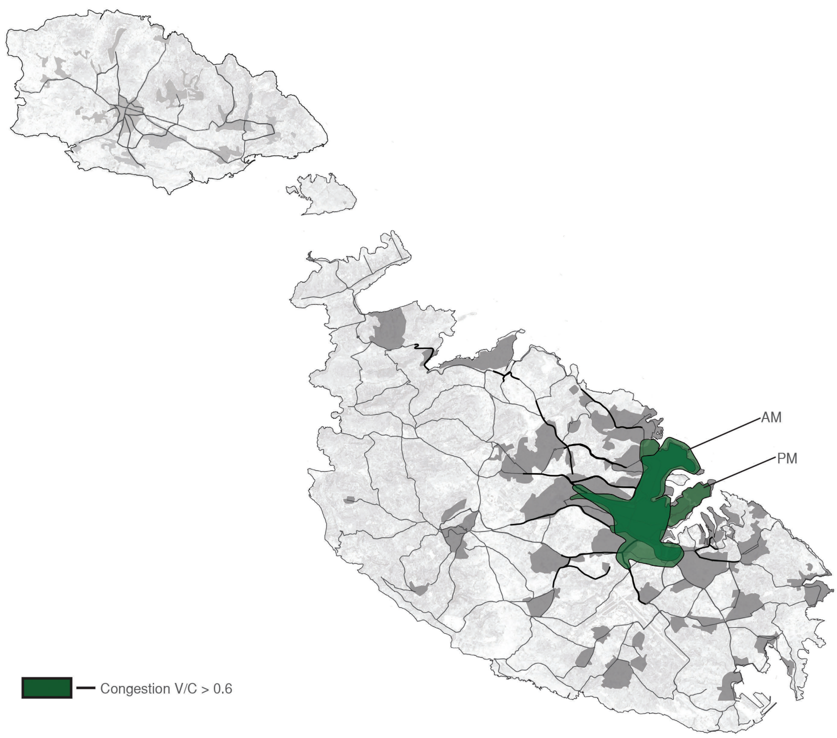


Figure 22.
Congestion area for AM and PM peak hours

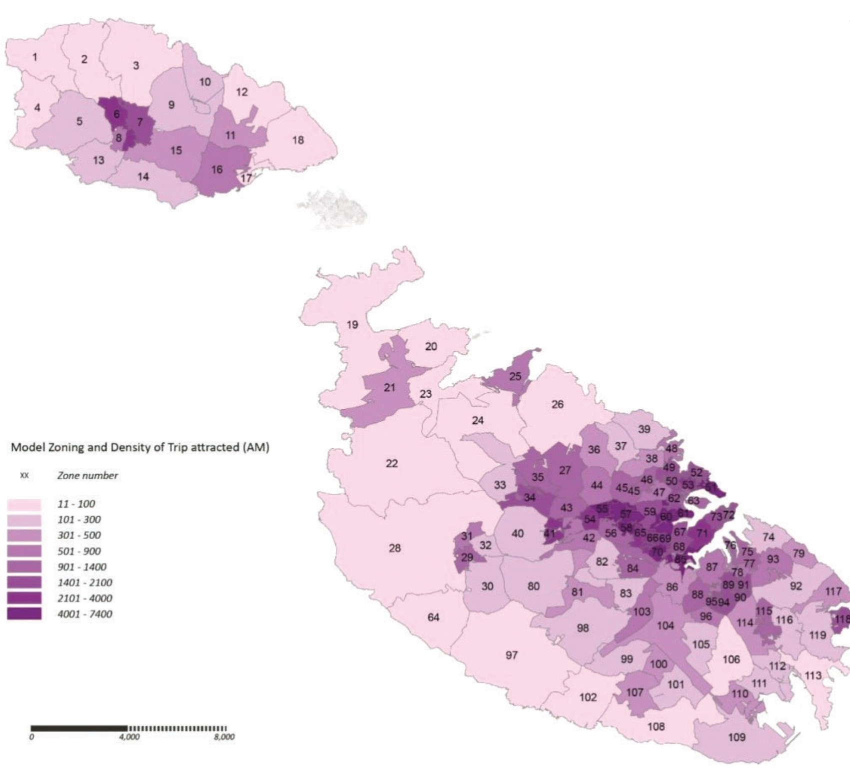


Figure 23.
Trips attracted by Zone

Overlapping these three layers of information leads to the identification of a new 'Hub' / congested area illustrated in Figure 24, where levels of mobility and traffic congestion are highest and where measures under this objective should therefore be focused.

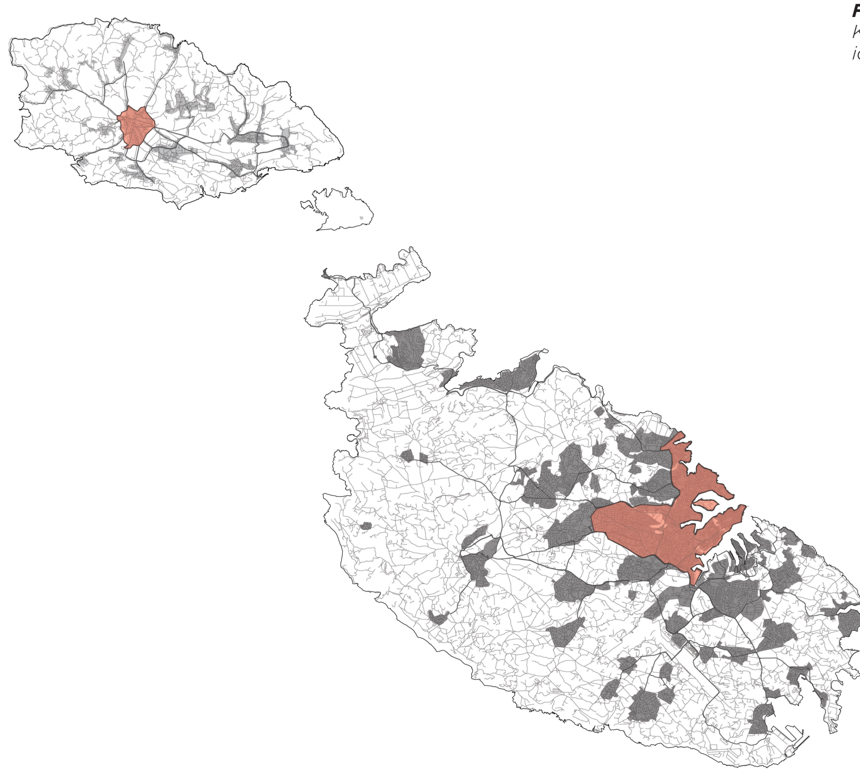


Figure 24.
Key congestion hub identified in the NTM

Measures

In response to these issues the following measures have been identified:

S

2.2.2.1 DEVELOP AWARENESS CAMPAIGNS TO IMPROVE THE UNDERSTANDING OF TRANSPORTATION ASPECTS

(S/M)

National media plans can help increase awareness of the impacts of excessive car use in cities. While such campaigns may not have an immediate impact on traffic, they can effectively set in place the necessary foundation for longer term travel behaviour changes (similar to social, safety and health campaigns). Locally, the use of alternative modes has been actively encouraged during special national events such as Notte Bianca and Isle of MTV through combination of specific public transport provision and car restraint.

In this context, awareness campaigns in the short term should focus on promoting a) the importance, awareness and opportunities for cycling and walking for shorter trips; b) improve knowledge and social conscience on travel behaviour and sustainable mobility and to change driver behaviour and speed in urban streets; c) compliance with traffic rules and regulations which can improve safety for all road users and more efficient use of road infrastructure, and d) introduce the health and environmental benefits resulting from cycling, walking and public transport in the primary and secondary school curricula.

PT

2.2.2.2 DEVELOP AND INCENTIVISE SCHEMES TO PROMOTE MULTIPLE OCCUPANCY, SMALLER VEHICLES AND REDUCE THE NEED TO TRAVEL IN PEAK HOURS

(M)

In Malta, the morning peak hour accounts for 11% of all traffic throughout the day. This heavily pronounced peak period in the morning is mainly the result of the start times for the vast majority of work places and schools coinciding. The evening peak period profile is considerably flatter, as school pupils usually return home before mid-afternoon and work finish times are spread over a longer period from late afternoon into the early evening.

The average car occupancy level in Malta currently stands at 1.25 persons per car. This is one of the lowest occupancy levels in the EU.

The concentration of travel shown in Figure 25 into such a short period in the morning (06:30-07:30) exerts enormous pressure on Malta's road infrastructure.

It is also costly both in terms of providing the necessary road infrastructure to remove the traffic bottlenecks and in terms of loss of economic productivity and higher operating costs resulting from congestion.

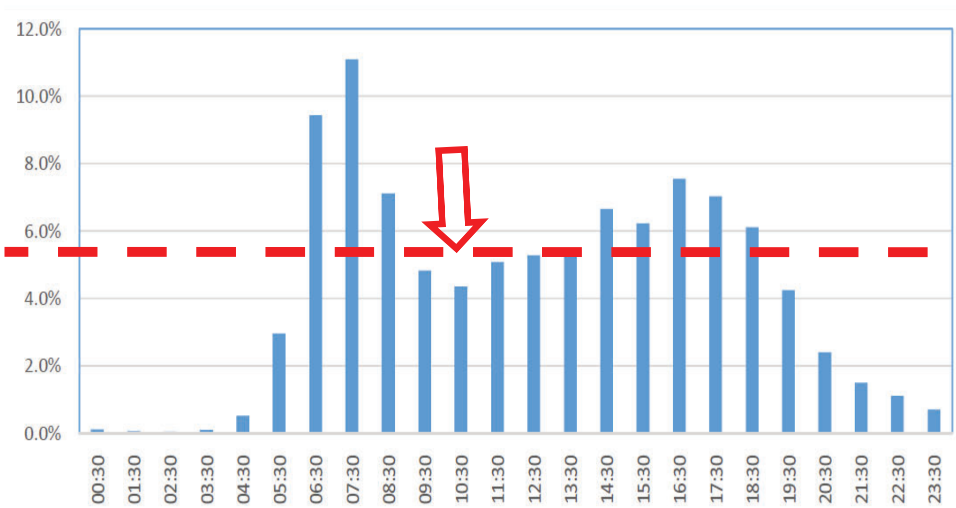


Figure 25.
Spreading of peak hourly deman

Transport policy measures can be effectively used to incentivise commuters to avoid driving their cars either by eliminating the need to travel or by enticing car drivers to travel more efficiently during the peak periods.

Modern information technologies and communication networks allow for the transfer of large amounts of data that had previously required individuals or companies to travel between places. The "dematerialisation" of data and consequently of travel has great potential to reduce traffic and parking problems, generated both privately and from business activity.

In recent years, e-Commerce and e-Government online 'travel avoidance' initiatives in Malta have most certainly reduced the need to travel by private car to busy central commercial and administrative areas; these include:

- Online-banking: electronic transfers via internet
- Government services: simplification of administrative services and making these available online
- Video conferencing and video-presentations
- Tele-diagnosis and remote maintenance: which can be used in IT and communication support services
- Flexi-working hours (to encourage travel avoidance using peak hours)
- Strengthening and promote the 'tele-working' policy in the public sector

Other initiatives could help encourage higher levels of vehicle occupancy and reduce the individual need to drive particularly during the busy peak hours or alternatively encourage the use of smaller, more road-space efficient vehicles; these initiatives include:

- Financial incentives to shift from private cars to alternative transport modes such as car-pooling or bicycle use.
- Central area parking priority for shared mobility services as part of parking management schemes
- Rewarding companies implementing 'Green Travel Plans'

Recently, a number of important initiatives such as car sharing for travel to schools, policy guidance for flexi-hours and promotion of tele-working by public sector employees, allowing high-occupancy private cars to use bus lanes and incentives to use low-powered motorcycles and scooters have been introduced at a national level.

With technical guidance, promotion and careful monitoring of the operation of the impact of travel reduction and avoidance schemes, measures can be further refined and deployed at a wider level.

The introduction of car sharing could be piloted by the establishment of a national car-sharing service. Utilising the latest green vehicle and ICT technologies (such as web applications and ANPR vehicle access or similar) such as system could enable a fleet of vehicles to be shared by the general public thereby improving efficiency of use of vehicles.

PD

2.2.2.3
SET UP A MULTI-ORGANISATIONAL TEAM TO DEVELOP A PEDESTRIAN INFRASTRUCTURE PLAN FOCUSSING ON THE "HUB"

(S)(M)

Analysis carried out using the transport model highlights that the average distance travelled by car during peak hours is 5.5km and in the busy 'hub' area the modal split of travel by foot and bicycle is much higher than the national average. These statistics are most welcoming, as there are clear opportunities to encourage modal shift to cycling and walking, if the right environment is created.

Promoting walking in the 'hub' area requires a holistic approach to infrastructure provision: including plotting of main desire lines, assessing the quality of infrastructure, considering the level of permeability and connectivity of urban areas and at major infrastructures and identifying obstacles which may be deterring factors along the main routes leading to central areas and access to major facilities.

It is acknowledged that Transport Malta is not the only authority responsible for the design of roads and streets. While Transport Malta is responsible for the Strategic Network and the construction of new local streets, Local Councils are responsible for the maintenance and refurbishment of local streets. Additionally, other authorities are often involved in projects involving public spaces which affect pedestrian infrastructure. This measure therefore suggests the setting up of a multi-organisational team to develop a Pedestrian Infrastructure Plan.

PD

2.2.2.4
DEVELOP A CYCLING STRATEGY FOCUSSING ON THE "HUB"

(S)

In the last 10 years or so, a number of dedicated cycle lanes and bus lanes permitting cycle usage have been incorporated into road infrastructure design with the aim of providing a safer, more segregated environment for cyclists in road traffic. In the main part, cycle lane provision has taken place on the wider main roads, outside of built up areas and, as such, are largely used by sports and leisure cyclists, but less so by commuters.

Cycling in the congested streets within the built up areas is still considered by most to be dangerous, given the high frequency of junctions, narrow roads, poor provision at junctions and possibility of 'dooring' from parked vehicles.

This master plan therefore aims to increase the modal share of cycling through the development of a cycling strategy where the promotion of cycling is not only seen as a leisure activity but also as a credible, safe, alternative mode of transport to be used as a mode of commuting.

The measure would include an in-depth study to again assess desire lines, connectivity issues between and through urban area and at major infrastructure so as to identify a cycling route network as well as design principles for the provision of cycle friendly streets.

The introduction of cycle friendly streets is an important principle as it is not physically possible to provide segregated cycle lanes on all urban streets and additionally not all types of urban streets require segregation. The principle of cycle friendly streets which are safe for all to use is therefore important.

As part of the study, appropriate cycling speed brackets will be determined together with the infrastructure needs required for such speeds. This would inform the design principles for the network and provision of cycle friendly streets. Additionally, the potential for introducing contraflows on low speed urban streets will be technically assessed.

The routes identified will be mapped out and developed into a smart route planner and offered on mobile devices while the necessary measures will be taken to upgrade a select number of routes into physically safe cycling routes. Measures could include the revision of vehicular speed limits, enforcement of the latter and the installation of the necessary ITS applications that would assist in enforcement, cycling prioritisation and additional security for cyclists. This concept shall be tested on two routes which shall be implemented as a pilot cycling corridors to test the effectiveness of the applications installed as outlined in the next measure.

Such a measure, also requires a review of the existing regulatory framework relating to pedestrians, bicycles, battery powered bicycles, etc. with the aim of facilitating greater uptake of these modes, while not compromising road safety. This could be in the form of a National Cycling Policy.

PT

2.2.2.5

DEVELOP PILOT CYCLE CORRIDORS BETWEEN VALLETTA AND: I) ST. JULIAN'S, SLIEMA; II) THREE CITIES AND FGURA, AND III) BETWEEN VILLAGES

(S)

The pilot corridors (Figure 26) have been chosen for their potential to achieve modal shift as well as the topography of the corridors that are relatively low-lying and without steep gradients.

This measure focuses on the planning and design of a number of cycle routes supported by the provision and monitoring of three pilot corridors selected from those designed.

Analysis using the transport model has indicated strong potential for modal shift from car to other sustainable modes of transport in the main 'hub' area, particularly between Valletta and north inner harbour area; between Valletta and the Three Cities/ Fgura; and also a pilot project between villages of Zurrieq, Mqabba and Qrendi.

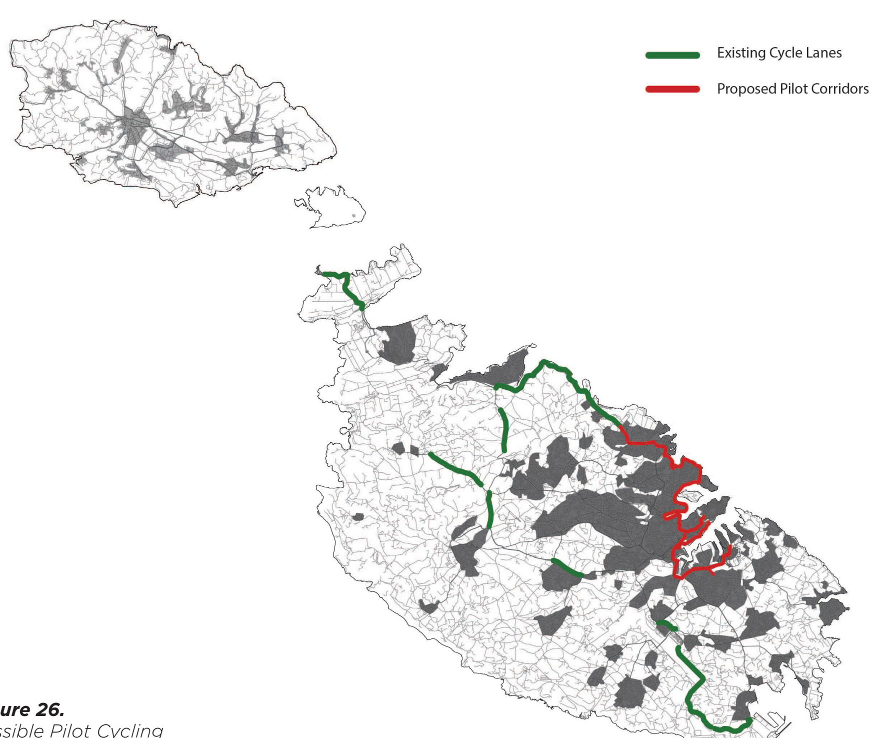


Figure 26.
Possible Pilot Cycling Corridors to Valletta (in red)

PT

2.2.2.6
DEVELOP A NATIONAL BICYCLE / EBICYCLE SHARING SCHEME

(S)

Bicycle sharing systems are increasingly popular in towns and cities around Europe and have the potential to increase the visibility of people cycling in everyday clothing. This may in turn help normalise the image of cycling, and reduce perceptions that cycling is 'risky' or 'only for sporty people'. Bicycle sharing schemes can provide car driving workers with an alternative means of travelling to meetings within busy central areas without having to resort to using their cars, while tourists can hire bicycles to visit places around Malta.

This measure will be piloted as a demonstration project within the framework of CIVITAS in which an e-Bike sharing system and management platform shall be set up within the central and outer areas of the Valletta as well as to improve accessibility between transport hubs and various urban centres.

PD

2.2.2.7
DEVELOP A FRAMEWORK FOR THE INTRODUCTION AND IMPLEMENTATION OF SUSTAINABLE URBAN MOBILITY PLANS (SUMPS) IN MALTA AND GOZO

(S)

The national modal split clearly highlights the predominance of private car travel in Malta and Gozo. As discussed in other sections this increased car dependency over the years is the result of: increased car ownership, increased need to combine tasks at different locations, spatial development in the outskirts of urban areas, and the perception that using a car is faster, cheaper and more convenient than alternative modes.

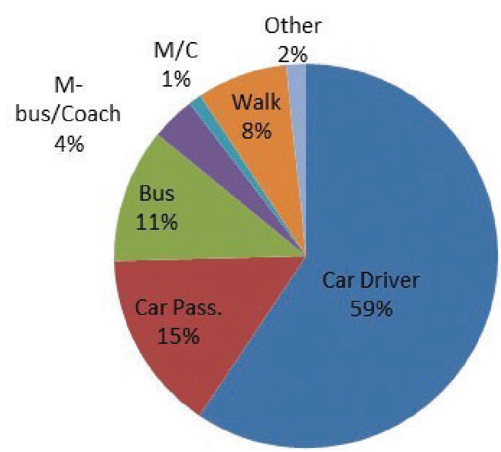


Figure 27.
National Modal Split
(NHTS 2010)

Sustainable Urban Mobility Plans aim to foster a balanced development of all relevant transport modes, while encouraging a shift towards more sustainable modes. The plans comprise a series of actions to improve the quality of life (health and environment), to reduce traffic congestion and to facilitate cost-effective, seamless mobility within urban areas.

These actions typically include: public transport, non-motorised transport (walking and cycling), inter-modality and door-to-door mobility, urban road safety, flowing and stationary road transport, urban logistics, mobility management, and Intelligent Transport Systems (ITS).

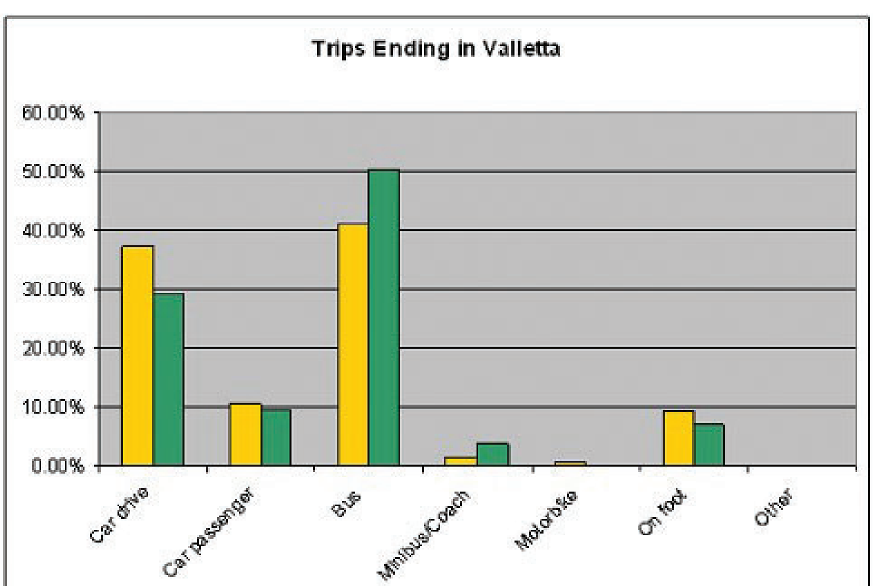
The only Sustainable Urban Mobility Plan (SUMP) carried out in Malta was that for Valletta between 2006 and 2010. This SUMP included a number of integrated actions aimed at restraining non-essential car use and promoting alternative green modes of travel i.e. pedestrianisation of busy shopping streets, reducing supply of parking spaces, introduction of park and ride services, implementation of CVA system, introduction of electric minicabs and upgrade of harbour ferry services. The combined effect of these actions had resulted in a modal shift of 10% away from the car and onto alternative modes of transport.

This measure will firstly define the framework for SUMPS to be created. An important lesson learnt from the Valletta SUMP is that SUMPS cannot function on a single locality as their impact goes well beyond the administrative boundaries. Rather SUMPS need to be developed at the regional scale and such regions should be defined at a functional level rather than administrative one. In this sense Malta's case is quite particular due to the whole country having the nature and size similar in scale to that of a European city. Based on the analysis of regional mobility and trip demand, two regions have been developed – the Valletta Extended Region and Island of Gozo (Figure 29)

Figure 28
Modal split for Valletta (NHTS 2010)

Trips ending in Valletta	1998	2010
Car driver	37.3%	29.2%
Car passenger	10.6%	9.5%
Bus	41.1%	50.4%
Minibus/Coach	1.4%	3.9%
Motorbike	0.4%	0.1%
On foot	9.1%	6.9%
Other	0.1%	0.1%

Table 21: Modal Split to Valletta



1998
2010
Graph 12: Trips Ending In Valletta

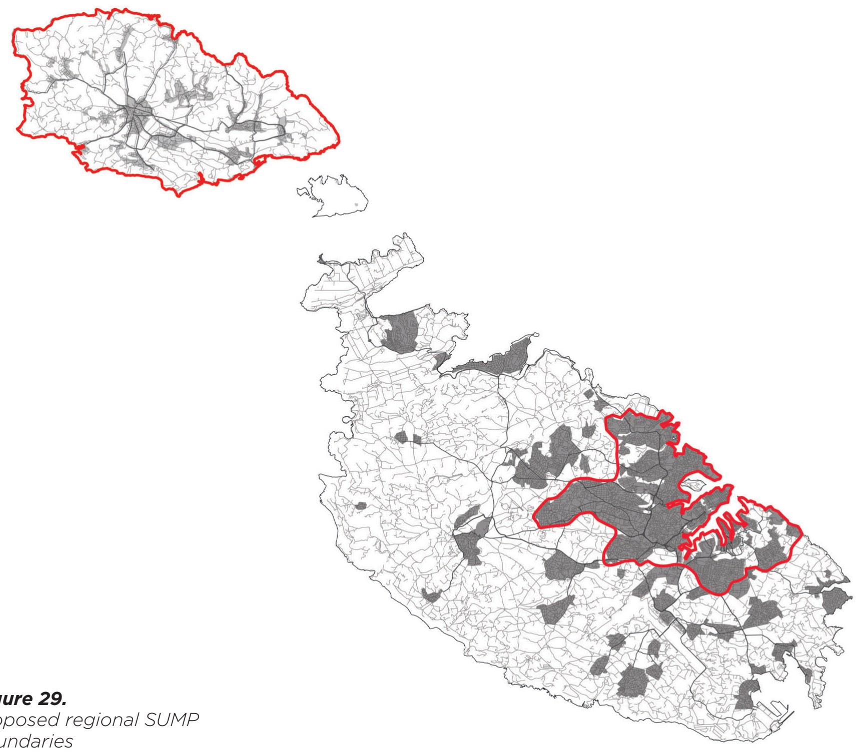


Figure 29.
Proposed regional SUMP boundaries

The SUMP for the Valletta Extended Region will be the first to be developed through:

- Further integrating of the Marsamxett ferry service landing site into the main public transport network through the deployment of a Circular Shuttle bus route connecting P+R –Valletta Terminus – Marsamxett – Lascaris ferry sites;

- Installing ITS applications to notify passengers of bus and ferry schedules.

- Carrying out an options analysis (lift, travellator etc.) for connecting the Marsamxett ferry landing site with Central Valletta.

- Introduction of e-bike sharing system and management platform between central and outer Valletta

- Last mile delivery of goods and consolidation system for the City of Valletta

2.2.3
REDUCING THE ROLE OF THE CAR IN BUSY, CONGESTED URBAN 'HUB'

Issues

Malta has both the highest road network density and the highest level of urbanisation of all the countries in the European Union.

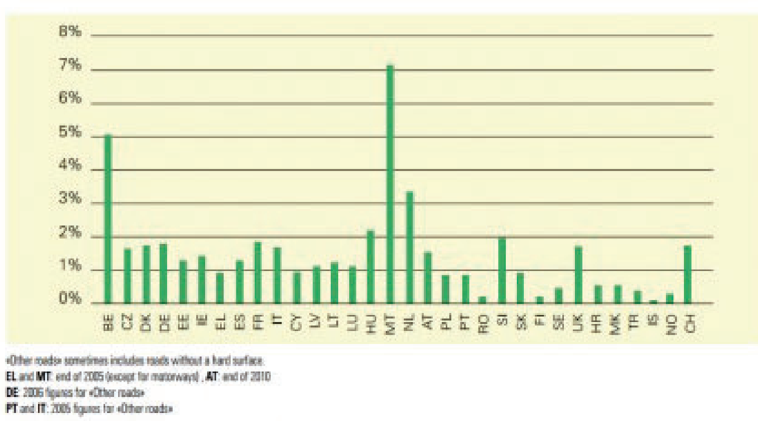


Figure 30.
Density of total road network across EU Member States (source: EC)

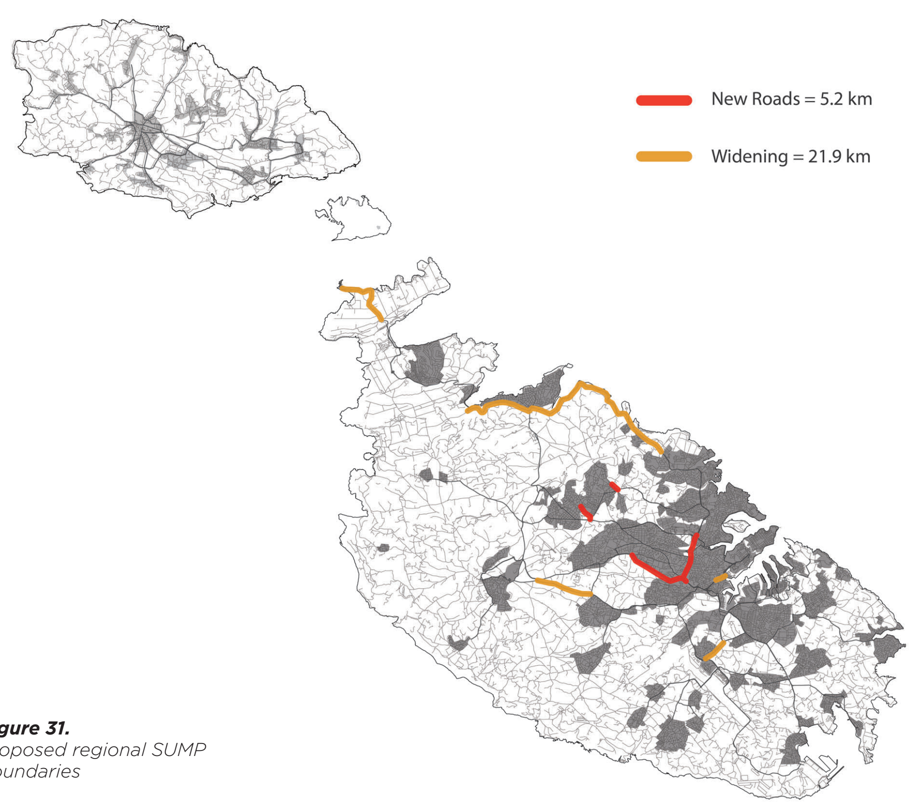


Figure 31.
Proposed regional SUMP boundaries

As a small island state, the geo-spatial characteristics place a heavy constraint on new road provision or major road widening in urban areas. Expropriation of buildings is expensive and difficult in practice. Environmental protection and heritage laws often legally preclude the possibility of providing road infrastructure to bypass the built up areas. In effect, over the last 25 years, only 5km of new strategic roads have been constructed and 22km of existing strategic road have been significantly widened. The option to address traffic congestion by only increasing the supply and capacity of roads in Malta is neither an effective nor a sustainable solution in the medium term.

For maximum effectiveness and benefits, a comprehensive transport demand management strategy would need to combine “pull” incentives, such as improved travel options with “push” incentives, which aim to disable habitual behaviour and discourage individuals from car use, by making it less attractive. Restrictive measure proposals are often not well received by the motorists who commonly cite that it would limit their personal freedom and would be unfair on them, since as road users they already pay annual circulation fees. The restrictive demand “push” measures are often introduced in conjunction with provision of alternative mobility modes facilitated through demand “pull” measures. Public acceptability is largely dependent on relative costs, travel time and convenience between the cars and the mobility modes brought about through the overall demand manage package of “push” and “pull” measures.

This objective has been developed in response to the severe traffic congestion problems in the ‘hub’ area that, in the transport model, have been forecasted to occur in the short-medium (2020 and 2025) should there be no changes to the current transport policy (supply and demand) framework.

The modelling results clearly indicate that a number of critical sections of strategic road network (both TEN-T and roads supporting bus corridors) will be operating at or near their capacities in 10 years’ time. Infrastructure project interventions to remove critical traffic bottlenecks on the TEN-T have been planned at Kappara junction and Marsa Addolorata junction, as sufficient road space is available at both of these locations to allow junction improvement through grade-separation. However, severe congestion problems are also being forecast on other critical sections of road network where additional road space is not available (for example Qormi, Sliema and Msida areas and the central section of TEN-T core and comprehensive network between Triq December 13th and Tal-Qroqq junction).

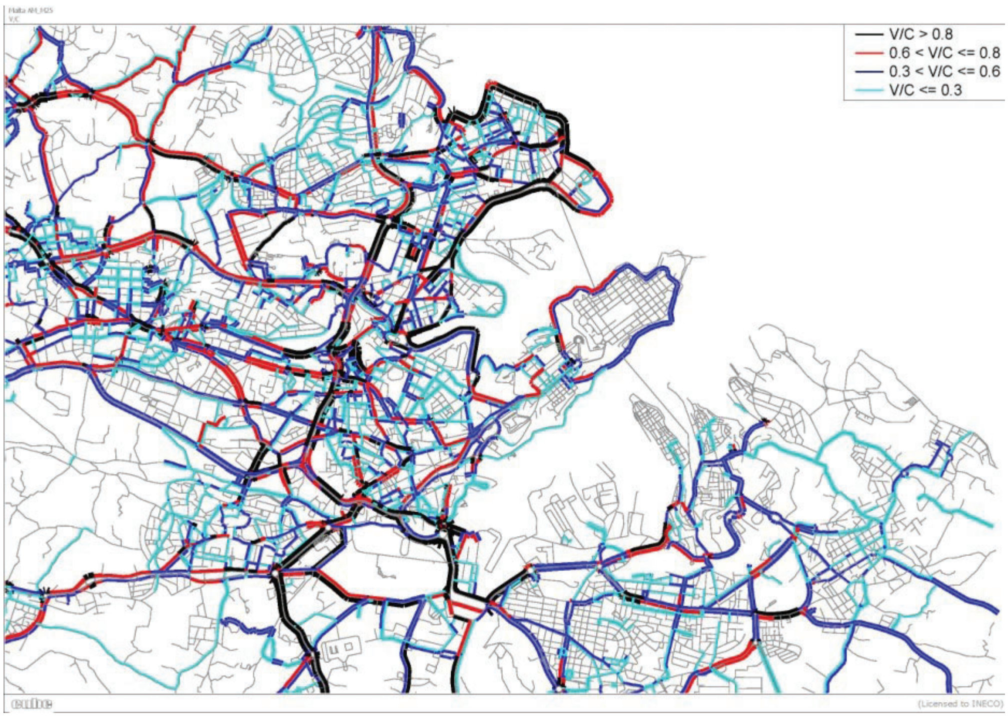
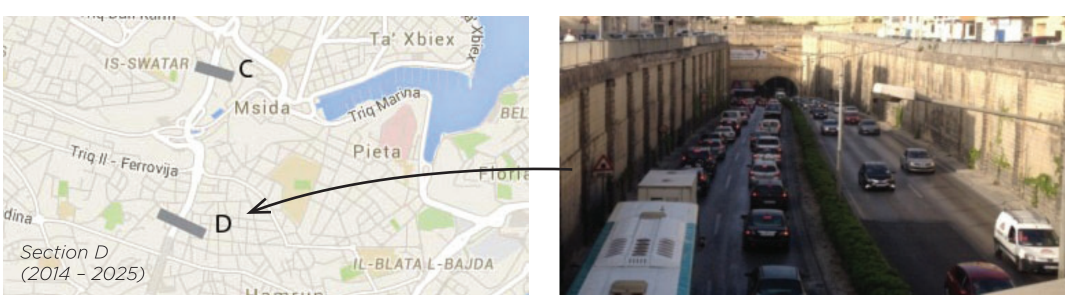


Figure 32.
2025 volume-demand/capacity at AM peak hour



Volume of vehicles in section C						
Year	Growth Scenario	Mode	AM		PM	
			South	North	South	North
2014	-	LV (veh)	2,324	2,255	2,580	1,873
		HV (veh)	248	177	99	239
		Total (PCUs)	**3,068**	**2,786**	**2,877**	**2,590**
2020f	B	LV (veh)	2,325	2,250	2,589	1,812
	B	HV (veh)	287	215	115	278
	B	**Total (PCUs)**	**3,186**	**2,895**	**2,934**	**2,645**
2025f	B	LV (veh)	2,346	2,207	2,636	1,542
	B	HV (veh)	315	249	129	238
	B	**Total (PCUs)**	**3,290**	**2,953**	**3,024**	**2,256**
2050f	C	LV (veh)	2,186	2,161	2,614	1,575
	C	HV (veh)	517	413	220	550
	C	**Total (PCUs)**	**3,739**	**3,399**	**3,275**	**3,224**

Volume of vehicles in section D						
Year	Growth Scenario	Mode	AM		PM	
			South	North	South	North
2014	-	LV (veh)	2,337	2,595	2,757	2,267
		HV (veh)	267	225	115	175
		Total (PCUs)	**3,138**	**3,270**	**3,102**	**2,792**
2020f	B	LV (veh)	2,317	2,524	2,746	2,223
	B	HV (veh)	306	279	134	206
	B	**Total (PCUs)**	**3,235**	**3,360**	**3,146**	**2,841**
2025f	B	LV (veh)	2,318	2,508	2,754	2,208
	B	HV (veh)	342	312	148	229
	B	**Total (PCUs)**	**3,343**	**3,444**	**3,199**	**2,894**
2050f	C	LV (veh)	2,092	2,322	2,737	1,912
	C	HV (veh)	563	512	250	390
	C	**Total (PCUs)**	**3,782**	**3,857**	**3,487**	**3,081**

Figure 33.
Critical TEN-T Network link between Sta. Venera and Tal-Qroqq Tunnels

The area with the highest level of day time trip attraction is focussed around Valletta, Floriana, Hamrun, Msida, Birkirkara and Sliema and Victoria in Gozo.

Currently only 2.77% of all daily car trips which have destinations in these four areas actually pay for parking off-street (or in the case of Valletta off-street and on-street). Of those who incurred a parking fee, the average amount paid is around €2.00.

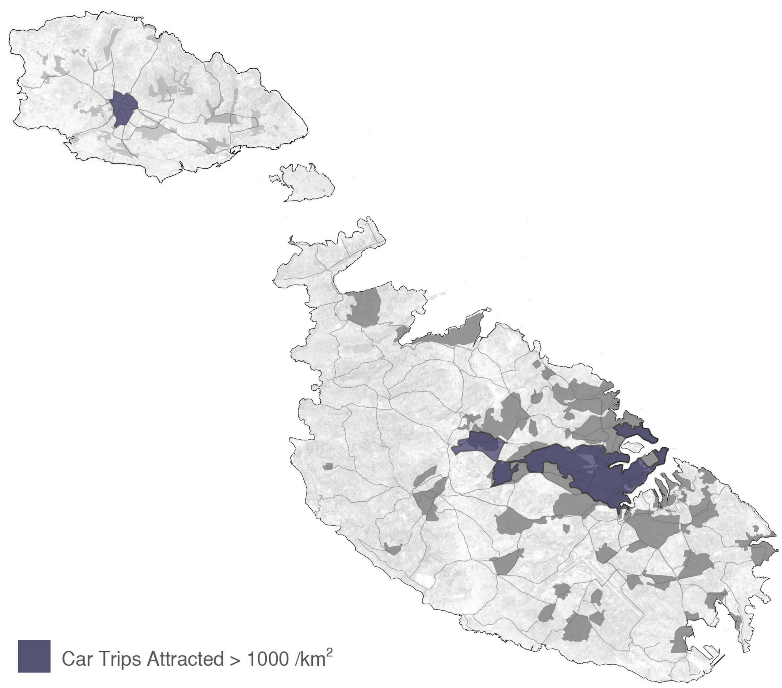


Figure 34.
Locations of highest density car attracting zones

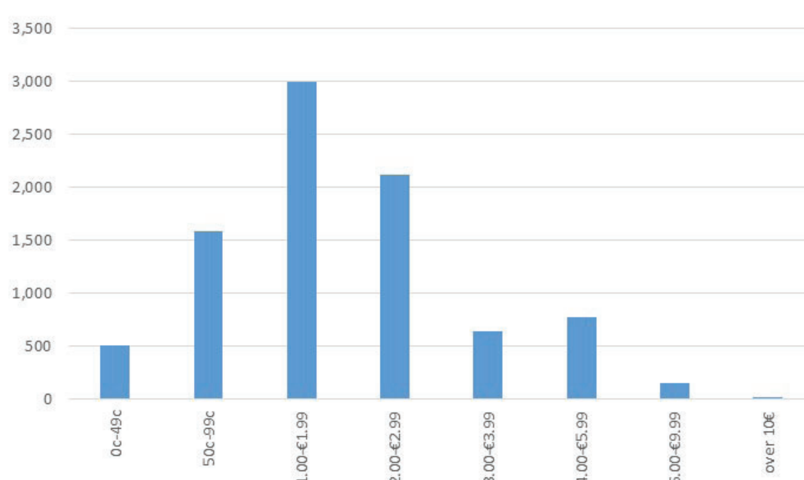


Figure 35.
Payment for Parking across Malta in numbers

With the exception of Valletta, there has been no real attempt to integrate transport planning with land use planning in order to reach a sustainable balance between the supply of parking spaces (including on-street and off-street) on the one side and the demand for parking on the other.

Development planning policies which require developers in central areas to provide a minimum number of spaces in new developments and the intensification of on-street parking provision (discussed in previous sections) have at best only provided temporary relief to the busy central areas. The increased supply of central area parking spaces has filled up quickly and the approach roads leading to these areas have inevitably become more congested. Furthermore, such policies can be seen as encouraging, rather than restraining, car use thereby further increasing urban congestion.

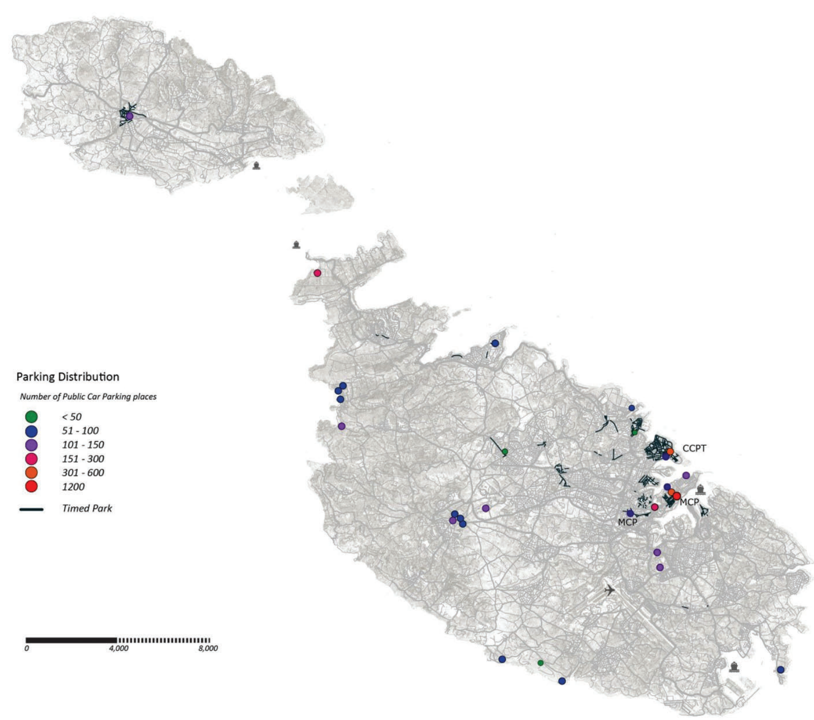


Figure 36.
Regulated on-street and off-street public parking

Today, 'push' measures that reduce demand for car use exist in most, if not all, of Europe's congested towns and cities. Private cars represent 84% of all traffic on the roads and account for three-quarters of all mobility movements in Malta.

The economic cost of traffic congestion through increased journey time delays for passengers and road freight journeys, increased vehicle operating costs (driver, fuel and maintenance) and cost of extra pollution will, by the year 2025, reach €584 million/year unless appropriate measures are introduced.

Measures

PRE

2.2.3.1
DEVELOP A COMPREHENSIVE PARKING MANAGEMENT SYSTEM TO CREATE A BETTER BALANCE BETWEEN OFF-STREET AND ON-STREET PARKING

(L)

In certain localities, congestion arises because of the mix of incompatible or conflicting street user types on the same road space. Street space priority in central areas has traditionally been allocated towards the private car, resulting in a general lack of space available to create safe and attractive infrastructure for cyclists and pedestrians. In some cases, it has even been seen that footpaths have been removed to increase the amount of on-street parking and increase vehicle speeds.

The Valletta Transport Strategy (2006-2010) had piloted the provision of easily accessible off-street parking spaces at a new park and ride facility on the periphery of the peninsula which allowed for the removal of unsightly of on-street parking from historically important squares and shopping streets in Valletta.

The provision of peripheral parking facilities not only removes the unsightly clutter of parked cars in central areas, but also reduces traffic congestion caused by both searching for parking spaces and waiting for vehicles manoeuvring into on-street parking spaces.

Such a solution results in social benefits in the form of improved street quality through the provision of more space where people can walk and interact, as well as health benefits as more opportunities are created for walking. In a society where 40-48% of children and 58% of adults are overweight and obese[10] , increasing opportunities for active mobility is essential.

There are also economic benefits to be had, such as making such urban cores more pleasant which will encourage shopping or leisure activities such as having a coffee, sitting out in the sun and dining out. It also improves the tourism product.

The spatial spread of public off-street parking areas is currently quite random. Many public car parking areas are located in the busy centres, which can often compound the nature of traffic congestion problem in that area. Few public parking areas have been planned on the peripheries of central areas.

Incentivising a shift from crowded on-street parking to off-street parking would require the provision of new, additional off-street parking areas and, therefore, this is not a short-term measure. It requires detailed studies on where a hierarchy of peripheral and centralised parking can be provided and ensuring good levels of accessibility to these parking areas by improving infrastructure for pedestrians. As part of such a scheme on-street parking located within the urban cores and town centres would need to be controlled through the introduction of parking demand management schemes designed to achieve the appropriate balance between residential parking, short-stay parking for visitors and priority car parking for car sharing and servicing of businesses.

[10] *A Healthy Weight for Life: A National Strategy for Malta 2012-2020*

It will be necessary to develop a framework for such a system to be managed holistically as opposed to individually by separate towns and villages. Two options are being suggested. In the first option (Figure 38) a similar approach would be adopted for all town centres with a focus on Urban Conservation Areas (UCA's). UCA's are seen as areas of priority as the urban form and narrow streets often do not support the provision of on-street parking. Additionally, improving the quality of UCA's would strengthen cultural heritage and have economic benefits.

A recent study (Attard et al., 2016) illustrates the potential such a measure could have by using the case study of Lija. Through the introduction of parking management, amongst other aspects, the redesign of public space was possible illustrating the potential for improving liveability of the urban core.[11] Option 2 (Figure 39) would look at a system which address the 'hub' holistically while still targeting additional UCA areas as may be required.

Figure 37.
Lija Church and Main Square today and following intervention to enhance public space (Source:

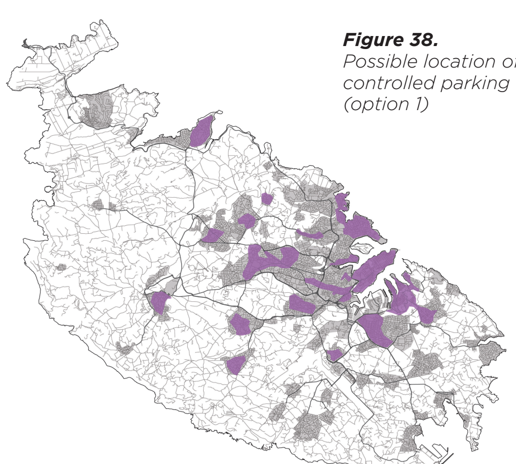


Figure 38.
Possible location of controlled parking (option 1)

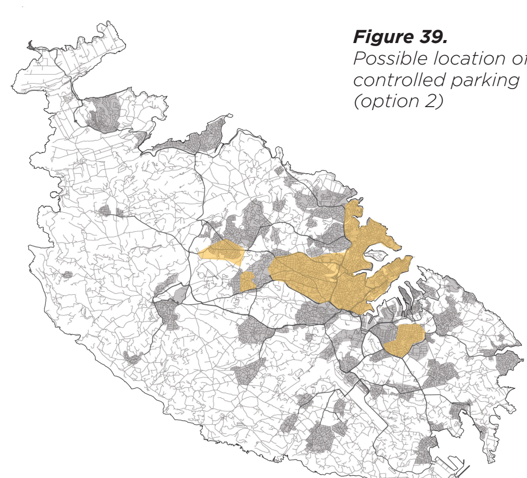


Figure 39.
Possible location of controlled parking (option 2)

[11] *Attard, M., Miceli Farrugia, A., Borg Barthet, J. (2016) Sustainable mobility, liveability and public space in historic village cores – a case study of Lija, Malta.*

2.2.4
REDUCE THE IMPACT OF HIGH POLLUTING VEHICLES IN INNER CONGESTED URBAN AREAS AND ON THE TEN-T NETWORK

Issues

Road transport is and is likely to remain a significant contributor to air pollution in Malta.

Traffic directly contributes to a range of gaseous air pollutants and to suspended Particulate Matter (PM) of different sizes and composition and can account for up to 30% of $PM_{2.5}$ (less than 2.5 µm) in urban areas. Road transport is also the main contributor to emissions of nitrogen dioxide, carbon monoxide, sulphur dioxide, Volatile Organic Compounds (VOCs) and benzenes, all of which can adversely affect human health.

The adverse effects in air quality of road traffic are much higher in the so-called street canyons where pollutants are trapped.

Living or working near busy roads (or both) has a direct effect on public health. According to the World Health Organisation[12], the time spent in traffic is also critical for population exposure, with travellers often being exposed to levels that are three times the background levels. Road transport related air pollution is associated with health impacts such as premature deaths, respiratory diseases, cardio-vascular diseases, cancer and issues with reproduction.

Air pollution varies in time and space, and depends on a number of characteristics, such as proximity to roads, the composition of the vehicle fleet, traffic patterns and the presence of other pollution sources.
In Malta, the past thirty years has seen an undesirable increase in the average of the motor vehicle stock has increasing from 13.8 years old to 14.7 years old and the average car age is currently 13.9 years, which is significantly higher than the European Union average of 8.6 years.

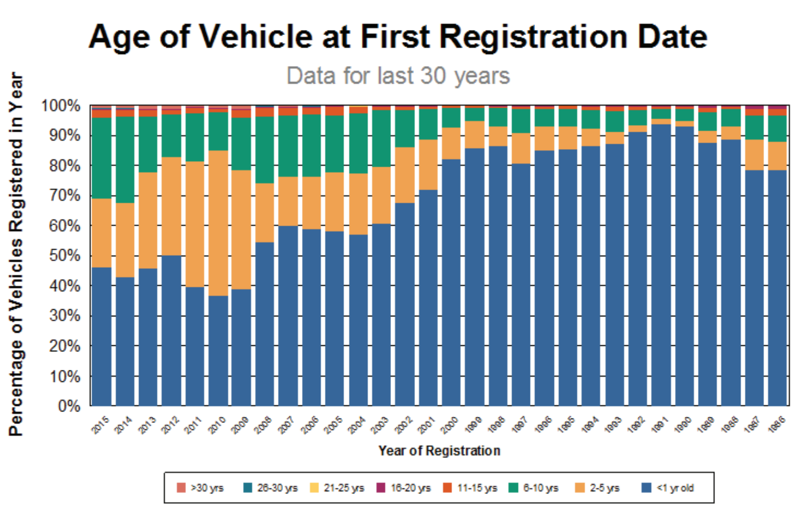


Figure 40.
Vehicle age profile at first registration Source: from VERA as at Q2 2015

[12] *Health Effects of transport-related air pollution: summary for policy makers, Krzyzanowski, M, 2005*

The proportion of new vehicles being licensed in Malta started to decrease significantly from about 2001 onwards as a result of cheap used-car imports from Japan and then from the European Union following Malta's accession in 2004.

Older vehicles produce significantly higher levels of pollutants from their tailpipes, than do newer vehicles.

Catalytic converters in the exhaust systems of vehicles only achieve their design effectiveness after the engine reaches and runs at normal operating temperatures for some time. With the average urban trip covering distances of only 5.5km, many vehicles run at sub-optimal temperatures and therefore the pollution prevention mechanism is not as effective as designed.

The urban environment around the harbour areas in Malta (and to a lesser extent Victoria in Gozo) are characterised by high volumes of road traffic and narrow roads forming street canyons. Air quality in these areas is of great concern as illustrated in by satellite imagery of NO_x (Figure 41).

Charging infrastructure for electric vehicles has been implemented throughout the islands. However, even though this infrastructure is in place, the take up of hybrid and electric cars is still well behind the European averages and more efforts are needed to incentivise the uptake of these low and zero-emission vehicles.

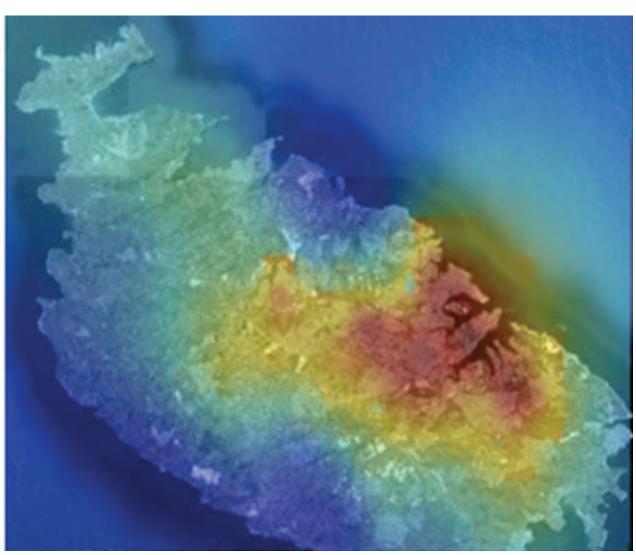


Figure 41. *NOx pollution recorded over Malta 2008-2011 (Air Quality Trends, MEPA)*

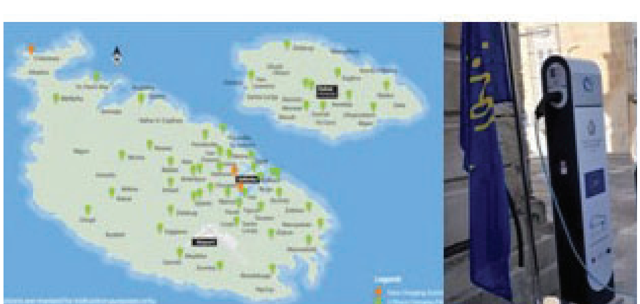


Figure 42. *Location of Electric Vehicle public charging points across Malta.*

Measures

PRE

2.2.4.1
STUDY THE POTENTIAL TO INTRODUCE LOW EMISSION ZONES IN DENSE AND POLLUTED URBAN AREAS

(L)

Low Emission Zones (LEZs) are normally introduced in areas where air pollution from vehicles is at a dangerous level for public health. They therefore regulate access to such areas by high polluting vehicles. LEZ's operate by either prohibiting vehicles with higher emissions from entering an area or by requiring the more polluting vehicles to pay more if they enter the zone.

As explained in the National Environment Policy (2012), air quality monitoring In Malta, over the years, has identified a number of localities which regularly exhibit transport derived pollution that exceed legal limits for particulate matter, nitrogen dioxide resulting from high volumes of traffic and / or high levels of traffic congestion.

This measure shall involve the implementation of a pilot project under the CIVITAS initiative to test the feasibility and effectiveness of a Low Emission Zone along St Anne Street, Floriana.

The measure shall also include the organisation of a joint study between transport and environmental authorities to identify all the areas where air pollution from motor vehicles is regularly at a dangerous level, to assess the different scenarios and options for the access control of high polluting vehicles and to analyse the potential impacts of LEZ introduction on other parts of the road network using network and air pollution modelling software.

PRE

2.2.4.2
INTRODUCE FURTHER FINANCIAL DIFFERENTIAL INCENTIVES TO REDUCE THE AVERAGE AGE OF VEHICLES

(M)

Currently the barrier to entry into the market on new vehicles is relatively high since it is related to the market value of the vehicle and new vehicles are at a premium when compared to nearly new vehicles. Also the tax differential on "used" vehicles between countries like the UK and Japan when compared to Malta are significant enough to completely negate the registration tax barrier to entry.

The relatively lower taxation on older vehicles (circulation tax) has also been flagged by the European Commission studies as a potential hidden subsidy for the uptake of these older vehicles. The impact of this reduced barrier to entry is evidenced by the significantly increased proportion of used vehicles being registered in Malta for the first time in recent years.

Indeed, the change from engine size/cost of vehicle as a basis of taxation to a cost/ CO_2 emission based taxation regime a few years ago has been shown to be regressive, with a higher total number of vehicles and a higher proportion of older vehicles being introduced into the market every year.

In recent years, fiscal incentives using an annual grant system for purchase of new cars when scrapping an old car has started to show some changes to the types of vehicles first registered in Malta. While this system has proved popular, however it does not address the issues relating to the increased number of cars on the road. This incentive scheme could be adapted to encourage the scrapping of old vehicles in exchange for free public transport travel for a fixed period or free access to car-sharing schemes.

Measures to influence the update of commercial vehicles and road based equipment (e.g. road based cranes) should also be considered. These are significant contributors to air pollution and currently have little incentive to reduce their impact on society.

PRE

2.2.4.3

INTRODUCE FURTHER FISCAL MEASURES AND INCENTIVES TO FAVOUR THE PURCHASE AND USE OF CLEAN FUEL VEHICLESS

(S)

Clean or zero-emission vehicles have higher "entry" costs due to their intrinsic cost resulting from the use of new technologies, albeit that over the lifetime of the vehicle their running costs are significantly lower. Support to date for the introduction of clean or zero emission vehicles through subsidies has had a minimal effect on the take up of these vehicles.

While fiscal incentives to discourage older inefficient vehicles will be crucial to support the uptake of clean or zero emission vehicles (see measure above), unless the differential market entry costs of a zero emission vehicle is brought closer to that of other types of vehicles, the uptake will continue to be subdued.

On this basis, Government should establish an annual target number of clean and zero emission vehicles expected to be introduced in Malta, and adjust annual subsidies to achieve these annual targets in line with the aim to achieve 5,000 of these vehicles in Malta by 2020.

PRE

2.2.4.4
CONTINUE IMPLEMENTING THE ELECTRO-MOBILITY ACTION PLAN

(S)

The Malta National Electro-mobility Action Plan, issued in 2013, has a series of measures that address bottlenecks and difficulties in the implementation of Government's stated aim to achieve 5,000 electric vehicles by 2020.

The measures include efforts to allay the fears of the public that this new technology might not meet the needs of a user in Malta, through the introduction of public accessible charging points and education as to use and costs of such technology. Efforts also include policy measures to encourage their uptake in relation to fiscal measures such as tax reduction and subsidies.

In the short-term, the measure shall focus on the further deployment of charging infrastructure for electric motorcycles and Electric Vehicles (including fast charging services for public use) and investing in electric minibuses to provide feeder services from peripheral areas to centres to improve accessibility for elderly and other marginalised groups.

PD

2.2.4.5
IF FEASIBLE, IMPLEMENT LNG REFUELLING STATIONS FOR LAND TRANSPORT BY 2025 ALONG THE TEN-T CORE NETWORK

(M)

Liquefied Natural Gas (LNG) might also offer a cost-efficient technology allowing heavy-duty vehicles to meet the stringent pollutant emission limits of Euro VI standards.

The TEN-T Core Network should be the basis for the deployment of LNG infrastructure as it covers the main traffic flows and allows for network benefits. When establishing their networks for the supply of LNG to heavy-duty motor vehicles, refuelling points need to be planned in places accessible to the public at least along the existing TEN-T Core Network, within adequate distances taking into account the minimum range of LNG heavy-duty motor vehicles.

This measure shall involve the carrying out of a feasibility study for the deployment of LNG infrastructure to determine current and future demand in Malta for LNG fuelling facilities, associated costs and calculation of economic, financial and environmental benefits that would result from this investment.

PD

2.2.4.6

IMPLEMENT CNG REFUELLING STATIONS FOR LAND TRANSPORT BY 2025 ALONG THE TEN-T CORE NETWORK

(M)

The Clean Fuels Infrastructure Directive requires EU Member States to ensure, by means of their national policy frameworks, that an appropriate number of refuelling points, accessible to the public for the supply of CNG or compressed bio methane to motor vehicles is built up, in order to ensure that CNG motor vehicles can circulate in urban/suburban agglomerations and other densely populated areas as well as throughout the Union, at least along the existing TEN-T Core Network.

CNG refuelling points will need to be accessible to the public and to take into account the minimum range of CNG motor vehicles (approx. 150km).

This measure will involve the carrying out of analysis of current and future vehicle demand for CNG in Malta and the identification of the potential locations of publicly available CNG supply infrastructure along the TEN-T core network.

2.2.5 REDUCE THE IMPACT (SOCIAL, ENVIRONMENTAL AND ECONOMIC) OF VEHICLES IN URBAN AREAS

Issues

With over 700 km of road for every 100 km^2 of land area and over 600 private vehicles for every 1,000 people, the impact of road transport and road transport infrastructure in a small country like Malta is very significant.

From an environmental point of view, Maltese roads have traditionally been designed or reconfigured in a manner that optimises space for motor vehicles (parked and moving), while squeezing other road users and any street landscaping into the limited space available.

Figure 43.
Roads not designed to facilitate pedestrian use

Any landscaping and trees that do form part of the urban streetscape are generally badly planned: their shallow rooting can cause damage to road surfaces and sub-road utility services, their often uncompromising positions within junction visibility splays poses a safety risk and their prominence within many narrow footpaths renders access-for-all challenging.

Figure 44.
Damage to road by tree roots with safety implications

However, landscaping and trees are, on the other hand, very important in an urban streetscape. If designed appropriately, trees and vegetation can have numerous benefits such as providing shade, bio-diversity, sinks for carbon dioxide, cooling qualities counteracting the urban heat island effect, buffering from road traffic and aesthetic qualities that encourage pedestrian activity. Traffic and parked vehicles in streets in urban areas, particularly historically important areas, are most visually intrusive. On the other hand, through appropriate design which manages, mitigates and balances the presence of traffic and parking, these streets could have positive economic benefits (through improving the tourism product or increasing real estate value), as well as social benefits through recreational provision and opportunities for social interaction.

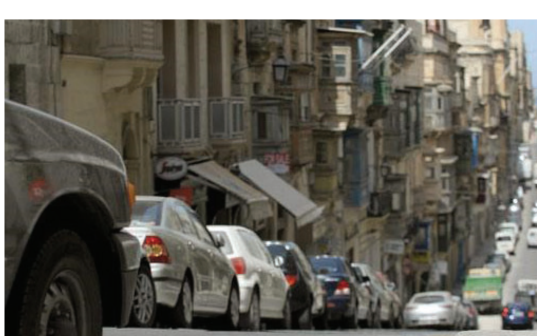


Figure 45.
Unattractive walking environment of a Maltese street

Figure 46.
Example of an attractive walking environment

Figure 47.
Planned open space that encourages pedestrian activity and stimulates economic activity

The social impact of too many vehicles passing through urban areas has been identified as a major issue in Malta. High volumes of traffic passing through urban areas can often sever communities, physically segregating residents from basic amenities and community services (church, health clinics, schools etc.). This can lead to marginalisation of vulnerable groups such as the elderly and a house-bound inactive society.

Figure 48.
Heavy traffic causing community severance

The impact of noise pollution from the increasing volumes of traffic is also a cause for concern, particularly near schools and hospitals.

Lack of driver discipline also results in negative impacts reducing walkability and inducing severance.

Figure 49.
Poor permeability between urban areas

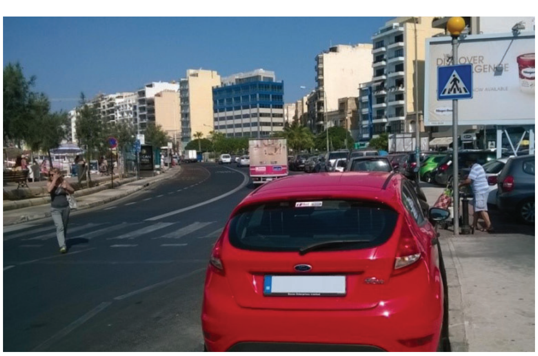


Figure 50.
Legal parking obscuring pedestrians crossing the road

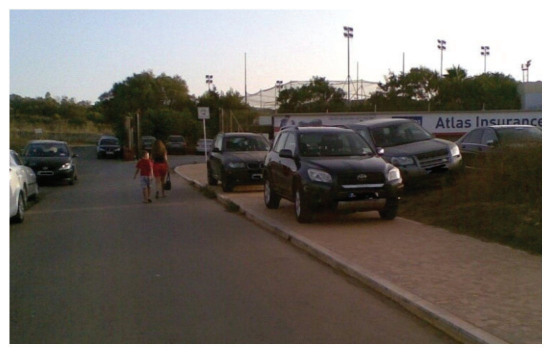


Figure 51.
Parking on the pedestrian footpath forcing people to walk on the road

While enforcement is an important measure, appropriate design of streets can also minimise such behaviour by reducing such opportunities. The design of a street says a lot about what type of mobility and behaviour is being encouraged.

Figure 52.
Illegally parked vehicles obscuring sight lines and reducing capacity of road

PRE

2.2.5.1
DEVELOP A POLICY FRAMEWORK AND DESIGN GUIDELINES TO CREATE A BALANCED APPROACH TO DIFFERENT MODES IN URBAN STREETS AND PUBLIC SPACE

(M)

A significant proportion of urban streets and public space in urban areas in Malta and Gozo is allocated to motor vehicles. Not only does this have a negative visual impact but it also impacts safety and the liveability of streets.

In the past years, very little attempt has been made to redress the growing imbalance in the allocation of street space between provision for motor vehicles and the space needed to create a pleasant living environment for walking and cycling. This also includes the need to increase the presence of soft landscaping and green infrastructures with the aim of greening the urban environment, not only to provide improved environmental conditions for walking and cycling but also to capitalise on benefits such as improved air quality and biodiversity, amongst others.

This measure therefore involves the development of design guidelines for urban streets to: reduce vehicle speeds; create balanced space allocation for alternative modes such as walking and cycling; reduce the visual impact of vehicles; and ensure the appropriate provision and use of trees and soft landscaping to enhance urban environments and improve the environmental quality of transport corridors.

The better use of public space under roads, promenades and squares, could be an opportunity to relocate some on-street parking to make way for urban improvements and needs to be studied.

Similarly, the displacement of through traffic to under road tunnels, where technically feasible, could lead to reduced surface level traffic in urban areas. This would be supported by the redesign and upgrading of the surface level in favour of pedestrians and cyclists, which could also improve the public realm and the environment.

PT

2.2.5.2
DEVELOP MITIGATION MEASURES SO AS TO REDUCE THE IMPACT OF NOISE LEVELS IN URBAN AREA UCA'S AND TOURISM AREAS

(M)

Prolonged exposure to excessive noise can lead to annoyance, stress and sleep disturbance which can cause physiological responses resulting in heart disease, high blood pressure and mental illness.

A significant proportion of Malta's population are exposed to harmful annual average noise levels (beyond 55 dB during the day, evening and night).

Children suffer some of the most adverse effects of noise (disruption of hearing, learning and understanding), particularly when schools are located near busy roads.

The level of noise on roads varies according to traffic volumes, traffic composition, streetscape, and the degree to which noise is mitigated through road infrastructure technology; as well as weather conditions.

This measure involves the allocation of resources to identify the main areas where traffic noise is harmful to human health and to determine the appropriate mitigation measures for vehicles (low noise tyres, better regulation of vehicle exhaust modifications, HGV entry prohibitions), road infrastructure (low noise asphalt pavements, noise insulation street barriers) and planning (location of new schools etc.). This measure will be developed in collaboration with the Ministry for Sustainable Development, the Environment and Climate Change.

PT

2.2.5.3
INTRODUCTION OF ELECTRIC BUSES IN GOZO

(M)

Following a pre-feasibility study, this measure will seek to address environmental impact of traditional public transport by introducing electric buses in Gozo as supported by three key actions:

- Replacement of 12 (9m and 12m) diesel buses by electric buses
- Introduction of Solar Vehicle Charing Ports to charge vehicles at Victoria Bus Terminus.
- Charging Infrastructure to support the electric buses

Charging infrastructure to service the electric bus fleet will be installed in key locations in Gozo. The measure is not technology specific and may include: induction, overhead, classic fast charge pillars or any appropriate mechanism to charge the electric buses.

PT

2.2.5.4
DEVELOP DESIGN GUIDELINES FOR THE DEVELOPMENT OF SHARED SPACE AND HOME ZONES

(M)

Similar to measure 2.2.5.1, this measure aims at achieving a balanced approach to different transport modes in the design of urban streets. However, while measure 2.2.5.1 addresses the provision of design guidance for urban streets in general, this measure focuses on design guidance for shared spaces within residential areas i.e. the provision of home zones.

Shared space is an urban design concept aimed at the integrated use of public spaces. It removes the traditional segregation of the street into a pavement for pedestrians and a central asphalted strip for motor vehicles. The goal of the "shared space" is the taming of traffic by encouraging slower vehicle speed with consequent improvement in road safety.

Motorists' consideration for other users is induced through negotiation of shared areas. Traffic is decreased in favour of walking and cycling and, consequently, the social function of residential streets and quality of life of residents is enhanced. The term 'shared space' is also somewhat interchangeable with other concepts such as the 'home zone', 'pedestrian priority', 'living space' and other similar approaches (TPPI, 2012)[13] .

Shortcomings in the urban environment, and their impact on communities, have led authorities in a number of European countries to look for new solutions. They have tried to tackle a range of environmental, social and transport issues by integrating highway and urban design. The result is residential streets designed primarily to meet the needs of all pedestrians, cyclists and local residents, opening them up for social use, whilst still allowing vehicle access. This is known in the Netherlands as a 'woonerf' or 'living yard. Similar shared-space designs were subsequently implemented in Germany, Sweden, Denmark, France, and Switzerland. In the UK, such streets are known as Home Zones (DFT, 2002)[14].

Each country has its own design guidance / best practice publications on the notion of shared space and home zone systems. If the social, environmental and economic impact of the over dominance of vehicles in urban areas is to be reduced, then the introduction of shared spaces and home zone systems is seen as one of the ways forward. In order to do this, design guidelines, researched and developed specifically for the Maltese context will be required. Such design guidelines need not only address residential areas but could also address specific uses, requiring safer environments, such as the immediate areas surrounding schools.

PT

2.2.5.5

SET UP A SUSTAINABLE MOBILITY UNIT WITHIN TRANSPORT MALTA TO WORK WITH LOCAL COUNCILS IN THE REDESIGN OF LOCAL STREETS

(S)

While Transport Malta is responsible for the construction of new local streets, the maintenance or refurbishments of such streets is the responsibility of the respective local councils. Any proposals for the redesign or refurbishment of local streets would therefore come from the local council which would request a permit from Transport Malta. Such proposals should promote sustainable mobility and should be produced according to the Design Guidelines which will be produced in measures 2.2.5.1 and 2.2.5.3. It is therefore necessary for Transport Malta to work hand in hand with local councils, and the setting up of a Sustainable Mobility Unit within Transport Malta, will facilitate this and provide the expertise required to ensure that such proposals promote sustainability mobility in relation to the said design guidance but also in the interim. The unit will also be responsible for the development of the guidelines in measures 2.2.2.4, 2.2.5.1 and 2.2.5.3 and will form part of the multi-organisational team in measure 2.2.2.3.

[13] *TPPI (2015) Healthy Mobility in Sliema, A Case Study – Retrieved from: http://tppi.org.mt/images/reports/sliema%20 mobility.pdf*

[14] *Department for Transport (2005) Home Zones – –Retrieved from: http://www.rudi.net/files/homezones.pdf)*

PT ○ ○ ● ○

2.2.5.6
DEVELOP A FUNDING PROGRAMME FOR THE REDESIGN/REFURBISHMENT OF LOCAL STREETS ACCORDING TO THE DESIGN GUIDELINES FOR URBAN STREETS AND HOME ZONES

(S)

If Objective 2.2.2 and 2.2.5 are to be achieved, infrastructural improvements are not only required at the strategic level but also at the local level. To improve conditions for alternative mobility such as cycling and walking, redesign and refurbishments of local streets, according to the design guidelines for urban streets and home zones to be developed under measures 2.2.5.1 and 2.2.5.3, will be required. This would also include any design guidance aimed at developing cycling friendly streets as outlined in measure 2.2.2.4.

Emphasis needs to be placed on the importance of designing urban street environments and residential areas for walking and cycling. Having said this, financial resources at a local council level are limited. This measure is therefore aimed at addressing this need. A specific funding program will be developed and made available for Local Councils to participate with the aim of improving the environment of local streets in relation to the relevant design guidelines as set out by Transport Malta.

2.2.6
REDUCE THE IMPACT OF HGV'S ON URBAN AREAS AND THE ROAD NETWORK

Issues

Goods carrying vehicles represent around 5% of national traffic on a typical weekday. However, during the morning peak hour, the proportion of these vehicles increases significantly to represent almost 11% of the total traffic composition. The longest and heaviest goods carrying vehicles are generally engaged in the transport of goods being imported or exported though Malta's external maritime ports. Distances between ports and the freight operators' warehouses and stores in the hinterland are generally quite short.

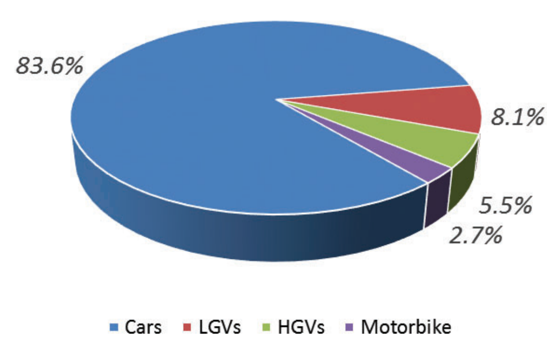


Figure 53.
Traffic Composition during AM peak hour

On the other hand, 88.7% of freight movement relates to internal distribution of goods. This is largely uncoordinated and inefficient in terms of loading factors (involving many empty or half-loaded runs). Freight distribution is largely unregulated with a high proportion of trips being made by 'own account' operators which fall outside of the main EU regulatory frameworks. Urban logistics at a national level is still at a rudimentary level when compared with Malta's international goods transport operations.

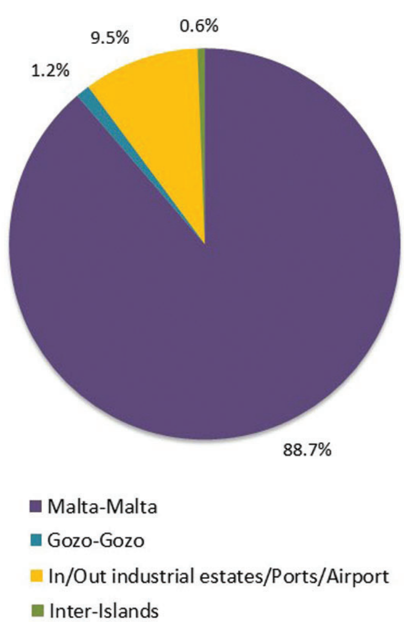


Figure 54.
Survey of Road Freight movements (2014)

The freight sector requires further regulatory and policy development in the training of Dangerous Goods Safety Advisers, urban logistics management, freight distribution and carriage of perishable goods. Authorities currently do not have sufficient capacity and lack certain modern inspection equipment needed to effectively monitor and enforce the operation of this sector. Particular problems are experienced in enforcing the compliance of goods carrying vehicles with the maximum permissible weights and dimensions regulations. Overloaded or oversized vehicles damage the road network and reduce its lifespan.

The general shortage of safe, dedicated off-road parking areas for goods carrying vehicles and the lack of provision for loading and unloading in commercial areas often results in goods vehicles stopping or parking illegally. This evidently compounds traffic congestion problems during busy times.

Measures

PRE

2.2.6.1
REVIEW AND UPDATE THE POLICY FRAMEWORK FOR THE REGULATION, MONITORING AND ENFORCEMENT OF HGV'S

(S)

Although information on licensed road haulage operators and their vehicles is now contained in a national database, there is little or no information available to the authorities to monitor the activities of this sector (movements, types of operations, locations of stores, services etc.) to be in a position to better, plan, regulate and provide for this important sector.

This measure involves the organisation of periodic sector surveys and the setting up of a comprehensive database that will be used to better assess journey routings, types and sizes of HGVs, types of operation and their likely damage to road infrastructure. This database of information, combined with investment in modern technologically advanced means of enforcement for roadside roadworthiness testing, checking driving times and resting periods and verifying the weights and dimensions of HGVs will support more effective monitoring and enforcement of this sector.

PD

2.2.6.2
INTRODUCE PROVISION OF SAFE OFF-STREET OVERNIGHT PARKING AREAS FOR HEAVY VEHICLES

(M)

This measure involves the provision of a safe and secure overnight parking facility for goods carrying vehicles as part of the TEN-T Marsa Addolorata junction project which will be implemented in 2018. This safe off-street parking facility is conveniently located on the TEN-T intermodal road connection between the maritime ports of Valletta and Marsaxlokk and the airport.

PT

2.2.6.3
DEVELOP AN ACTION PLAN FOR THE MANAGEMENT AND REGULATION OF FREIGHT TRANSPORT AND 'LAST MILE' URBAN LOGISTICS

(M)

Urban centres commonly experience traffic problems as a direct result of inefficiencies in goods delivery operations, illegal parking and the use of unsuitably large and high polluting vehicles which negatively impact on the urban fabric and public health.

Clearer regulation of freight transport operation in urban areas is needed at a national level to protect the urban environment, to reduce air pollution, to reduce the incidences of traffic infringements and to reduce congestion on Maltese roads (particularly during peak hours). At the same time, opportunities exist through the better application of freight logistics to improve the efficiency of road freight operation, to reduce the number of empty runs and therefore to make significant operational cost savings. Studies would include the potential to use smaller green freight vehicles and cargo / e-cargo bikes for ´last mile´ urban logistics.

This measure therefore involves the development of an Action Plan in collaboration with stakeholders involved in road freight operation for the management and regulation of freight transport and 'last mile' urban logistics. A pilot project for Valletta will be developed to test the concept of sustainable last mile delivery of goods within Valletta.

2.2.7 ENSURE A HIGH LEVEL OF SERVICE ON THE TEN-T CORE AND COMPREHENSIVE NETWORK

Issues

The European Union has a new transport infrastructure policy that connects the continent between East and West, North and South. This policy aims to close the gaps between Member States' transport networks, remove bottlenecks that still hamper the smooth functioning of the internal market and overcome technical barriers such as incompatible standards for railway traffic. It promotes and strengthens seamless transport chains for passenger and freight, while keeping up with the latest technological trends.

Under this new European transport policy, 22km of Malta's Strategic road network have been designated as forming part of Malta's TEN-T core network and a further 90km of national strategic roads fall under the designation of the TEN-T comprehensive network.

The TEN-T core network is of the highest strategic importance for achieving the objectives of the trans-European transport network policy, and shall reflect evolving traffic demand and the need for multimodal transport. It shall, in particular, contribute to coping with increasing mobility and ensuring a high safety standard as well as contributing to the development of a low-carbon transport system. **This network needs to be completed by 2030**. The road infrastructure along the TEN-T core network needs to be of high quality, express road standard.

The TEN-T comprehensive road network shall comprise a conventional strategic road (not a motorway or express road) but which is still a high-quality road. The TEN-T comprehensive network shall be upgraded to improve road safety, improve road efficiency using ITS and mitigate congestion. **This network needs to be completed by 2050.**

In Malta, several sections of the conventional strategic roads pass though busy urban areas which act as bottlenecks. Here it is difficult to increase road capacities for motor vehicles by road widening or new road building, so the general approach will be to increase road capacities through measures to enhance numbers of travellers passing through the link rather than the number of vehicles.

Integrated long term planning with utility services that pass through roads has, in a number of past projects, not been effective and new buried services and repair work on old existing services has had to be carried out shortly after the completion of the road infrastructure projects. This negatively impacts on the full life-cycle of the project therefore improved and more integrated planning will be required to complete the new TEN-T network.

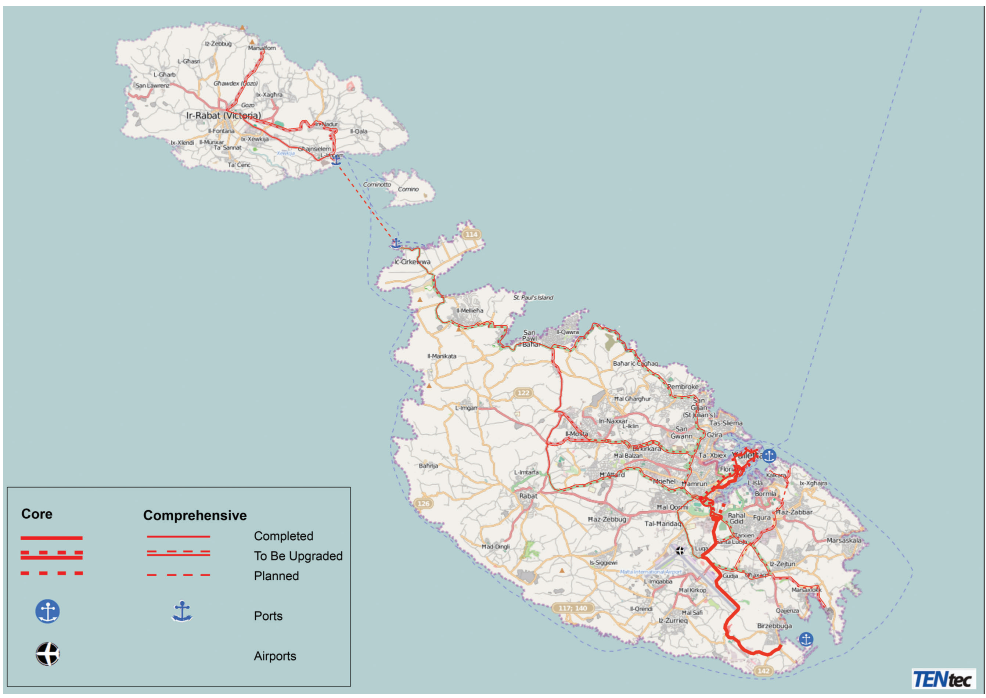


Figure 55.
Malta's TEN-T Network
since 2014

The table below identifies the 29 road sections required to complete the TEN-T network (Core and Comprehensive) as required by Regulation (EU) 1315/2013 within the 2030 and 2050 timeframes referred to above.

For measures that are to be carried out in the lifetime of this Master Plan identified in Section 7.3, due consideration as to environmental impacts and benefits have been described in Chapter 5. Other measures listed in Table 1 have also been assessed under Appropriate and Strategic Environmental Assessment frameworks; however these will need to be reviewed under the respective environmental frameworks when preparing plans that follow this Master Plan.

	TEN-T Section	TEN-T
1	Remove traffic bottleneck at [nodes EA20a-EA21a] - Addolorata junction, Marsa	Core
2	Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara	Comprehensive
3	Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa	Core
4	Removal of bottlenecks, improving road infrastructure quality and reducing severance (where possible) on Regional road [Nodes EA16-WA19], Msida	Comprehensive
5	Make more efficient use of road space and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta	Core
6	Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's	Comprehensive
7	Removal of bottlenecks between Birkirkara Bypass and Mosta Road [Nodes WA1-NA21] - Birkirkara, Lija	Comprehensive
8	Upgrading of Mriehel Bypass [Nodes WA18-WA8] and removal bottleneck / reduce functional conflict between traffic and urban activity [Nodes WA7 -WA18], Mriehel	Comprehensive
9	Upgrade of Regional road [Nodes EA13-south of EA14] including Sun Yat-Sen tunnels and Guze Ellul Mercer bridge and reducing severance, San Gwann	Comprehensive
10	Malta-Gozo Fixed Link	Comprehensive
11	Redesign to make more efficient use of restricted road space [Nodes WA23-WA19] / Upgrade of bottleneck [Node WA13], Luqa, Qormi	Comprehensive
12	Removal of bottleneck and functional conflict between high traffic flows and urban activity at Notary Zarb Street and Mdina Road [Nodes WA8-west of WA10], Attard	Comprehensive
13	Remove bottlenecks at EA16 upgrading Birkirkara Bypass and reducing severance [Nodes EA16-WA1] – Birkirkara	Comprehensive
14	Removal of bottleneck and reduce severance between urban communities [Nodes SA12-SA11] - Triq Tal-Barrani, Tarxien	Comprehensive
15	Removal of bottleneck and upgrading quality of road infrastructure on Triq tal-Barrani and Sta. Lucija Ave. [Nodes EA21-SA11 and SA12-SA12b] - Ghaxaq and Marsa	Comprehensive
16	Upgrade of existing link and construct missing link from Tal-Barrani to Smart City [Nodes SA12-SD9-SD7], Fgura and Zabbar	Comprehensive

	TEN-T Section	TEN-T
17	Upgrade road quality at Valletta Ring Road [Nodes EA6-EA6]	Core
18	Upgrading alternative link from Victoria to ferry port [Nodes GA34-GA44-GA37] and removal functional conflict with urban activity [Nodes GD8-GA46], Nadur Road, Gozo	Comprehensive
19	Removal of bottleneck at Victoria and removal of functional conflict between high traffic flows and urban activity [Nodes GA33-west of GA30] - Victoria Bypass, Gozo	Comprehensive
20	Upgrading of road infrastructure quality on Marsalforn Road [Nodes GA32-GA41] - Victoria to Marsalforn, Gozo	Comprehensive
21	Redesign to address conflicting road function (high traffic volume and high urban activity area) [Nodes NA3-NA4] - Ghadira, Mellieha	Comprehensive
22	Removing bottleneck and functional conflict between high traffic volume and urban activity at Xemxija Road [Nodes NA6-NA7] - Xemxija Bypass, Xemxija	Comprehensive
23	Removing bottleneck in Burmarrad at [Nodes ND2-NA8], St. Paul's Bay	Comprehensive
24	Upgrade of road infrastructure quality [Nodes ND12-NA22 and NAD3-NA22], Mosta	Comprehensive
25	Remove conflict between high traffic flow and urban activity [Nodes SA13-SA12b] - Triq Tal-Barrani Triq Ghar Dalam, Ghaxaq	Comprehensive
26	Improve road quality and reduce traffic impact in village centre on Marsaxlokk Road [Nodes SA13-SD16], Marsaxlokk	Comprehensive
27	Upgrade quality of road infrastructure on Triq Hal-Luqa [Nodes WA22-SA11], Sta. Lucija	Comprehensive
28	Improve road infrastructure quality and reduce functional conflict between high traffic flows and urban activity on Ghaxaq Bypass [Nodes WA24-SA12a] – Ghaxaq	Comprehensive
29	Upgrade of road infrastructure quality on Triq Hal-Tarxien [Nodes SA13a-SA12], Gudja	Comprehensive

Table 1.
TEN-T Road sections legally required to complete the TEN-T network (Core and Comprehensive)

As of 2015, 73% of the TEN-T Core road network and 32% of the TEN-T Comprehensive road network has been completed.

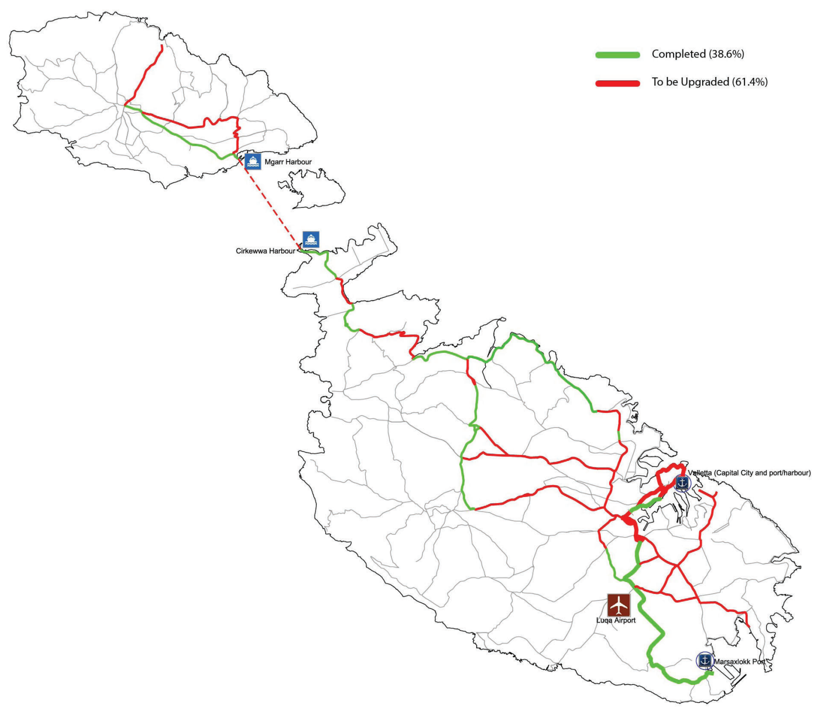


Figure 56.
Status of Completion of TEN-T Road Network (2015)

Measures

PT

2.2.7.1
TEN - T CORE AND COMPREHENSIVE NETWORK

(S/M/L)

Of the entire list of TEN-T interventions required, this master plan considers the top six sections requiring intervention as follows. The remaining sections will be addressed in the next master plan for the period 2026 onwards.

This Master Plan also considers the ongoing preparatory studies for the Malta-Gozo fixed link, which is one of these remaining sections.

Each of these measures have been appraised on an individual basis (vide Chapter 3) and then in a combined form for the two scenarios considered (vide Chapter 4).

	TEN-T Section	TEN-T
1	Remove traffic bottleneck at [nodes EA20a-EA21a] - Addolorata junction, Marsa	Core
2	Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara	Comprehensive
3	Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa	Core
4	Removal of bottlenecks, improving road infrastructure quality and reducing severance (where possible) on Regional road [Nodes EA16-WA19], Msida	Comprehensive
5	Make more efficient use of road space and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta	Core
6	Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's	Comprehensive

Table 2.
TEN-T Road measures short listed for scenario analysis

2.2.8
IMPROVE THE FUNCTIONALITY OF STRATEGIC ROADS, PROVIDING SECONDARY CONNECTIVITY AND IMPROVING THE QUALITY OF URBAN AREAS

Issues

The road network classification which is set out in the 1992 Structure Plan, has not been updated and is in need of review as a result of: overlapping of different hierarchies, the construction of new strategic roads which have not been classified; and changes in functionality due to spatial development patterns over the years.

As an example, many arterial roads (Figure 58) originally constructed as edge-of-town bypass roads now have development on both sides thereby reducing functionality, increasing disruption to traffic flows and restricting opportunities for widening to accommodate growth in demand.

(*)There may be variations between the legend classification and that being shown in the document. The classification has not been updated since 1990 and therefore the classification that is assigned is primarily for modelling purposes.

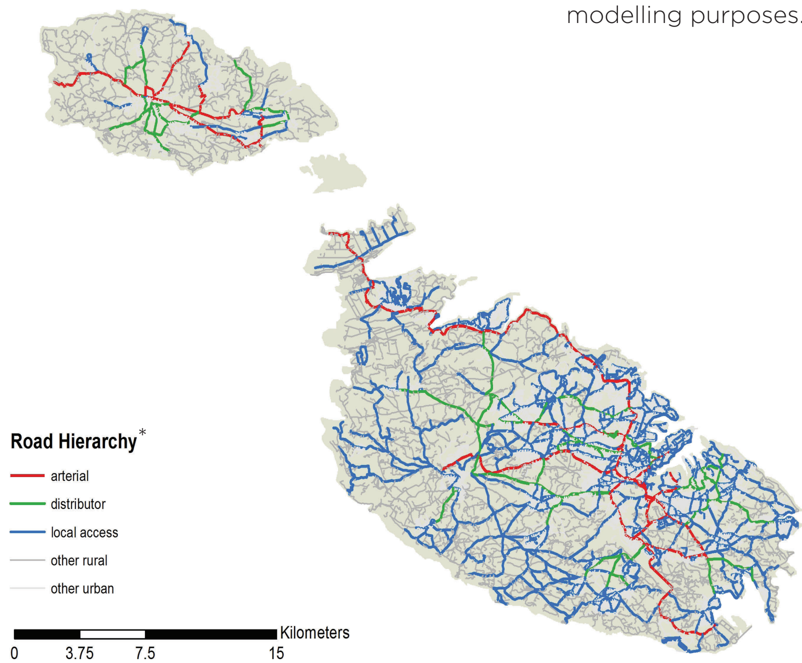


Figure 57.
Malta's Strategic Road Network

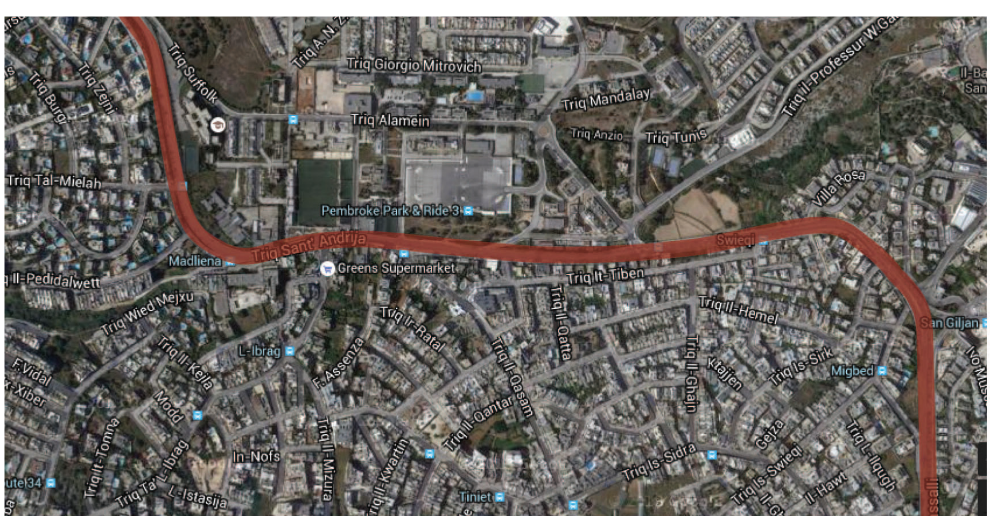


Figure 58.
TEN-T Comprehensive Road passing through dense urban area

Additionally, when strategic roads pass through urban centres (highlighted in yellow in Figure 59), conflicts exist between the functional requirements of roads for traffic flow, existing activities and kerbside development along these roads e.g. Mosta, Zabbar, San Gwann, Hamrun, Birkirkara, Msida, Attard, and Naxxar. In such cases the road treatment needs to address the presence of urban activity and would require a different approach than that of a typical Arterial or Distributor road.

The review of the classification may therefore consider whether the hierarchal levels are sufficient.

Interestingly, while Arterial and Distributor roads only account for 7.5% of the road network, they carry up to 58.5% of traffic. This implies that the roads carrying the highest volume are indeed correctly classified as strategic roads.

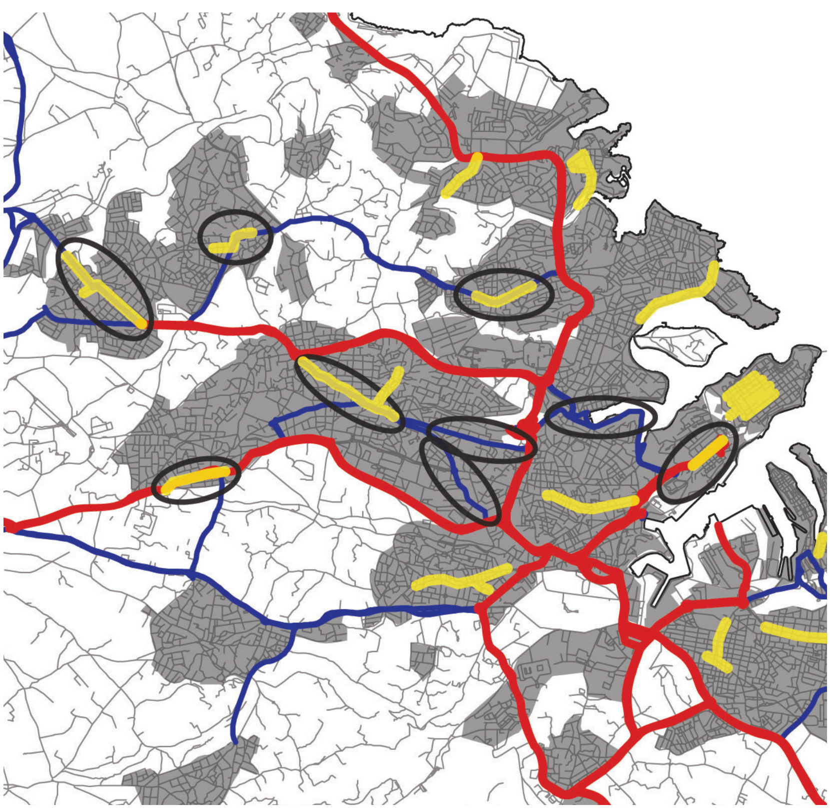


Figure 59.
Examples of Road Categorisation in conflict with use

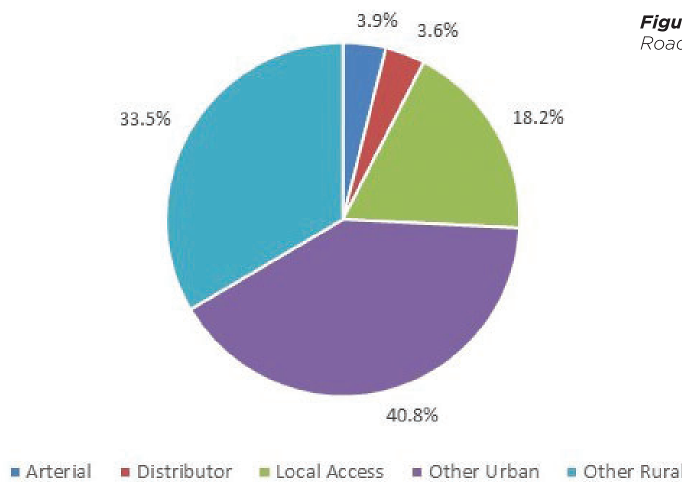


Figure 60.
Road Lengths by Category

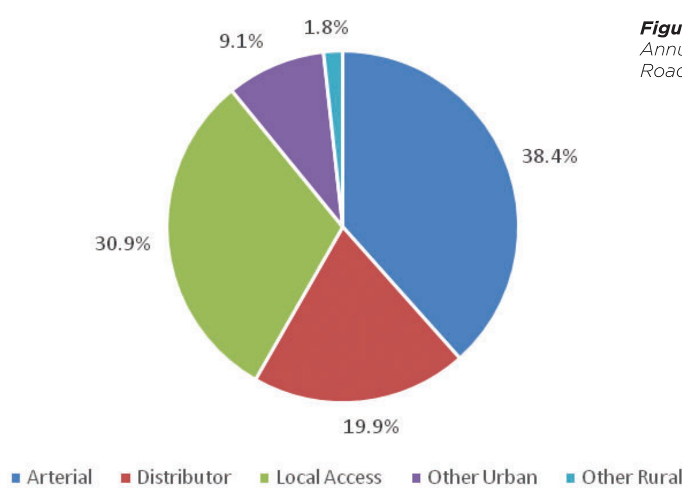


Figure 61.
Annual Distance Travelled by Road Category

Having said this, there are a number of roads experiencing heavy traffic flows of greater than 1000 vehicles per hour which do not for part of the Arterial road network Figure 62) The review should therefore consider whether in such cases capacity can be increased and roads upgraded, whether capacity can be increased by transport modes other than the private vehicle or whether through traffic flows can be diverted onto other routes.

The road classification therefore needs reviewing in relation to the functionality of the network by revisiting the hierarchy as well as re-classification of roads as required. In doing so, the aim will also be to improve the quality of urban areas.

Segregated and multi-level infrastructure within the urban environment creates severance between communities due to physical size and design of surrounding infrastructure. Severance is also an issue due to traffic volumes in some town centres.

A detailed analysis is therefore required to identify where the pedestrian environment can be improved so as to reduce severance. Objectives to reduce severance and improve urban quality should therefore form part of the project briefs.

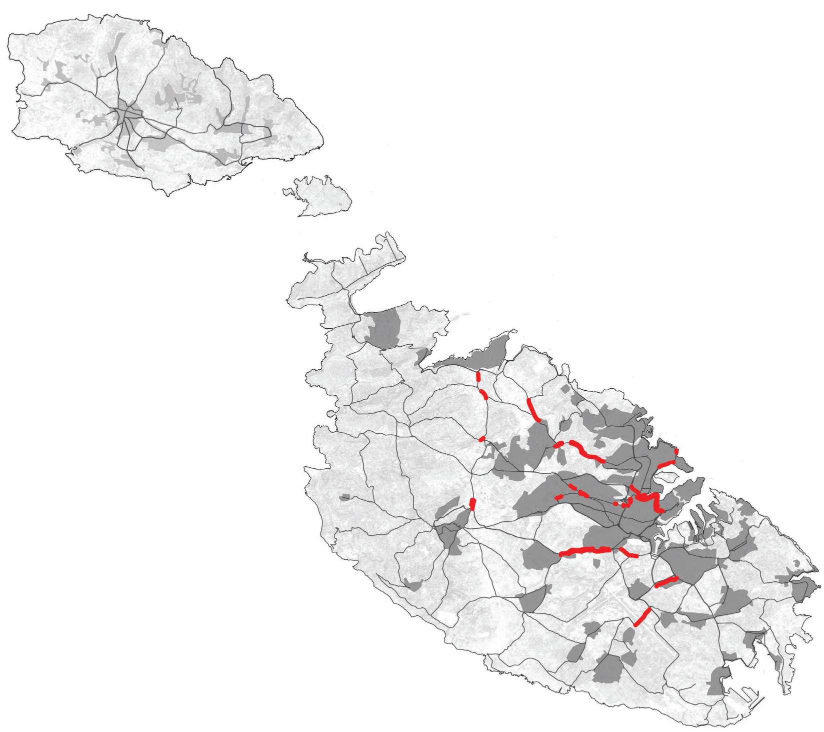


Figure 62.
Non-arterial roads with high levels of traffic (>1,000 veh/h)

Measures

PD

2.2.8.1
REVIEW AND CLARIFY THE ROAD NETWORK CLASSIFICATION

(S)

Changing a road from one category to another e.g. from Local Access Road to Distributor Road or vice versa can be a useful measure in any management strategy aimed to reduce traffic congestion.

Changes in road classification often reflect the practical usage of the road or address problems (traffic, safety and environmental) that may have arisen from an inappropriate level of usage. Before changing the classification of a road it is important to take the necessary steps to modify the existing link (pavement, signage, services etc.) to allocate the appropriate levels of road space to vehicles, pedestrians and other road users depending on the function and category of the new road.

Creating the appropriate balance between the allocations of space is challenging when there is not sufficient space to satisfy all requirements between transport modes. This is where the road or street classification becomes essential, as it can guide the design approach depending on the classification. In such cases, it is important to recognise the function of roads and streets not only as having a movement function, but also as being places in their own right. Jones (Carmona, 2012) describes this as the 'Link' and 'Place' function as shown in figure 63

These objectives are conflicting when space is limited. One approach to dealing with this is to develop a link/place matrix approach to the road/street classification as illustrated in figure 64.

Transport for London has recently adopted a similar approach in their newly launched Street Types Matrix (Figure 65).

Figure 63.
Conceptual classification Roads and Streets

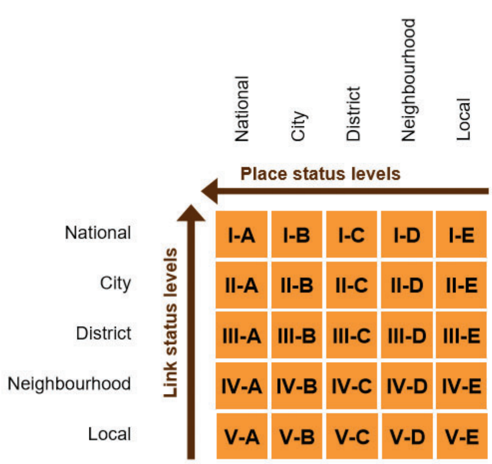


Figure 64.
Example of detailed classification matrix Source: Jones et al (2007)

Figure 65.
Street Types Matrix (Transport For London)

Through an in-depth analysis of Maltese streets and their respective contexts this measure intends to redevelop the road and street classification to incorporate the concept and functionality of both place and movement thereby developing design guidelines according to the classification with both objectives in mind.

While it is expected that the reclassification of these roads to reflect their use will have minimal environmental effects, the Appropriate Assessment (see Chapter 5) has identified their proximity to Natura 2000 sites and careful consideration of the impacts of such reclassification needs to be carried out during project implimentation.

PD

2.2.8.2

CLASSIFY ROUTE 120 FROM (TAL-BALAL TO BIRGUMA) ACCORDING TO ITS DESIGN AND BUILD AS A DISTRIBUTOR ROAD

(S)(M)

Classify the link road built some years ago according to its current function and context.

Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

When this link road was constructed, the classification of the road network has neither been coded nor identified as a Distributor Road as designed and built.

PT

2.2.8.3

IMPROVE PROVISION FOR PEDESTRIANS, CYCLING AND PUBLIC TRANSPORT AND CHANGE FUNCTIONALITY OF ND9 (NAXXAR/GHARGHUR) TO ED1 (SAN GWANN)

(S/M)

Improve provision for pedestrians, cycling and public transport and change functionality to redirect through traffic away from this route and onto the TEN-T network which runs almost parallel to this route.

Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

PT

2.2.8.4
IMPROVE PROVISION FOR PEDESTRIANS, CYCLING AND PUBLIC TRANSPORT AND CHANGE FUNCTIONALITY OF ROUTE 127 (ST. JULIAN'S TO TA' XBIEX)

(S/M)

Improve provision for pedestrians, cycling and public transport and change functionality to redirect through traffic onto the TEN-T network.

Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

PT

2.2.8.5
IMPROVE PROVISIONS FOR PEDESTRIANS, CYCLING AND PUBLIC TRANSPORT AND CHANGE FUNCTIONALITY OF EA16 (UNIVERSITY SKATEPARK) – ED3 – ED3A (MSIDA) – ED4 – EA5 (PORTES DE BOMBES)

(S/M)

Improve provision for pedestrians, cycling and public transport and change functionality to redirect through traffic onto the TEN-T network.Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

PT

2.2.8.6
IMPROVE PROVISION FOR PEDESTRIANS, CYCLING AND PUBLIC TRANSPORT AND ADDRESS CONFLICTING TRAFFIC FLOWS AND URBAN ACTIVITY AT WD11 (ZEBBUG) – WA13 (QORMI

(S/M)

Upgrade and review functionality and use of road space to encourage modal shift, addressing conflict between high traffic flows and urban activity between WD14 and WA13 (Qormi Town Centre).

Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

PT

2.2.8.7
REVIEW THE STRATEGIC FUNCTIONALITY OF ROUTE 132 (MARSA RACE COURSE ROAD) BETWEEN THE CORE TEN-T NETWORK AND THE PARK & RIDE TO IMPROVE ACCESSIBILITY FOR ACTIVE AND PUBLIC TRANSPORT MODES

(S/M)

Review Strategic Functionality of the route for a Potential Bus Priority Route from the TEN-T Core network (December 13th road) to the Marsa P+R, to address a bottleneck of public transport access to the interchange. Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

PT

2.2.8.8
IMPROVE PROVISION FOR PEDESTRIANS, CYCLING AND PUBLIC TRANSPORT TO ENCOURAGE MODAL SHIFT ON THE ROAD SECTION WD18 TO WA24 (TUNNEL UNDER RUNWAY)

(S/M)

Improve provision for pedestrians, cycling and public transport to encourage modal shift.

Secondary network to the TEN-T network has a number of instances where developments over time have needed that the classification of the road is changed.

2.2.9
ENSURE EFFECTIVE AND EFFICIENT MANAGEMENT OF ROADS AND RELATED EQUIPMENT ENSURING QUALITY AND SUSTAINABILITY OF INVESTMENT THROUGH REGULAR MAINTENANCE

Issues

Regulations relating to the road classification system date back to 1992. Legislation enacted since that time has the responsibilities for management of formed roads between central Government (arterial and distributor roads) and local Government (local access roads).

Inspections and updating of data on road condition are carried out in a fragmented manner. The last nationwide report was carried out in 1998, which was partially updated in 2005.

A Comprehensive Asset Management System to support prioritisation of maintenance has never been in put place. The maintenance of roads, particularly at the local level, is therefore of concern.

In the last 15 years or so, there has been unprecedented investment in upgrading the strategic road network which handles 60% of the traffic in Malta and Gozo on a typical day. These new road infrastructures (e.g. St. Paul's Bay Bypass, Coast Road, Council of Europe Road etc.) are acknowledged to be high quality. These strategic roads have been planned, prioritised and implemented in a systematic manner since 2004.

However, in terms of length, these strategic roads represent only a small proportion of the total road network. To access to these strategic roads, motorists need to pass through lower category roads, the condition of which is highly variable in quality. An example is the quality of road signage and road markings. While clear road signage and visible road markings exist on most of the strategic road network, signage on lower category distributor and local access roads is more sporadic and road markings often fade very quickly.

A recent survey of tourists highlighted that directional signage needs to be improved. The problem is often compounded by the lack of space in footpaths and verges to house appropriately sized road signage, which reduces their visibility and legibility. Additionally, there is no comprehensive overview or planning between the road signage and markings on the strategic roads falling under central Government and local roads falling under local Government.

Road signage and street furniture is also limitedly documented and not geo-referenced; consequently, replacement of damaged street furniture such as crash barriers may be a lengthy process.

Road design and construction specifications and standards introduced in 2003 had brought about a radical change in the lifecycle planning and design for roads, with the classification of different types of road pavements according to road function and traffic volumes. Technologies, standards and construction methods change over time to reduce the cost, and generally improve the resilience and longevity of the infrastructure investments. However, the Maltese road design and construction specifications and standards, which are commonly reproduced in tender documents for road works, have never been comprehensively reviewed or updated since their launch. Improvements to reflect changes in technological advancements and legislation e.g. from British codes to Euro codes, are usually dealt with in the relevant specifications and appendices within individual contracts.

From a water management perspective, the increase in urbanisation has led to capacity problems with service infrastructure leading to flooding during storms. There is no coordinated forward planning between the entities concerned that takes into account the impact of climate change on transport infrastructure and potential adaptation measures.

Centralised, detailed information on the location of buried utility services is lacking and there is a lack of integrated long term planning of investments to meet future demands between road network infrastructure and buried service utilities.

With regard to data collection systems an opportunity exists to routinely build these into the infrastructures being developed, so as to have less resource intensive, continuous data reporting and analysis.

Despite significant transport infrastructure investment over the past 10 years, the level of investment in Malta falls well below the OECD target for developed countries (1% of national GDP). This is mainly due to lack of national finances being made available for road maintenance.

Additionally, revenue generation from transport (vehicle licensing, taxation) has no bearing to infrastructure works or maintenance. As a result, insufficient levels of maintenance reduce the lifespan of new road infrastructures drastically and result in a poor return on investment.

Concurrently, due to lack of finances and technical resources at local council level, much of the major works are taken over by Transport Malta even though this is not legally provided for in the legislation. This leads to diminished resources for the strategic arterial and distributor road network.

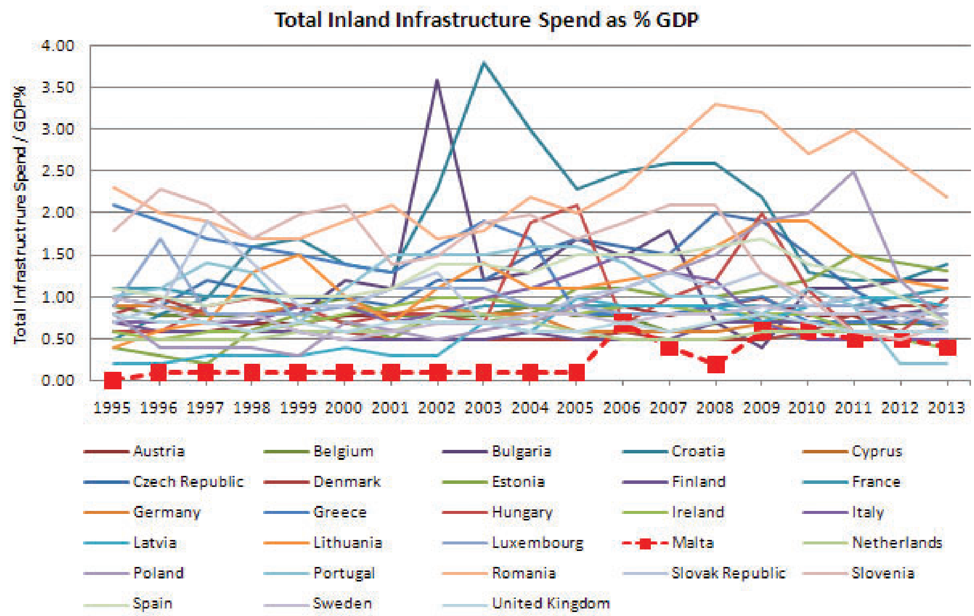


Figure 66.
Total Inland Infrastructure Spend as a % of GDP

Measures

S

2.2.9.1
SET UP AN ASSET MANAGEMENT SYSTEM AND ASSET MANAGEMENT PLAN FOR THE ROAD NETWORK

(M)

The current system of planning for road maintenance and upkeep is mainly based on short-term prioritisation and reactive measures taken after storms, accidents etc. The lack of strategic long term planning in road maintenance is a direct result of the lack of centralised knowledge on the condition of the road network assets at a national level and the lack of medium to long-term financial planning.

Without an asset management plan or programme in place there is no guarantee that sufficient funding would be made available each year to carry out road maintenance in a comprehensive and effective manner.

The aim of setting up an Asset Management System is the first step required to provide a more structured approach to road maintenance to enable Transport Malta and eventually local Government to better operate, maintain and restore ‘road assets’ to meet key performance requirements.

Asset management is a strategic tool that uses information to look at the whole road network rather than individual schemes. It involves collecting physical inventory and managing current conditions based on strategic goals and sound investments. The setting up of an Asset Management System will require four main processes to be undertaken:

a) Set up an inventory of assets and continually update the data;

b) Assessment of the current condition of the asset;

c) Establish the level of service to achieve from each road according to road type and its level of use;

d) Devise an optimised and prioritised plan to achieve objectives and maximise the asset value, using the most cost-effective method possible.

This measure shall involve establishing the necessary organisation set-up to inspect and systematically collect and collate data (using GIS) on the condition of road infrastructure, markings, and equipment; establish asset values and levels of service required for each section of road and development of an asset management plan which identifies required works, quantifies and prioritises implementation works over the short, medium and long term.

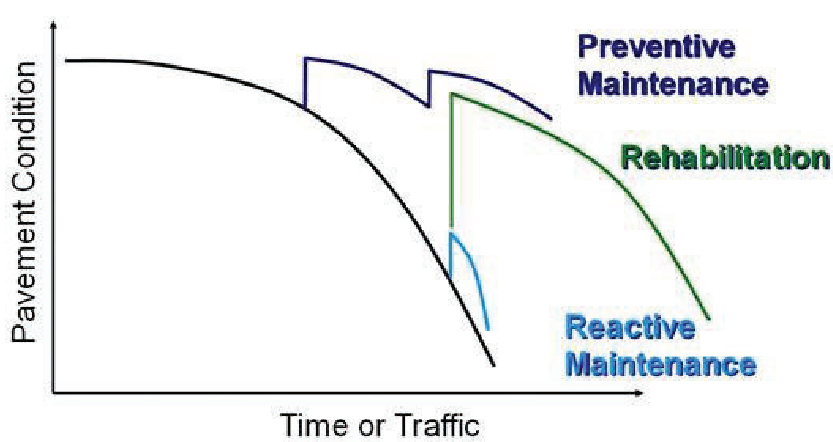


Figure 67.
Types of Maintenance and Time

PT

2.2.9.2

INCREASE THE IMPLEMENTATION OF SERVICE CULVERTS AND SUSTAINABLE STORM WATER MANAGEMENT IN LOCAL ROADS

(S/M)

The utility services infrastructure - the pipes and cables that deliver utility services to homes and which supports urban living - is usually buried beneath the urban streets (roads, footpaths and paved pedestrian areas).

It follows that street works to install, replace, repair or maintain these utility service pipes or cables using traditional trench excavations will disrupt traffic and people movement, and will often significantly damage the surface transport infrastructure and the ground on which it bears.

It is clear, therefore, that the ground and physical (i.e. utility service and surface transport) infrastructures exist according to a symbiotic relationship: intervene physically in one, and the others are almost inevitably affected in some way, either immediately or in the future.

Apart from a few major road infrastructure projects (such as the roads constructed under the 5th Italian Protocol and TEN-T network), there has been little or no attempt at integrated long-term planning of road infrastructure with service utilities, particularly non-strategic roads. Service utility entities generally financially plan for cable and pipe replacement and upgrade according to their own priorities, which often do not coincide with road infrastructure priorities which often would require the securing of additional financial allocation. The lifespan of new road infrastructure is drastically reduced when old service utilities need to be repaired, replaced or upgraded; thus reducing the cost effectiveness of investment in road infrastructure.

The implementation of more service culverts and extending the system of storm water management to all roads would necessitate better communication between road planners and utility planners in the long term provision of road infrastructure. It will involve clear centralised geo-mapping of all sub-road infrastructures, prioritisation of road infrastructure investments and securing budgets for utility upgrade on these roads. This measure will also explore measures to enhance the lifespan of roads by minimising the need for interventions e.g. use of parallel service culverts beneath footpaths in busy urban areas.

With regard to storm water management, storm water drainage systems are implemented within new major projects on the strategic road network. Within local roads however, storm water management systems are generally not present. This creates an issue particularly in dense urban areas where flooding during the rainy season is increasingly present. As more and more surface areas become impermeable and climate change leads to increased rain intensity, there is the need to develop storm water management in local roads either through traditional storm water systems or through sustainable urban drainage systems where permeable surfaces and increased vegetation is used to reduce rain water run-off.

PD

2.2.9.3
DEVELOP AN ACTION PLAN TO IMPROVE THE QUALITY OF STREET FURNITURE AND INFORMATION

(S)

This measure involves the collection of data on existing road signage (type, location, condition) and its geo-referencing using GIS (part of asset management system). The existing road signage will be verified against design, location and size standards to create a more harmonised and rationalised approach between all road categories.

A comprehensive plan for directional signage shall be prepared at a national level to ensure clear directional signage is provided along links and at main junctions for the most popular and important destinations.

Testing of durability of road marking materials shall continue to determine the most cost effective paint material for different road types.

PD

2.2.9.4
REVIEW AND UPDATE ROAD SPECIFICATIONS AND STANDARDS

(S/M)

National road design and construction specifications and standards have not been reviewed or updated for 15 years. This measure will involve a step by step process to update the specifications that takes into consideration best international practices, proven technologies and conversion to equivalent Euro code standards (where applicable).

2.2.10
IMPROVE ROAD SAFETY THROUGH BETTER RESEARCH, ENGINEERING, EDUCATION AND ENFORCEMENT

Issues

Poor driver behaviour and discipline contributes significantly to road safety issues. There is a compelling need to address illegal road user behaviour to improve driver discipline. This includes, in particular, drink-driving, driving under the influence of drugs, over speeding and use of mobile phones while driving. As the National Road Safety Strategy aims to reduce the number of fatalities and injuries by 2020, significant work remains to be done.

While most of the road accidents occur in Northern and Southern Harbour area, important data sets (such as road accident data) that are collected lack important details that are required for road accident safety analysis. This creates problems in identifying and describing the exact accident location and limits the effectiveness of the interventions made to address the cause of accidents. It also causes issues with Malta’s ability to report required levels of data to CARE/Eurostat and thereby participate in cross-EU analysis of road safety policy. Coupled with this, only a limited number of road accidents are reported by the Police (i.e. those that include loss or damage to life and property) and the integration of data sets from the various responders to incidents and accidents continues to be a challenge.

A large proportion of accidents occur on the strategic road network necessitating the need to improve road safety on this important part of the network.

However, there is no risk exposure information currently published for pedestrians, cyclists and motorcyclists and there is generally a lack of travel data for these transport modes, resulting in these methods of mobility being relatively invisible to the transport entitles. 16% of road casualties also involve pedestrians; however there is minimal understanding as to how or why these casualties arise. This understanding is needed to be able to develop ways of reducing such accidents.

There is the need to improve the understanding on how to design safer roads, especially for pedestrians, cyclists and other road users. There is also scope to improve Health and Safety of the work site during road works – for both the workers and the road users.

There are five major bridges of more than 50m in length and five tunnels of more than 100m (and less than 500m) in length, but currently there is no data available to allow a comprehensive diagnosis of the state of repair of tunnels, viaducts and bridges across the Maltese road network.

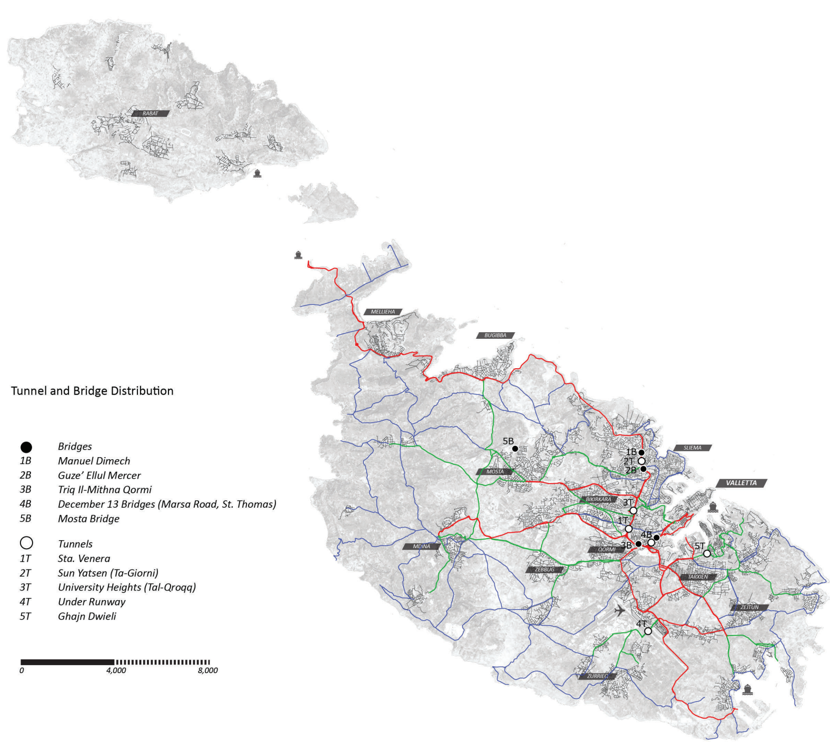


Figure 68.
Location of Bridges and Tunnels in Malta

There is currently no process of road accident safety investigation to better inform the transport authorities as to what effective actions could be taken to prevent recurrence of accidents. An appropriate legal framework to support this set up is required. It could also be combined with accident safety investigation units covering other modes of transport so as to maximise the input of limited professional resources.

A strategic high level approach for incident management and co-ordination between different authorities needs to be established, so that incident management and response follows established protocols resulting in maximised efficiency.

This includes road transport management for air or maritime incidents, the latter requiring appropriate prioritisation on the land side to ensure effective management of the incident.

S

2.2.10.1
IMPLEMENT ROAD SAFETY STRATEGY

OTH (S)

In 2014 the Government issued the Malta Road Safety Strategy and set up the Malta Road Safety Council. This Council has the remit to advise government on road safety measures and to oversee the implementation of the Road Safety Strategy by Transport Malta and other entities across Government.

Further efforts to advance the implementation of the Road Safety Strategy is required, including the allocation of appropriately skilled resources and funding to support the approved measures in the strategy.

S

2.2.10.2
IMPROVE THE OVERALL EURONCAP RATING OF THE MALTESE VEHICLE FLEET

OTH (S/M)

Efforts to improve the average age of vehicles would also indirectly help improve the overall EuroNCAP rating of the Maltese vehicle fleet. To address the standard, appropriate structures to be able to collate and assess data on the fleet need to be established and regular reporting to the EU Safety bodies carried out.

Legal frameworks need to be established to enable potential purchasers of vehicles to know the safety rating of the vehicle prior to purchase, indirectly influencing the market towards ever higher standards.

PD

2.2.10.3
DEVELOP DESIGN GUIDELINES FOR SAFETY MEASURES WITH RESPECT TO DESIGNING FOR E-BICYCLES, BICYCLES AND MOTORCYCLES

(S/M)

Design guidelines relevant to the Maltese context need to be developed and published so that both designers and users are aware of the need to provide appropriate infrastructure allocation to users of two-wheeled vehicles. By so doing, it will reduce the opportunity for conflict of two-wheeled vehicles with cars and other vehicles. Further research is also required with regards to monitoring HGV and cyclist behaviours so as to understand the safety issues and inform such guidelines.

Increasing the prominence of these non-car vehicles will support the education of all road users as to the rights for these vehicles to use the road and for other users to make space available.

This development would also include amendments to the legal frameworks to support the allocation of space to such users thereby improving the safety of all concerned.

PT

2.2.10.4
DEVELOP BRIDGE AND TUNNEL MANAGEMENT SYSTEM

OTH

(S/M)

As bridges and tunnels age, deterioration caused by heavy traffic and an aggressive environment becomes increasingly significant, resulting in the need for a higher frequency of repairs.

Bridges and tunnels, being both critical and costly infrastructures, require a more intensive programme of inspection, as well as preventive and routine maintenance in order to realise their full lifecycles and to maintain high carrying capacities.

The direct cost of the engineering work necessary to maintain bridges and tunnels in a satisfactory state can often be significant. However, indirect costs of traffic congestion resulting from major structural failure due to lack of maintenance can be much higher, as experienced at the Manuel Dimech Bridge.

The tunnels and bridges are complex and vulnerable structures that therefore require a systematic approach to their management. This measure requires the classification of the condition of bridge and tunnel structures, the assessment the load carrying capacity and the modelling of the deteriorated structures and their deterioration rates. This information will be used to determine whether the sub-standard or deteriorated structure should be repaired, strengthened or replaced and then to establish a priority list of interventions.

2.2.11
ENSURE SAFE AND EFFICIENT TRAFFIC MANAGEMENT TO OPTIMISE USE OF EXISTING INFRASTRUCTURE

Issues

A high proportion of traffic congestion today occurs within built-up areas as a result of growth in traffic levels. Where privately built property directly affronts the busy roads and junctions, the option to expropriate to widen roads is usually not tenable or feasible.

Roads are dynamic structures that are integrated into a larger network. Unplanned events such as a traffic accident in one road can have a ripple effect across major parts of the network – causing temporal gridlock and delay.

The vast majority of road traffic accidents are non-injury collisions and only involve damage to vehicles. Yet, with the exception of front/ rear collisions, vehicles are required to be left in the collision position until the arrival at the scene of a warden. Accident details are taken purely for insurance purposes and this is due to the high proportion of vehicles in Malta that are insured for third-party risks rather than fully-comprehensive coverage. The cost of congestion resulting from damage-only accidents is disproportionately high compared to the cost of insurance.

Planned events such as road works can also cause major disruption to traffic flows, if network repercussions and public information are not taken into consideration. Past practices of trying to complete road works in the shortest possible time, while trying to keep traffic flowing, has obvious health and safety drawbacks for construction workers; whereas longer construction periods generally increase project costs. Recent experiences of carrying out construction during the night are generally positive but more consideration can be given to reducing the noise levels of machinery. The lack of alternative routes for projects carried out on the main strategic roads remains a challenge.

Traffic management at other planned large public events or at schools, which lead to the road or area closure, could in many cases, be better planned between the entities involved.

Traffic signal time settings need to be adjusted more frequently to reflect traffic growth and the increasingly complex changes in traffic patterns over the course of the day and during different seasons. There is no centralised control of traffic and the level of usage of Intelligent Transport Systems is still at a very rudimentary level compared with most other European countries.

There is a general lack of experience in the field of traffic management and design, traffic signals and control and the use of ITS technology, particularly at local council level and in the private sector.

Measures

PT

2.2.11.1
INCREASE USE OF INTELLIGENT TRANSPORT SYSTEMS IN TRAFFIC MANAGEMENT

(S/M)

Optimising the use of existing infrastructure is an important and cost effective step to be taken before considering the development of new infrastructure. The introduction of operational traffic management measures can help get the highest levels of service from current transport infrastructure.

Intelligent Transport Systems (ITS) utilise information technologies in road infrastructure, in vehicles and between the two to increase the performance and improve the safety of the road network.

When big data generated by these systems is processed through data analytics applications, it provides real time traffic information.

ITS applications communicate information in real time about the current conditions of the road and vehicles using the road. Road users can be advised via message signs, radio, internet, in car journey planners and mobile phones etc. to adapt their behaviour at short notice by changing routes or means of transport and, in a fully integrated system, could be accessed by public transport operators and integrated with public transport travel information.

TM shall encourage access to and the sharing of various sources of data, such as user generated data and in-vehicle data, as well as the development of any applications, which provide real time traffic information. In this respect further research in line with Measures 2.2.1.8 and 2.8.3.4 is necessary.

Other elements of traffic operation and monitoring can be effectively managed through centrally managed ITS through traffic control centres. Traffic signal installations can be dynamically coordinated to optimise and prioritise the flows across whole sections of the network by adapting in real-time to prevailing traffic conditions.

This measure shall focus on the continued implementation of Phase II of the National ITS Action Plan for Malta 2013-2017.

The main focus of this phase is the further deployment of ITS for public transport (bus transport infrastructure, bus corridors, and public transport hubs and their approach roads) in a bid to increase public transport efficiency, security and accessibility through the:

- Deployment of additional road-side cameras integrated into the new National Traffic Control Centre. These shall include CCTV, infra-red technology and ANPR Cameras to improve both monitoring and enforcement;

- Installation of more Dynamic Message Signs (DMS) for traveller information, especially on all the Bus Network;

- Provision of a web-based application that would provide integrated, real time journey planning information for public transport (bus, ferry, other scheduled modes);

This measure also includes the updating of national legislation on road signage to provide legal basis for use of temporal prohibitory signage and variable speed limits.

PT

2.2.11.2

PILOT AND ANALYSE THE POTENTIAL FOR INTRODUCING TIDAL LANES

(S)

Tidal flow systems are useful where there exists a significant daily change in the direction of the dominant traffic flow. Tidal flow systems operate by allowing motorists to use common lanes whose direction changes according to the time of day and the dominant flow.

This is achieved by coordinating in-road and gantry displays to guide traffic into the appropriate lanes. Tidal lanes are particularly effective for road sections in confined urban areas or on bridges and tunnels, where the infrastructural provision of additional lanes cannot be constructed easily.

In recent years the tidal lane concept has been deployed, through the use of temporary barriers, at major road works in critical locations where capacity is severely restricted.

A pilot project for tidal lanes has been implemented along Sir Paul Boffa Avenue, one of the links leading to the busy Marsa Addolorata junction. This is now being carefully monitored, fine-tuned and technically assessed to compare before and after scenarios. If this pilot project is effective in reducing traffic congestion at peak hours, then the technical and financial feasibility of deploying tidal lanes in other areas will be considered.

PD

2.2.11.3

DEVELOP A FRAMEWORK FOR THE NATIONAL CO-ORDINATION AND MANAGEMENT OF ROAD WORKS, ROAD CLOSURES, ROAD SIDE MAINTENANCE AND CLEANING

(S/M)

Road works are necessary to maintain and improve infrastructure in order to deliver safer and smoother traffic flows. However, when road works are carried out in traffic sensitive areas in Malta and Gozo they can often result in surges of congestion, if not managed properly.

The scheduling of road works likely to disrupt traffic flows is known well in advance to the road authorities but may not always be known by all road users who may not always have access to the traditional communication media (newspapers, websites etc.) in advance of their travelling. Today's society expects instant information at its fingertips both in real time and at any time of day and night. The use of radio information and real-time variable message signage which can be interfaced with in-vehicle navigation devices can supplement the traditional communication tools to provide the necessary information for road users to make informed decisions about their journey routes, both in advance and during their travel.

This measure involves the development of a framework to better coordinate temporary road works. The framework will examine measures aimed at carrying out road works at night time with minimum disturbance to neighbours and will assess the costs and benefits of reducing the frequency of maintenance by investing in long-life pavement materials that require surfacing every 30 years rather than the standard frequency of every 10 years.

S

2.2.11.4

INTRODUCE TRANSPORT MODELLING AND GIS IN PLANNING DIVERSION ROUTES FOR ROAD WORKS

(S/M)

Road work management is mainly concerned with optimising the trade-off between the delays to road users and the cost of carrying out the works. Usually, the less intrusive the road works, the longer the project takes to implement and ultimately the project will be more costly.

During the planning of major projects and the development of the associated construction management, different road work phasing options can be tested using macro and micro traffic simulation software e.g. CUBE, Aimsun and Paramics to simulate likely traffic impacts at national and local levels.

Transport Malta has now invested heavily in macro-modelling software and in the setting up of a Transport Geographical Information System which will be used to simulate the impact of different road works scenarios so that optimal solutions can be identified to minimise delay and reduce construction costs.

PRE

2.2.11.5

REVIEW AND UPDATE TRAFFIC MANAGEMENT GUIDELINES TO IMPROVE TRAFFIC MANAGEMENT AND SAFETY DURING ROAD WORKS

(S)

Work zone safety rules and protocols are important from a health and safety point of view and also from the perspective that unnecessary congestion may result from poor site layout and dangerous operational practices leading to accidents.

This measure entails the review of current traffic management guidelines for road works, and updating based on best practice and the extensive experience gained during the implementation of major projects over the last ten years.

PD

2.2.11.6

REVIEW AND UPDATE TRAFFIC MANAGEMENT GUIDELINES TO IMPROVE TRAFFIC MANAGEMENT AND SAFETY DURING ROAD WORKS

(S)

Major events that attract many visitors such as Notte Bianca, Isle of MTV etc. can result in the closure of whole areas to vehicles while other special events can result in the temporal closure of sections of road e.g. fireworks display, marathons, cycle races etc. Unless major and special events are carefully planned and coordinated ahead of the event, they can have a devastating effect on traffic conditions, mobility, businesses, bus service operation and even basic access for residents to their homes.

The organisers of major and special events are required to seek authorisation from the various competent authorities responsible for management, safety and enforcement on Malta's road network and often from the business community (i.e. Transport Malta, public transport operators, Local Councils, Police and associations presenting shops and businesses). The ultimate responsibility for authorising major and special events rightly falls under the Police.

Past experience has shown that the application process for a non-regular event can be uncoordinated and often, with event dates fixed in advance of authorisation, pressure for authorities to carry assessment and planning within limited time frames can lead to an unsatisfactory assessment and contingency planning for the event.

This measure involves the development of a policy framework to be drawn up between the competent authorities responsible for event authorisation which inter alia will clearly establish responsibilities, application procedures, the need to carry out risk assessment and safety audits, fees and the minimum / maximum time frames for event application processing.

PD

2.2.11.7
DEVELOP INCIDENT MANAGEMENT PLANS

OTH (S)

Incident management is the process of planning and coordinating that detects, responds to and removes impediments caused by traffic incidents or other unforeseen road-related incidents that have a direct effect on the practical capacity of the road network. Unless there is an incident management plan in place, the impacts of incidents such as crashes, vehicle breakdowns, flooding, collapsing of stone walls on the roadway etc. typically extends well beyond the immediate vicinity of the incident. This often triggers slowdown in both directions of traffic (rubber necking effect), delays to arrival of emergency services and much longer duration for road capacities to be restored.

Effective incident management strategies involve the establishment of standard operational procedures for the main steps (incident detection, incident verification and obstruction clearance) and clear coordination between transport authorities and emergency services.

Automatic detection based on Intelligent Transport System area surveillance supported by camera surveillance can accelerate detection and verification significantly. Moreover, when linked to motorist travel information, it can divert traffic away from the incident facilitating faster response times for emergency services and minimise delays to r Re-establishing normal traffic conditions.

This measure will involve the establishment of inter-organisational protocols and the setting up of an incident management centre between Transport Malta, Police, Civil Protection Department and Ambulance Services which will integrate Intelligent Transport Systems for traffic signals, the network of traffic surveillance cameras and the use of variable message signs to provide information for motorists in the core areas.

2.2.12
IMPROVE THE EFFECTIVENESS OF ENFORCEMENT OF ROAD TRANSPORT REGULATIONS

Issues

The responsibility of carrying out the enforcement of regulations in the transport sector is spread over a number of enforcement agencies, primarily the Malta Police Force, Wardens and Transport Malta's Enforcement Officers.

Self-enforcement is a tool that results from effective awareness of the penalties that may be suffered if a road user transgresses the rules if caught, and the risk of being caught by the enforcement agencies is sufficient to deter the action in the first place. It appears that the self-enforcement aspect is not sufficiently functional due to a variety of reasons such as ineffective conclusion of enforcement processes though Malta's complex judicial system, low penalties and insufficient physical presence or automated enforcement. Lack of driver discipline for both moving and stationary vehicles reduces the effectiveness of the road network.

While Transport Malta officers have reasonable remit over commercial vehicles, the legal system for enforcement over private transport is tedious and inefficient, to the extent of it being generally ineffective. Enforcement of illegal parking can only be carried out by wardens and policemen, and Transport Malta's Enforcement Officers do not have the authority to carry out enforcement beyond a limited scope.

Speed cameras tend to be in open roads and are notably lacking around the Marsa area which forms a crucial central part of the TEN-T Core and Comprehensive network. Abusive parking and inappropriate stopping causes obstructions on the road network and presents danger to pedestrians and other road users. Bus Stops and their immediate vicinities are frequently obstructed, necessitating that buses stop in the middle of the road with negative impacts on congestion and hazards to bus users.

In the commercial transport sector, national road haulage operator licence conditions are difficult to enforce due to short distances and significant numbers of "own account" transport (which is subject to reduced requirements). Enforcement over the parking of heavy vehicles in registered spaces (and the deterrent to other vehicles to park in these designated spaces) is difficult and not enforced effectively. Double (or triple) parking by goods carrying vehicles for delivery / distribution is also not enforced rigorously and now seems to be common practice, to the frustration of other road users and the resultant cost to society.

Overweight or inappropriately loaded goods vehicles can result in dangerous cargo situations, as well as damage to the road structures. Moreover, Ro-Ro traffic arriving or departing from maritime terminals is not required to use weighbridges to monitor and control axle weight, this is to the detriment of both the ferry and the road network.

While the enforcement agencies' training in relation to roadside checks and dangerous goods is up to date, enforcement resources are spread over a large number of regulatory areas. Enforcement could be made more efficient through more widespread use of technologically advanced control equipment. Analysis of the value of fines issued in recent years has remained constant and a review as to whether this is due to less infringements or less enforcement needs to be undertaken to ensure that the appropriate enforcement pressure is maintained to ensure orderly use of the road network.

While the roads in the vicinity of schools are closed to improve safety to schoolchildren, parents continue to park illegally near the school cordon and this obstructs peak hour traffic flows.

Finally traffic accidents are not cleared quickly enough, partially due to the lack of understanding as to what actions persons involved should take to clear as quickly as possible. This causes obstructions and delays to other road users.

Disruption of the traffic flows, especially when at peak hours comes at a cost to society in terms of delays and emissions. Consideration could be given to scale up sanctions where the illegal stopping causes extensive disruption to traffic flows.

Measures

S

2.2.12.1 INCREASE PRESENCE AND EFFECTIVENESS OF TRAFFIC POLICE

(M)

Due to the different interpretations of allocation of responsibility between the various enforcement entities, insufficient resources are allocated and when they are, the visible presence of the enforcement agencies is not sufficient to ensure that the public comply with road rules. Officers in the enforcement agencies need to lead by example, including in relation to road traffic rules, parking and courtesy to the public to help in educating the latter.

Additionally, the penalties applicable on enforcement are not a sufficient deterrent to ensure self-compliance, resulting in an attitude of "risk it and pay up if you get caught", for which transgressions clearly outstrip the ability of any enforcement activity to be effective.

Enforcement action to reduce illegal stopping by delivery vehicles needs to be strengthened to reduce the cost to society by this sector.

S

2.2.12.2 REVIEW OF THE SPEED CAMERA SYSTEM

(S/M)

Speed cameras could be more effectively deployed over the network as technology improves and evolves quickly. A review of the speed camera system needs to be carried out so as to better contribute towards improved road safety and traffic flows rather than to act only as a deterrent to over-speeding. Camera technologies provide a range of new ways in improving land transport, and these and other similar technologies could be exploited to manage road safety efficiently and effectively.

The introduction of the latest and best available technology coupled with the reassessment of the system will contribute to an improved automated enforcement function, with priority being given to the TEN-T Network.

S

2.2.12.3 INTRODUCE TECHNOLOGY TO REDUCE LABOUR INTENSIVE ENFORCEMENT (RED LIGHT AND BUS LANE CAMERAS)

(S/M)

Automatic enforcement appears to be an effective deterrent to transgression of road rules, especially where the presence of the enforcement agencies is constrained by resource availability. Therefore, further deployment of automated technology to support enforcement such as red light, bus lane cameras (including on-board buses) would be a cost effective method to improve safety on the road. Similar to speed cameras, not all camera points need to have a camera inside them, but the understanding that they might do, is usually sufficient to provide effective deterrent with a lower cost to Government.

Overloaded or overweight trucks could be more easily identified by permanent and/or temporary weigh-in-motion equipment to improve road safety and to safeguard the road infrastructure including bridges and flyovers.

S

2.2.12.4 INCREASE ROADSIDE CHECKS AND ROADWORTHINESS TESTING

(S)

While Malta routinely achieves the required standards and quantities of road side checks, a large number of vehicles do not fall within the scope of such checks. Therefore national rules could be extended to ensure that more vehicles fall within the scope of this enforcement regime.

Furthermore, a large number of vehicles appear to be non-roadworthy (e.g. headlight alignment, exhaust and noise emission levels) raising doubts about public understanding that roadworthiness is not required only at the time of the test but at all times. Road side checks of commercial vehicles and roadside roadworthiness checks of private cars would help improve the understanding of the need to have a roadworthy vehicle at any time it is used on the road.

S

2.2.12.5 REVIEW ENFORCEMENT FINE LEVELS

(S)

Current penalty levels have been static for a number of years and do not keep up with inflation. Therefore over time, they are rendered less effective as people's earning potential rises. Possibly a more effective deterrent would also be the automatic withdrawal of driving licences after the driver commits a series of serious road traffic offences. The system of penalty points currently applied to new drivers should also be fully extended to all drivers.

One measure to improve recovery of fines could be to introduce a multiplier cost should a fine not be paid after a limited period of time. Repeat offenders who do not settle their penalties would therefore accumulate significant dues making the follow up by the judicial system cost effective.

PRE

2.2.12.6
REVIEW REGULATORY SYSTEM TO GIVE ENFORCEMENT OFFICERS MORE AUTHORITY

(S)

Internal analysis of the enforcement system shows that the low rate of conclusion of penalties (due to the complex legal framework) and the low level of fines for each infringement mean that the cost of effort by enforcement agencies to enforce penalties far outstrips the penalty itself. This results in a conflict where the requirement of management of enforcement staff in an efficient way would mean that it is more effective to direct enforcement officers to other activities than to enforcement.

Similar issues are noted by other enforcement agencies, leading to a clear understanding that the regulatory system needs to be reviewed, streamlined and made more effective and timely.

S

2.2.12.7
INTRODUCE WEIGHBRIDGES AT MARITIME TERMINALS

(S)

The implementation of tools to ensure enforcement is most effective at points where freight vehicle flows are highest. These tend to be in the proximity of maritime terminals (for international freight) as well in the vicinity of industrial estates due to the concentration of freight traffic at these points.

The introduction of weighbridge sites along the TEN-T network will enable enforcement agencies to assess the appropriateness of loading on a wide range of vehicles.

02.3 PUBLIC TRANSPORT OPERATIONAL OBJECTIVES

2.3.1 IMPROVE SERVICE QUALITY AND MODAL SHARE ALONG STRATEGIC ROUTES BY INTRODUCING PUBLIC TRANSPORT QUALITY CORRIDORS

Issues

Today, reliability and punctuality of bus services are considered to be the most important issues that will need to be addressed to encourage further growth in public transport patronage and modal shift away from the private car.

The specificities of mobility structure in Malta highlight a much lower average trip distance of 5.5km, when compared with other EU countries. This translates to an average journey time on the bus of 22 minutes compared to 14 minutes by private car. However, when the time taken walking to and from bus stops and the time taken waiting for a bus and transferring between buses are taken into account the average duration increases to 40-45 minutes.

As the majority of bus stops are with a five-minute walk of most parts of the urban area, the main variable journey component is the waiting time. Low frequency of service mainly occurs in the last section of a route in the outlying parts of Malta and Gozo. However, as these routes approach and pass through the principal urban areas they often converge with other routes and form bus corridors.

The combined frequency of different bus services along the bus corridors increases and waiting time is reduced substantially. A low frequency of bus service and long, tortuous routes in sparsely populated outlying areas are common features in most public transport systems.

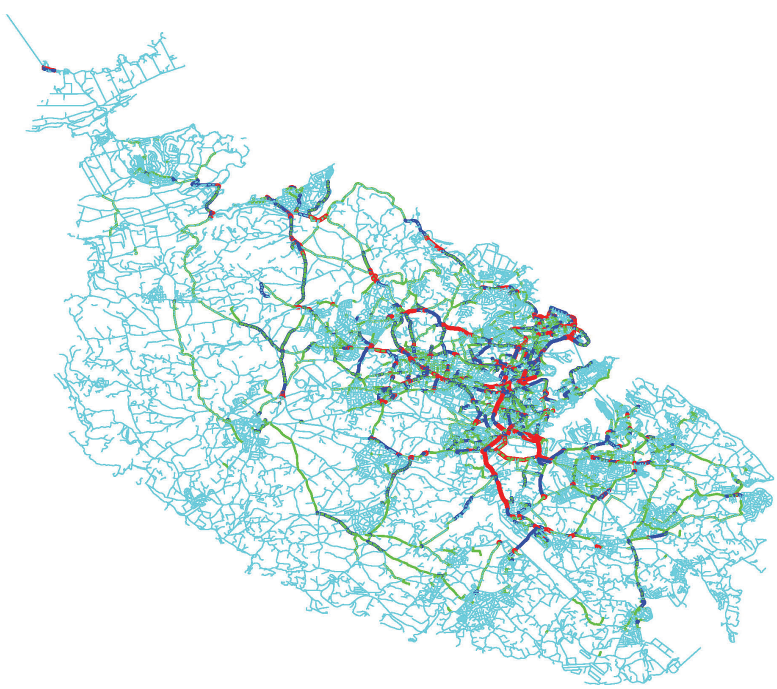


Figure 69.
2014 (base year) Public Transport Speed Ratio across the network

Transport modelling analysis clearly indicates the main road links where journey delays occur during peak periods on typical weekdays. The most critical sections of bus network (depicted in red in Figure 69), exhibit bus speeds that are less than one-third of normal free-flowing traffic speeds due to congestion and high frequency of bus stops.

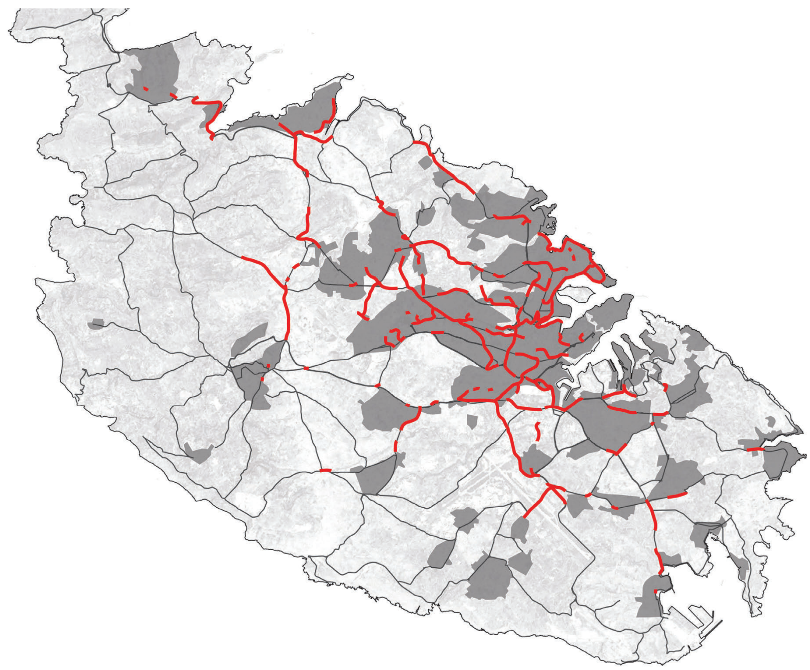


Figure 70.
Identified Public Transport corridors that exhibit potential to address journey time improvements

Short journey lengths and heavy delays being experienced by bus services on main bus corridors approaching the central area coupled with the availability of free, unrestricted parking in most localities, results in a higher perceived 'generalised cost' of travelling for a bus user compared with a car user - thus reinforcing the cultural car dependency preference.

Sharing the same road space with general traffic increases the problem bus service unreliability. Unlike cars, buses cannot bypass localised congestion as service routes are fixed. Public transport speeds in general are 32% slower than private traffic with an average speed of 16km/h as compared to an average speed of 24km/h for private traffic (average over the day).

Despite the fact that a bus filled with passengers utilises the limited road space much more efficiently than the equivalent number of cars, transport policy has traditionally favoured road space provision for the private car over provision for public transport. The allocation of segregated road space through bus lanes to assist buses to get through congested road sections during peak hours has, so far, been quite limited in its extent and not without strong public reaction.

Figure 71.
2015 Existing Public Transport priority lanes

All bus lanes to date have been implemented on dual carriageway roads involving little or no removal of on-street parking. The sections of bus corridors on which buses experience most delay today are, however, mainly single carriageways with on-street parking. Measures facilitating buses to bypass congestion here would necessitate the removal of on-street parking at peak hours.

Through the use of the transport model the opportunity now exists to accurately identify strategic sections of the bus network which have high service frequencies (Figure 72) and high patronage (Figure 73 & Figure 74).

Additionally, the model can be used identify the top origin destinations matrices showing the predominant movements and their model split, thus providing useful information for bus service, road infrastructure and route development

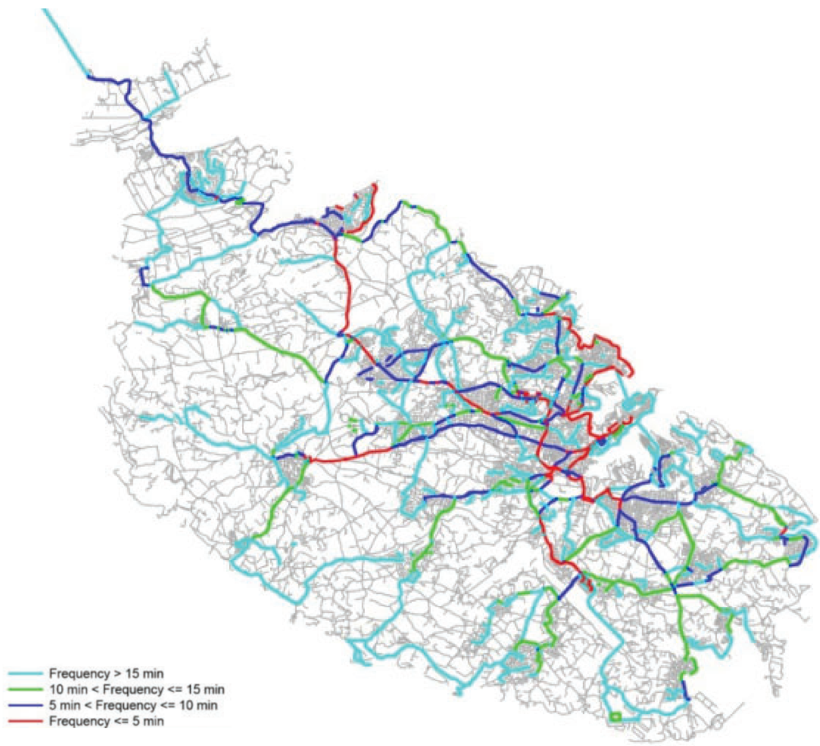


Figure 72.
Public Transport Frequency

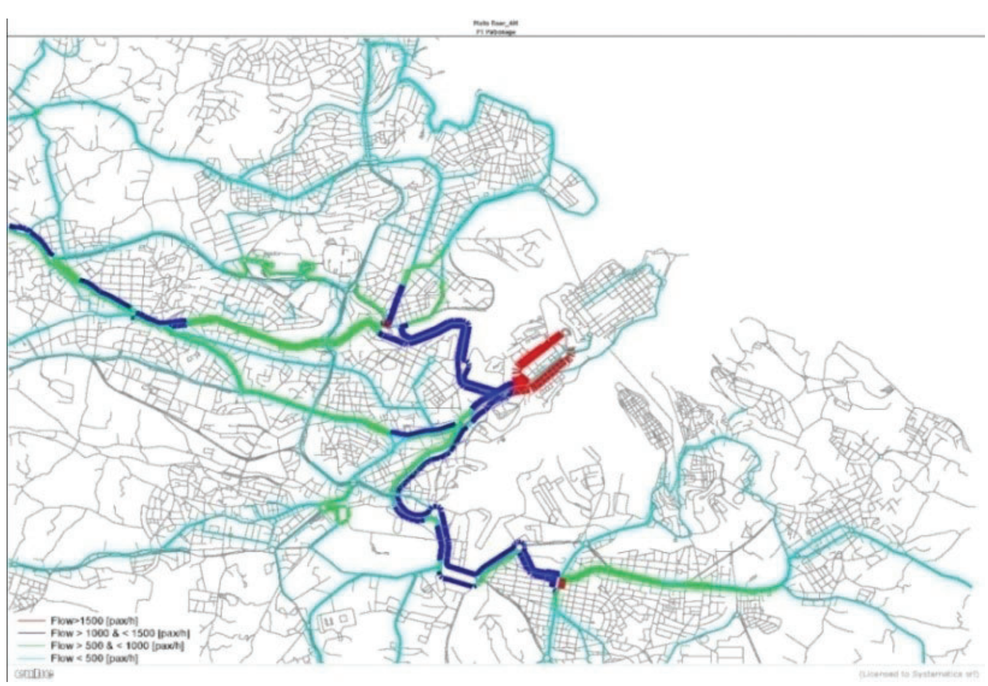


Figure 73.
Public Transport Patronage AM Peak

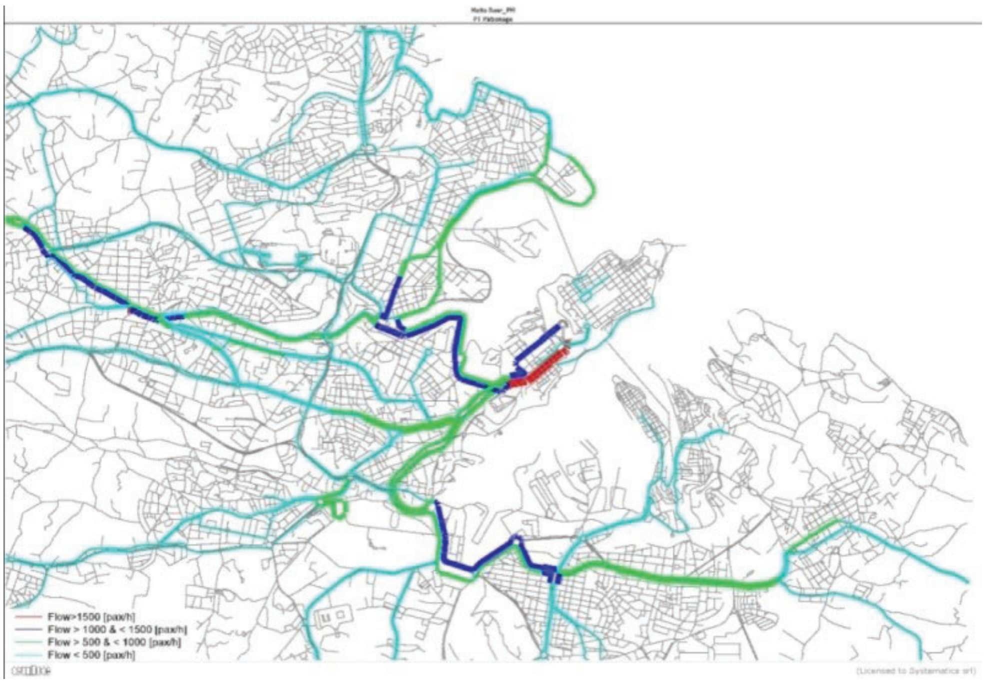


Figure 74.
Public Transport Patronage
PM Peak

Regional mobility analysis provides further insight into the origination of trips for the various regions. Figure 75 illustrates the peak commuting movements from the outer lying regions of Malta to the 'Valletta Hub' (which includes the Valletta and Floriana Peninsula, Inner North and South Harbour Regions). Further analysis shows the Northern regions are a major generator for trips to the North Inner and Outer regions and the Peninsula (Figure 76). One the other hand, trips to the South Inner and South Outer Harbour regions are generated equally from the North and South (Figure 77).

Analysis of movements between the North and South Regions as whole (Figure 78) illustrate the high volume of trips interchanging between the two regions during the morning peak hour. Such trips result in the concentrated congestion being experience by the Strategic Network at key junctions such as Marsa and Kappara roundabout.

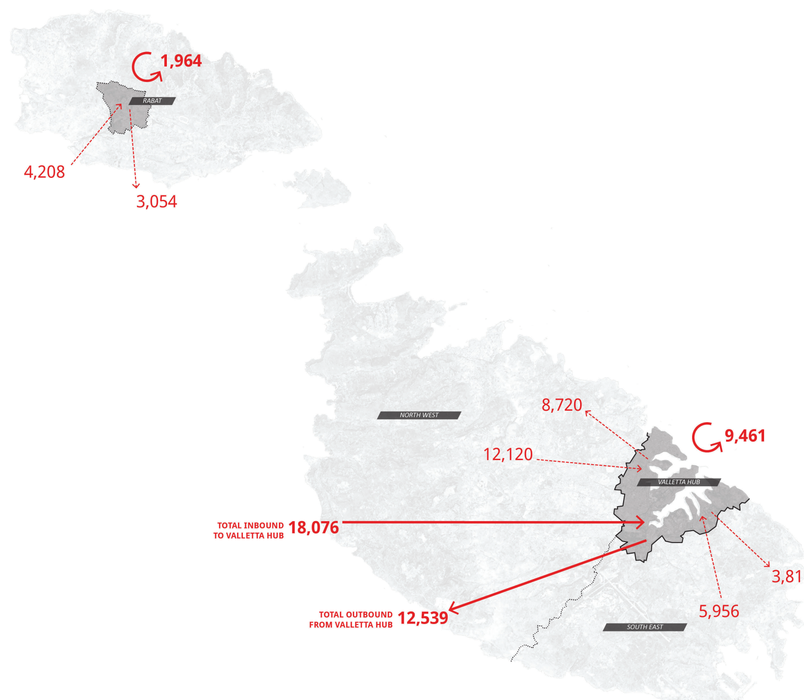


Figure 75.
Morning peak hour movements Valletta & Gozo Hub

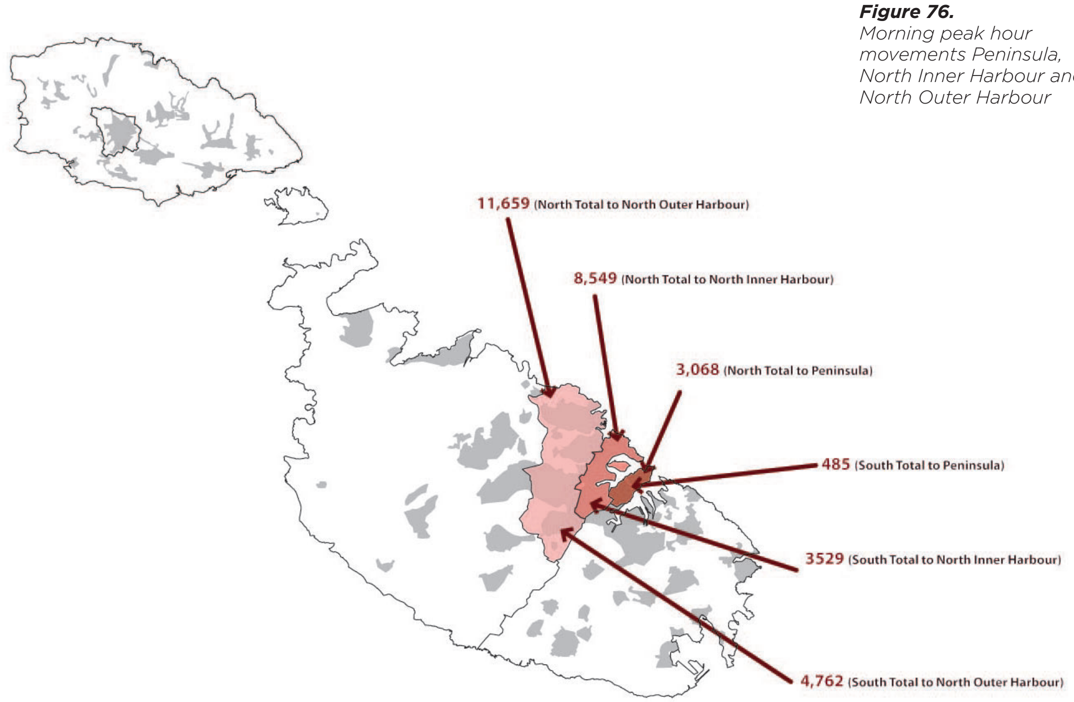


Figure 76.
Morning peak hour movements Peninsula, North Inner Harbour and North Outer Harbour

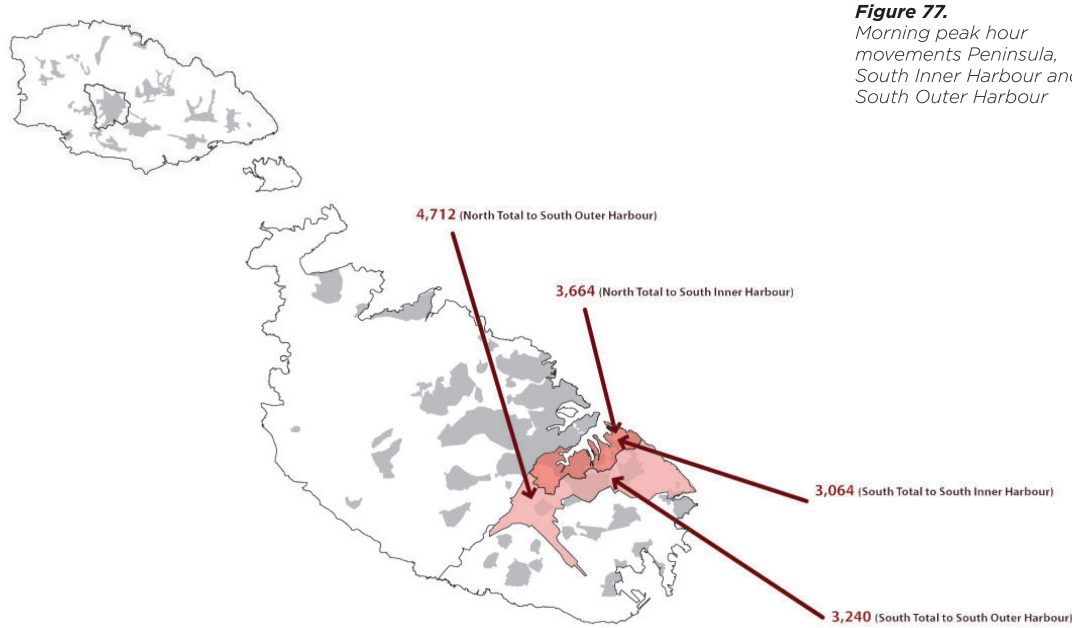
*

Figure 77.
Morning peak hour movements Peninsula, South Inner Harbour and South Outer Harbour

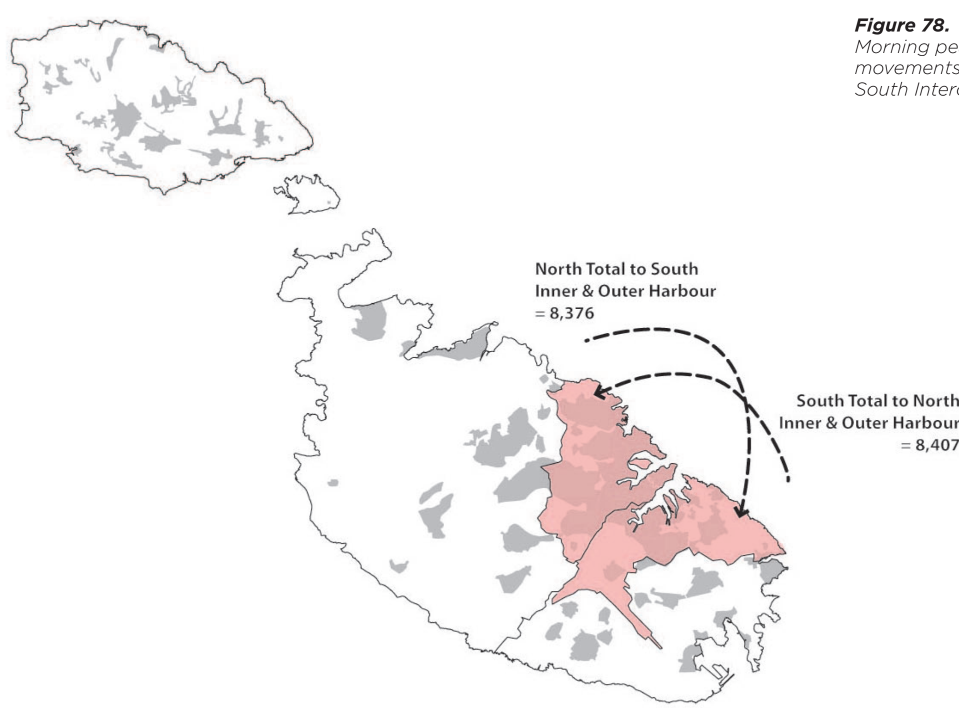


Figure 78.
Morning peak hour movements North – South Interchange

The model has also allowed spatial mapping of demographic data to identify major employment nodes (Figure 79) and residential areas with highest densities. Public transport service frequencies should also respond to these nodes. Valletta, Qormi and Msida have been identified as existing, primary employment nodes with each node having more than 7% of the employees. Marsa and Luqa are considered to be secondary nodes with between 5-7 % of employees. Tertiary nodes are St. Julian's, Sliema, Birzebbugia, Birkirkara, Floriana, Qawra, Zejtun (Bulebel) and Mosta, each having between 3 – 5% of employees.

Review of planning policy has also identified other future nodes which are being targeted for further development these being St. Julian's, Mriehel, Smart City, Marsa and the Airport surroundings.

Residential areas with highest densities are Fgura, Paola, Tarxien, Sliema, Gzira, Birkirkara, Pieta, Hamrun, Senglea and Qawra.

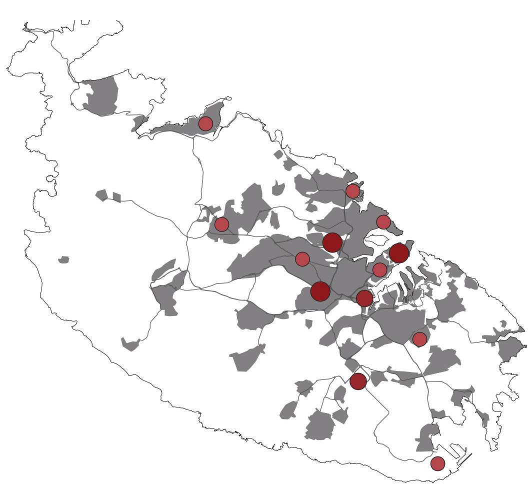


Figure 79.
Existing Hierarchy of Employment Nodes

The predominant movement of people is therefore identified to occur between the North Outer Harbour and both the North Inner Harbour and Peninsula. There is also strong movement between South to North and vice-versa.

The main Public Transport movement corridors are noted at:

- Qawra, Mosta, Birkirkara, Hamrun, Valletta
- Qawra, Mosta, Birkirkara, Msida, Valletta
- Naxxar, Birkirkara, Msida, Valletta
- St. Julian's, Sliema, Gzira, Msida, Valletta
- Fgura, Paola, Marsa, Valletta
- Qormi – Hamrun – Valletta

Significant amounts of data are automatically collected through bus tracking devices and bus ticketing information. This data could be more effectively utilised to more accurately identify local areas of congestion - on the road, on the bus and at bus stop. Such data can be used to plan and justify bus corridor interventions.

New national guidelines for the design layout of bus stops were published in 2009. These contain geometrical standards that allow a bus to safely pull into and out of bus stops, stopping parallel to the kerb.

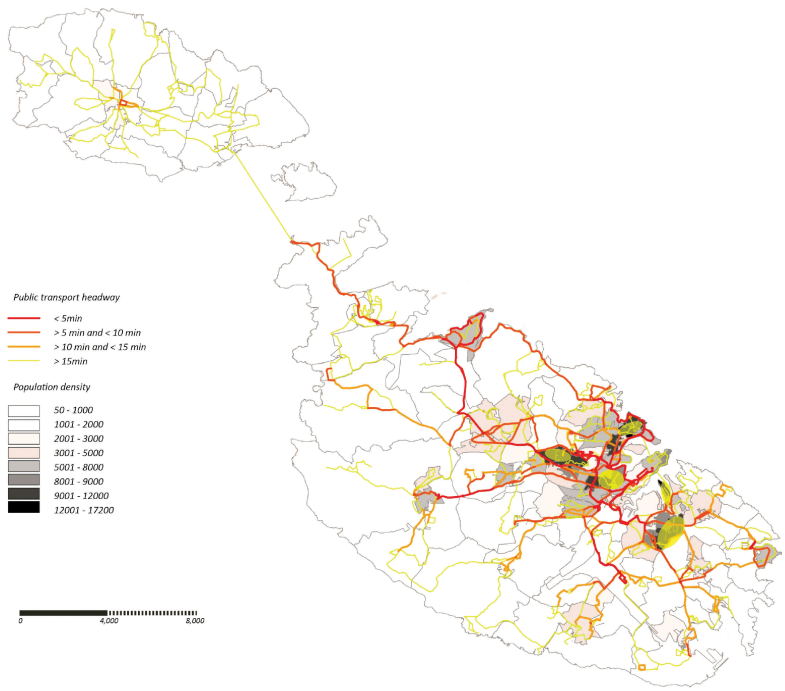


Figure 80.
Comparison of Residential Density and Public Transport provision

A high proportion of bus stops still do not conform to these standards and are too short in length to allow proper docking of buses parallel to kerbs, often resulting in buses obstructing traffic. Illegal parking on bus stops in busy commercial streets and poor enforcement are also identified as issues affecting the operational performance of the bus service.

Only 22% of bus stops have bus shelters and 4.5% have real-time information displays. Bus shelters have not been installed at a number of main locations due to confined space and inflexible bus shelter design types.

PT

2.3.1.1

IMPLEMENT PUBLIC TRANSIT QUALITY CORRIDORS FOR:

Sliema – Msida – Valletta
Tarxien – Fgura – Marsa – Valletta
Mosta - Birkirkara – Msida – Valletta
Naxxar – Birkirkara – Hamrun – Valletta
Mosta – Birkirkara – University – Msida
Attard – Birkirkara – Hamrun – Valletta
Qormi – Hamrun – Valletta

(S/M)

Based on the transport modelling and spatial analysis undertaken in support of the Transport Master Plan, a number of important bus corridors have been identified for action corresponding to regional movement, slow bus travelling times, and high patronage and frequency levels.

To address the issues identified, this measure involves the creation of Public Transport Quality Corridors (PTQC) along strategic sections of network (Figure 81).

This will entail determining optimal capacities, provision of a continuous network of public transport priority routes along the corridors (Improve reliability, journey times), removal of obstructions at pinch-points, improved monitoring of operations along these corridors, traffic signal control to favour buses, improving the quality of bus waiting infrastructure, provision of real time information systems and improving comfort on-board buses (e.g. provision of free public Wi-Fi).

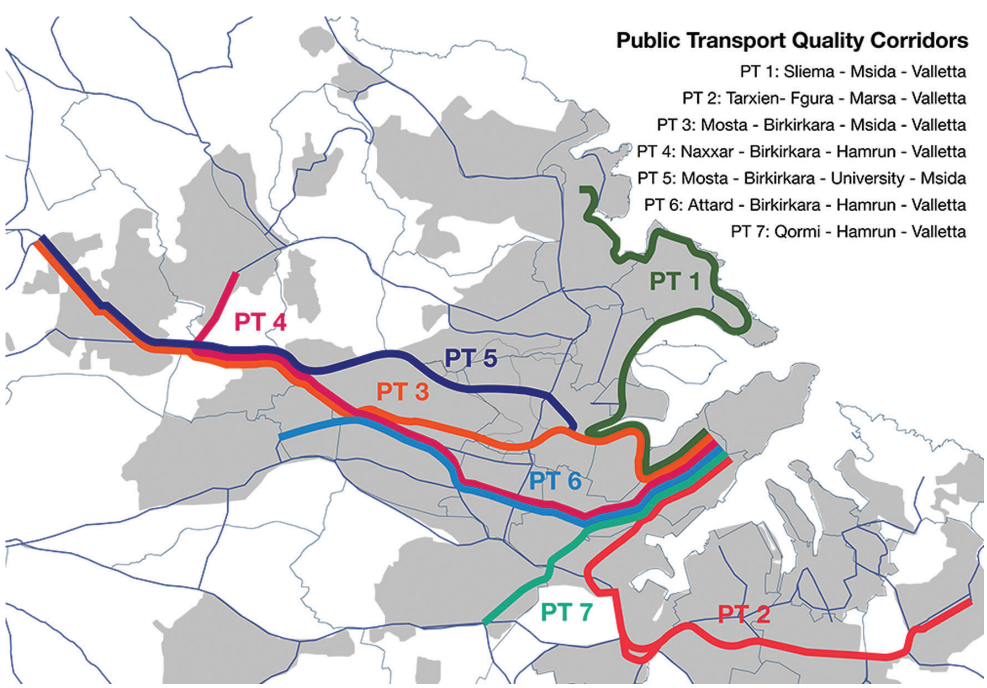


Figure 81.
Key Corridors to be developed into Public Transport Quality Corridors

A number of these corridors are not classified as Arterial or Distributor roads and therefore do not fall under Transport Malta's responsibility. In such cases the possibility of reverting responsibility for these sections of the road to Transport Malta is being considered as they would form strategic links in the Public Transport network which require infrastructural improvements and monitoring.

PT

2.3.1.2
DEVELOP A PROGRAMME TO UPGRADE MAIN BOARDING BUS STOPS

(S/M)

This measure will involve drawing up a plan for improving the comfort, security, safety and operational efficiency of bus service infrastructures primarily used by passengers waiting to board the bus throughout the rest of the network. It is less important to upgrade the bus stops primarily used for alighting since these are not used for waiting.

Inter alia, this plan shall include provision of shelters, increasing real time travel Information displays, ticket machines, pedestrian safety and accessibility to bus stops and improved security e.g. night lighting.

S

2.3.1.3
MAKE BETTER USE OF ELECTRONIC DATA COLLECTED BY THE BUS OPERATOR TO QUICKLY ADAPT BUS ROUTES TIMETABLES AND COMBINE FREQUENCIES TO TEMPORAL AND SEASONAL DEMAND CHANGES AND IDENTIFY ADDITIONAL PTQC

(S)

This measure aims to reinforce the bus corridor concept by using electronic data passively collected and stored on-board bus during service operation. The data can be analysed to optimise operation of services along bus corridors by identifying times and locations of congested bus stops and reorganising services to provide regular headways between different bus services along the corridors and ensure sufficient spare capacity is available in buses during peak times. Additionally, the data can also be used to analyse the need for additional PTQC in relation to increasing demand or shifts in movement patterns.

PRE

2.3.1.4
IMPROVE ENFORCEMENT OF PTQC THROUGH GREATER DEPLOYMENT OF TECHNOLOGY

(S)

Roadside enforcement resources are insufficient to cover all parts of the bus network. The introduction of camera surveillance for bus lane and bus stop parking enforcement could provide a more cost-effective solution, particular along sections of network along the PTQC in order to improve bus service reliability and punctuality.

S

2.3.1.5
DEVELOP AND PUBLISH COMPREHENSIVE ROUTE INFORMATION

(S)

Malta Public Transport has recently published a map illustrating the spatial distribution of the bus network as illustrated in Figure 82. The Public Transport operator also provides a journey planner that allows selection of origins and destinations and suggests possible routes between.

Further improvements should be provided to ensure the availability of detailed information to third parties (such as Google Transit

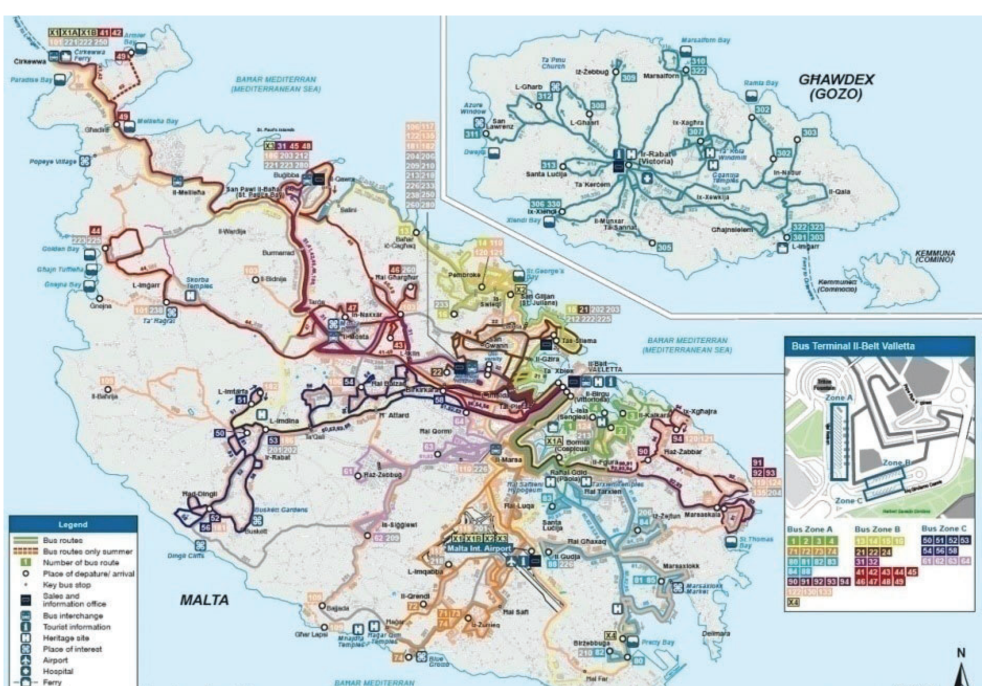


Figure 82.
2016 Published Map of Public Transport Routes

and other aggregators), such that new applications, such as the recently launched Tallinja app, and innovative uses of the data could be developed by the IT industry that supports the various communication and mobility tools in use today and in the future.

Reliably updated static and real-time information needs to be provided by the bus operator for bus stops, routes and the buses themselves. The updated data should reflect temporary and permanent changes in location of the bus, routing and scheduling in a timely manner so as to be effective.

Once the data provided is reliable, it would allow current and potential public transport users to utilise their preferred method of identifying effective public transport routes and timings while being independent of legacy journey planner tools developed by the operator and/or regulator.

Further work needs to be carried out to incorporate other scheduled public transport services such as the internal maritime ferry links.

2.3.2
IMPROVE PUBLIC TRANSPORT SERVICE QUALITY TO AND BETWEEN STRATEGIC EMPLOYMENT NODES, SERVICES OUTSIDE THE INNER HARBOUR REGIONS AND PERIPHERAL RESIDENTIAL AREAS.

Issues

The current bus network provides high levels of service to the main places of interest and the major trip attractors (such as employment, entertainment and shopping centres etc.) in Gozo and within the Inner Harbour areas.

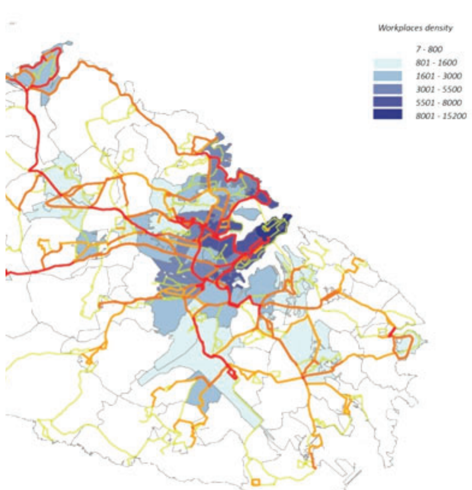


Figure 83.
Employment Densities and Bus Service Frequencies

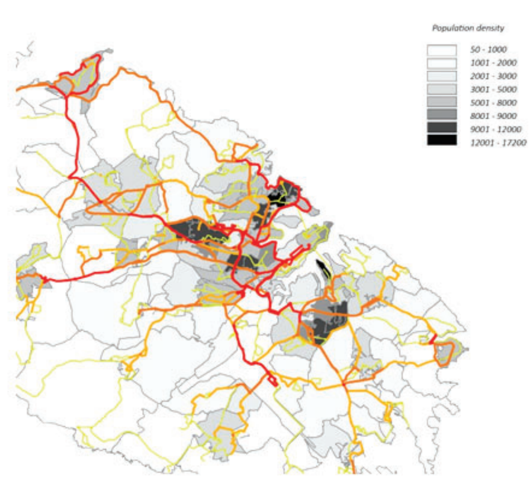


Figure 84.
Residential Densities and Bus Service Frequencies

Analysis of bus frequencies illustrated that while higher frequencies (lines depicted in red and orange) respond well to areas with higher employment and residential densities (Figure 83 and Figure 84), peripheral residential areas do not entertain the same service levels (Figure 85). While this is understandable as financial feasibility of the service needs to be considered, Public Transport also offers a social service with the need to ensure that peripheral communities are not isolated from important facilities. There is therefore the need to explore feasible ways in which the service quality to peripheral residential areas.

Service quality does not only relate to bus frequencies; the number of routes servicing strategic facilities / major trip attractors is also important as this will determine how easy it is to access that location from different parts of the island.

Overlaying the mapping of the number of routes along the bus network with strategic employment nodes, illustrates that some major employment hubs such as Mriehel, Smart City, Qormi and Bulebel are lacking in this respect. In general, places of interest and major trip attractors away from the harbour areas tend to have lower levels of accessibility.

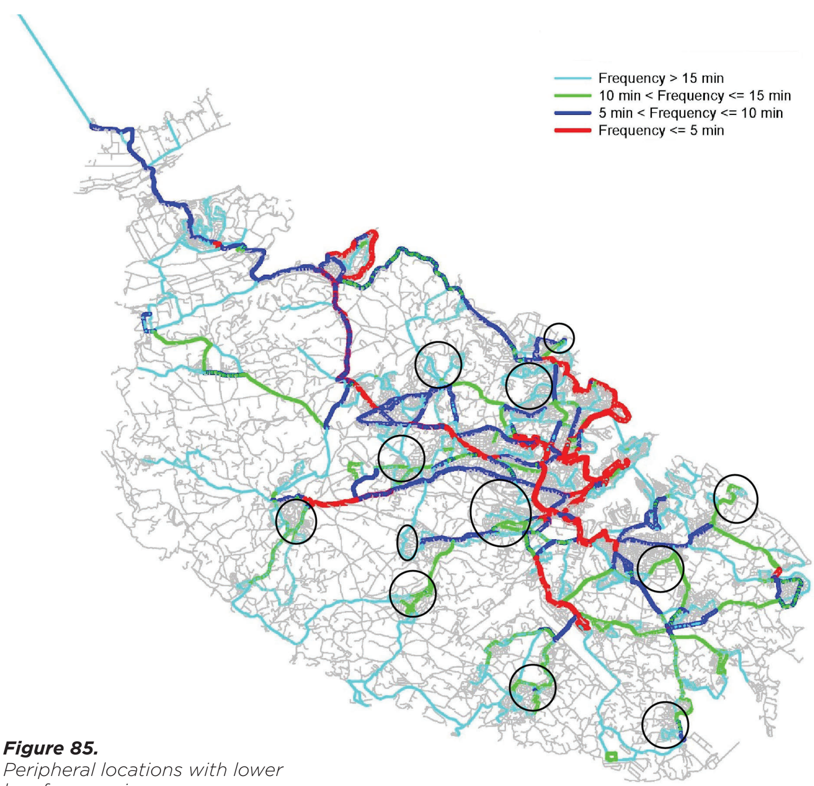


Figure 85.
Peripheral locations with lower bus frequencies

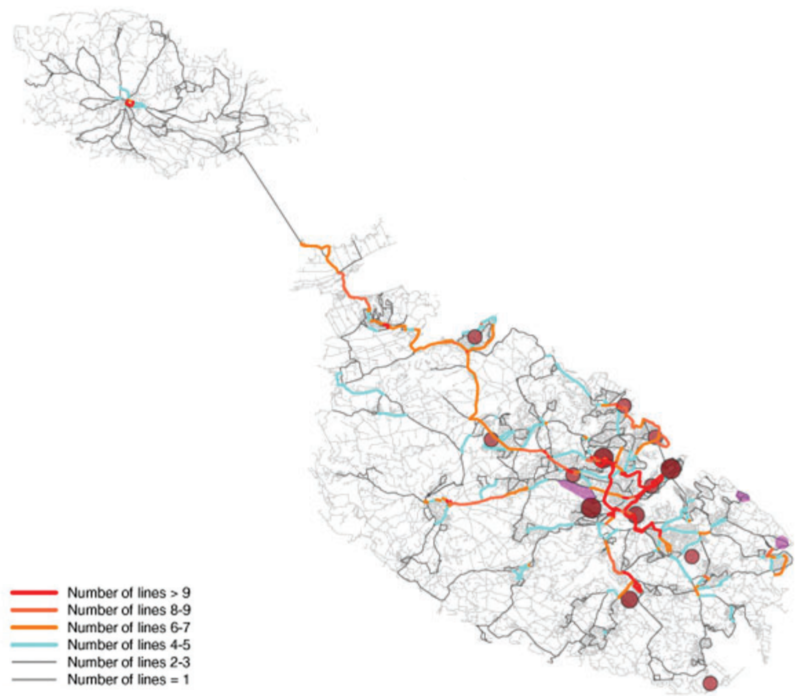


Figure 86.
Employment Nodes overlaid with no of Bus Routes along the network

The model also allows for mapping of access times to popular locations such as the Airport, Mater Dei Hospital / University and St. Julian's /Paceville.

The mapping shows that such locations can be generally reached within 45 minutes by car from most locations; however this journey times are comparatively much longer for many locations when using public transport.

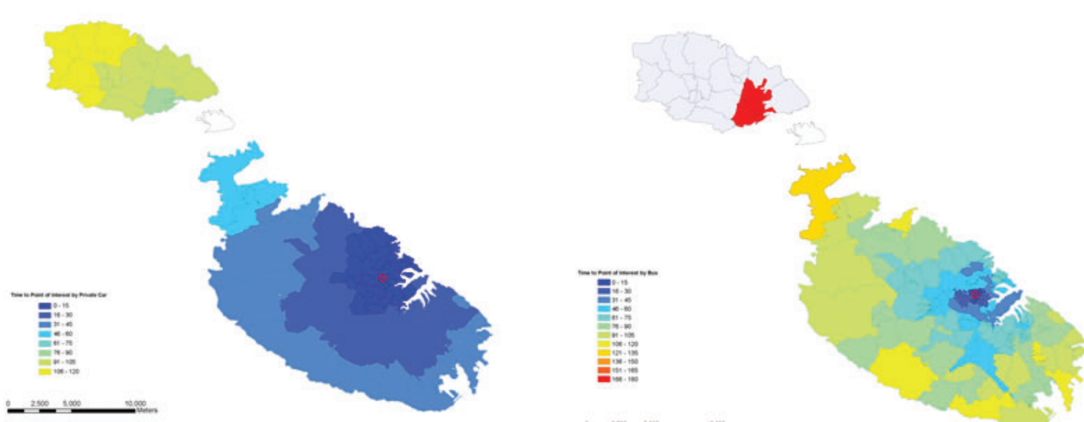


Figure 87.
Example of Accessibility Map by Private and Public Transport (University / Mater Dei)

Measures

PD

2.3.2.1
OPTIMISE USE OF EXISTING PARK AND RIDE FACILITIES AND DEVELOP NEW SITES AT STRATEGIC LOCATIONS TO ENCOURAGE MODAL INTERCHANGE

(M)

Three park and ride facilities are currently operational within the public transport network of services. These inter-modal interchange points are characterised by good levels of access for cars and buses from the strategic network, well laid out parking spaces and a reasonable quality of waiting facilities.

The park and ride facility at Pembroke is not however well patronised at present.

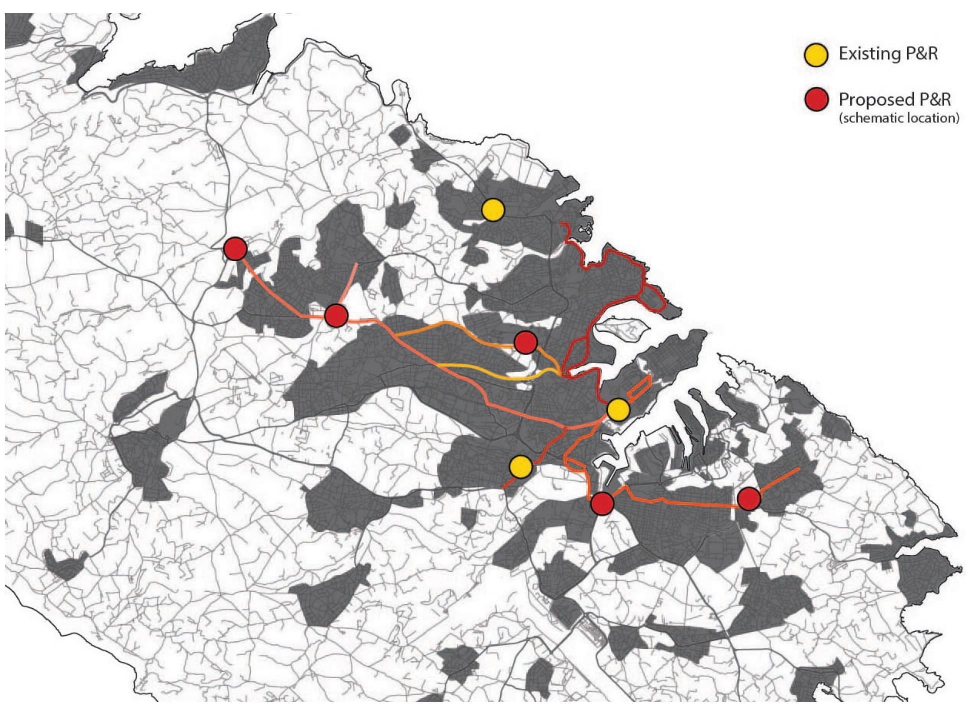


Figure 88.
Potential P+R sites for modal interchange

This measure will involve examining ways to improve the operations of the existing park and ride sites, identification of new links (e.g. between the peripheral Pembroke Park and Ride facility and the congested area around University of Malta and Mater Dei Hospital) and exploring the potential to develop additional Park and Ride facilities to encourage further intermodal interchange from private car to public transport at the periphery of main areas of employment. The potential to introduce frequent circular bus routes connecting peripheral informal parking areas to town centres could also be studied.

Analysis illustrates that points of interchange are missing for the North / Central interchange to the Hub and the South interchange to the Hub (Figure 89).

These Park and Ride sites need to be developed in relation to the PTQC (Figure 88) with the aim of facilitating modal shift from cars to public transport at the periphery of the 'Hub'. Such sites could also be linked to peripheral residential areas via circular routes to increase the quality of service. Alternatively, public transport would be made more accessible to these areas as users could drive to such sites and then change onto public transport using the PTQC.

Further analysis would be required as part of this measure to better understand the usage and patronage of the existing Park & Ride sites. Park and Ride sites can sometimes be seen to attract bus users rather than car users (Attard, 2011) or could potentially act as traffic generators. The system developed would therefore need to consider all aspects so as to ensure that it serves to achieve modal shift from cars to public transport at the periphery of the 'Hub'.

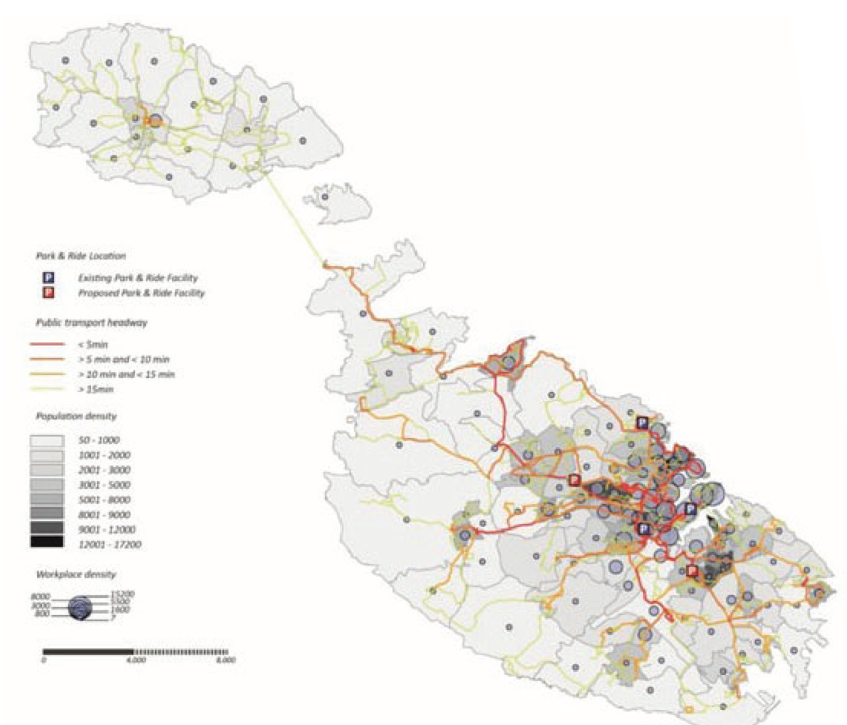


Figure 89.
Population Density overlaid with P+R sites and Public Transport Frequencies

2.3.3 EXPLORE OPPORTUNITIES TO MOVE TOWARDS TRANSIT ORIENTED DEVELOPMENT

Issues

The failure of the Structure Plan spatial planning and land use development strategy to stem the decentralisation of residences from the Inner harbour areas and to encourage mixed growth of residencies and jobs in close proximity of one another, has led to a larger geographical spread of trips and highly complex travel patterns.

The lack of critical mass of travellers between residencies, work and educational places renders regular bus service provision between these places uneconomic and, therefore, reinforces car dependency.

Changes to the bus network in 2011 had attempted to reconcile the land use decentralisation and spatial separation issues by identifying places on the bus network (interchanges) where passengers could change direction on buses away from the Inner Harbour region or places where car drivers could change onto bus services without the need to enter the congested Inner Harbour region. The general absence of parking control measures in the rest of the Inner Harbour region (outside of Valletta) had, however, seriously impacted on the overall effectiveness of this network reengineering. The decentralisation of work places and shopping areas away from the Inner Harbour Region also reduced the effectiveness of the backbone to the public transport network – the 'hub and spoke' system which has traditionally serviced the Valletta / Floriana peninsula. In contrast, land use development in Gozo has been better planned and the integrity of the central business and transport hub around Victoria still operates very efficiently.

As illustrated in Figure 90 and Figure 91, while frequencies tend to respond to higher densities, the choice of destination based on the number of bus routes servicing strategic areas is limited. The opportunity therefore exists to analyse the bus service in terms of frequency and choice of destination and develop measures which orient development towards areas with strong public transport access as well as improve public transport access in areas where population and employment densities are high.

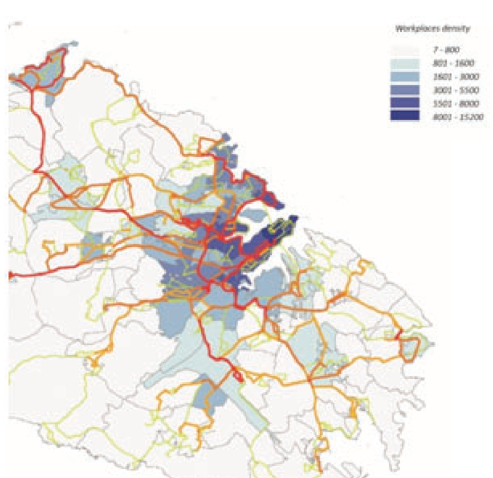


Figure 90.
Transit Routes showing Work Place Density

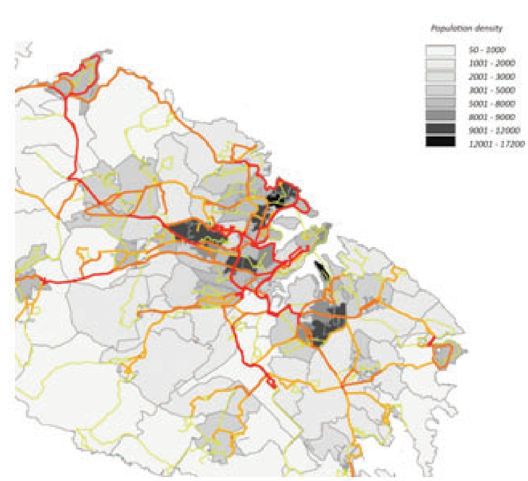


Figure 91.
Transit Routes showing Residential Density

Measures

S

2.3.3.1
ANALYSE ACCESSIBILITY (PT) INDEX FOR ALL TRANSPORT ZONES AND IMPROVE TRANSIT PROVISION IN RELATION TO CURRENT DEVELOPMENT PATTERNS

(S/M)

This measure involves the identification of an accessibility index to assess high density residential, employment and retail nodes and identify whether transit improvements are required. In parallel, it will develop the necessary policy framework aimed at prioritising future development around transit hubs and along the main bus corridors. Such an accessibility index will be a useful tool in informing development planning in relation to public transport provision.

PD

2.3.3.1
IDENTIFY STRATEGIC TRANSPORTATION HUBS AND TRANSIT CORRIDORS WHERE THE CONCEPT OF TRANSIT ORIENTED DEVELOPMENT CAN BE STRENGTHENED TO INFORM THE SPATIAL PLANNING PROCESS

(M/L)

Transit-oriented development, or TOD, is an approach to development that focuses land uses around a transit station or within a transit corridor. Typically, it is characterized by:

- A mix of uses
- Moderate to high density
- Pedestrian orientation/connectivity
- Transportation choices
- Reduced parking
- High quality design

The rule of thumb is that TOD occurs within half a kilometre, or a 5-7 minute walk, of a transit station or interchange point. Many cities are now adopting a TOD approach to city planning as a response to road congestion, rising energy prices, and growing interest in green building and walkable neighbourhoods. Experience shows that homebuyers, renters and employers are increasingly drawn to areas with convenient access to transit and other urban amenities such as neighbourhood shopping and services. Development frameworks should therefore be drawn up for the areas identified with the aim of improving the quality of the urban environment around the transportation hubs and transit corridors.

The spatial planning framework and the inter-disciplinary planning team referred to in previous sections should investigate technical and financial feasibility to introduce high capacity transit for such areas including: bus rapid transport corridors or light rail options (such as light rapid transit and metro), parking policies and control, and land use development policies and constraints.

2.3.4 IMPROVE PHYSICAL ACCESSIBILITY OF PUBLIC TRANSPORT SERVICE

Issues

Although in recent years there has been significant investment in accessible buses and in accessible infrastructure (termini, hubs and park and ride), access to many of the bus infrastructures – particularly on streets in residential and commercial areas - remains problematic for several user groups such as the elderly, the young and persons with reduced mobility or impaired vision. Public transport waiting facilities need to be accessed on foot and, in this respect, footpath quality, continuity and width, as well as safe pedestrian crossing facilities, all form part of the overall travel experience by bus. Inadequate infrastructure provision for pedestrians negatively impacts on bus services. Similarly, inconsiderate and illegal parking at bus stops can have equally detrimental impacts on the accessibility by inhibiting boarding and alighting onto the low floor buses.

Measures

PRE

2.3.4.1 PROVIDE MORE ACCESSIBLE BUS INFRASTRUCTURE

(M)

National guidance for accessible public transport infrastructure published in 2009 sets out in detail the technical requirements for bus stop infrastructure including minimum geometric dimensions for bus stops, footpaths leading to bus stops and bus shelters.

While the provisions of this design guidance have been applied in the majority of infrastructure projects carried out on main arterial and distributor roads over the last five years, bus waiting infrastructure does not conform to these standards and prevent the proper docking of buses at bus bays. The measure will involve ensuring the strict adherence to the technical requirements for bus stop infrastructure by Local Government entities when preparing traffic management applications for roads falling under their responsibility. Training sessions on designing for universal access could also be provided to improve awareness and knowledge within the industry.

S

2.3.4.2 INCREASE ENFORCEMENT OF ILLEGAL PARKING AND ENSURE PROPER USE OF BUS BAYS

(S)

Illegal parking, fly-parking or waiting on or near the bus stops can prevent buses from being able to enter the bus bay area and pull up in parallel to the kerb.

A more coordinated approach to enforcement is needed to effectively target and penalise illegal waiting or parking on bus bays.

This measure envisages the further use of technology (such as the use of CCTV parking surveillance equipment) which can be deployed throughout the day at the most critical locations.

2.3.5
IMPROVE THE QUALITY OF THE ENVIRONMENT AT PRIMARY AND SECONDARY PUBLIC TRANSPORT HUBS

Issues

For public transport to be considered as a viable alternative to the private car the comfort, safety, security and convenience of the facilities used for waiting and changing buses needs to be of the highest standards. The principal public transport hubs (Valletta, Bugibba, Malta international Airport, University, Cirkewwa, Mgarr and Victoria) were fully re-planned and designed to enable improved bus access, safe segregation between vehicles and bus users, shelter from the elements, seating and clear travel information. Secondary hubs at Mosta Techno park, Paola Square, Attard and Rabat were also upgraded along the same lines with pedestrian provision for crossing busy roads.

Customer and operator feedback received to date in relation to using the different upgraded infrastructures has been quite varied. Certain bus infrastructure facilities are considered to be user friendly and of the highest quality while others (such as Mater Dei, University; Porte Des Bombes, Blata l-Bajda; Rabat, Mosta Rotunda and Paceville) would seem to have fallen somewhat short of the mark.

Measures

S

2.3.5.1
CARRY OUT A QUALITY AUDIT OF EXISTING PUBLIC TRANSPORT HUBS

(S)

This measure will involve the carrying out of a national quality audit of all primary and secondary bus infrastructures to objectively assess each facility (old and recently upgraded) and allocate an individual score to the infrastructure for both the bus user and the bus operator from the perspective of comfort, safety, security and convenience. Such an audit will also need to consider how public transport hubs can be better integrated, through urban design, into the urban fabric, so as to encourage commuters to approach these facilities through walking and cycling.

This relative scoring of the quality and user friendliness of public transport facilities shall enable the objective ranking and prioritisation of future maintenance and new projects, facilitating longer term financial planning for infrastructural investment.

PT

2.3.5.2
IMPROVE THE ENVIRONMENT AND ACCESSIBILITY AT VALLETTA PUBLIC TRANSPORT HUB

(M)

Following the previous measure involving a quality audit to objectively assess each facility, the improvement of the infrastructure for both the bus user and the bus operator would follow. In recent years, the Valletta terminus has expanded to handle more routes that originate at Valletta and there is an opportunity to regenerate the Triton Fountain area and improve overall appearance and accessibility of all trips to Valletta including cycling and on foot.

Some bus operations to the Valletta terminus could be transferred to the Park and Ride just outside Valletta. The connectivity and mode of travel between the Park and Ride and the entrance to Valletta could be improved thus optimising the use of the limited space available at the public transport hub.

PRE

2.3.5.3
EXPLORE ALTERNATIVE FORMS OF FINANCING FOR PUBLIC TRANSPORT INFRASTRUCTURE

(S)

Over the decades, the level of investment in new public transport infrastructure and in the upkeep of existing facilities was low and inadequate. In more recent years, the situation has changed with significant national funding being made available for the one-off projects to modernise many bus termini and interchanges, for the extension of the Valletta bus terminus and for the creation of two new park and ride facilities. There is, however, a lack of short, medium and long term programming and financial planning for bus infrastructure provision and improvement.

The only exception to the national funding of public transport infrastructures has been in the provision of bus shelters. In this case, a concession contract was entered into between a private sector entity and the Local Councils Association. The contract obliged the private company to procure, supply, install and maintain bus shelters in Malta and Gozo and in return this company was granted exclusive advertising rights on the bus shelter panels.

The balancing between bus operational needs and the commercial needs of the private entity has, at times, led to lengthy delays responding to new bus shelter provision. In this respect, experience gained in the outsourcing of infrastructure provision gives useful insight into how any future contracts with the private sector could be refined and improved.

This measure shall involve exploring opportunities for further private financing of bus infrastructure provision through for example integrating small retail outlets into the larger bus stations and park and ride facilities and sub-letting these out to private operators against payment. The measure also envisages making greater use of ERDF and other EU funding programmes made available under the theme of decarbonising cities.

2.3.6 IMPROVE AVAILABILITY AND QUALITY OF UNSCHEDULED PUBLIC TRANSPORT FOR SCHOOLS

Issues

The use of private cars to ferry children to and from schools has been steadily increasing over the years. From a preliminary analysis, modal choice in travel to school is largely dependent on two factors: type of school and the travel distance between home and school. For trip lengths which are less than 5km almost 37% of trips are made by car which is relatively high considering the short distances.

Trip Length (km)	Private Vehicles	Public Transport	Other
0 – 5	36.9%	43.1%	20.0%
5 – 10	56.6%	43.3%	0.1%
10 – 15	47.0%	53.0%	0.0%
15 – 20	45.0%	55.0%	0.0%
20 – 25	78.6%	21.4%	0.0%
25 -30	100.0%	0.0%	0.0%
>30	100.0%	0.0%	0.0%

Table 3.
.Modal split in relation to travel distance for educational purposes

Government primary schools are generally found within urban centres and attending pupils mainly live within the local catchment area. For this reason, a high proportion of journeys to Government primary schools are made on foot. Government secondary schools tend to have a more regional dimension with a larger geographical pupil catchment area. Unscheduled collective transport is organised centrally through the Ministry for Education using private operators from minibus and coaches sectors; such transport is provided free of charge. A significant proportion of trips to Government secondary schools are made using collective unscheduled public transport.

Church schools, private schools and sixth forms, on the other hand, largely operate with a national catchment area and this gives rise to highly complex systems of trip attraction to these schools. Collective unscheduled public transport is only usually provided where there is sufficient demand from a town or village to a particular school; this transport is usually organised on the initiative of parents rather than the school.

The modal split to church schools, private schools and sixth forms has a significantly higher proportion of car trips (with many parents dropping children off on their way to work) when compared with government primary and secondary schools.

The spatial planning policy framework for new schools or relocation of existing school tends to encourage development in new areas with more open space available for school facilities and parking. However, these open spaces are generally located at the edge of towns or outside development zones and are often sited beyond easy walking distances for children and out of reach of scheduled public transport services. This inevitably leads to increased car dependency and ultimately increased traffic congestion.

Pupils are often discouraged from using collective school transport due to the inconvenient timing of the services. Journeys often start very early in the morning and the return trip back home is usually at a fixed time that does not take into account extra curricula activities.

More detailed analysis is, however, needed to fully understand the individual patterns of transport and modal split at each main school.

Measures

S

2.3.6.1
REVIEW SCHOOL TRANSPORT SERVICES TO IDENTIFY ISSUES AND STRATEGIC INTERVENTIONS

(S)

This measure involves carrying out a review of unscheduled public transport provision at the main Government, private and church schools with a view to assessing the quality of service, types of operation, relative costs, levels of safety and security, convenience of transport start times, effectiveness of routings and traffic impact on road network surrounding the school.

Criteria for assessing planning applications for the location of new schools and relocation of existing schools should focus on school accessibility on foot, by scheduled public transport and unscheduled public transport.

Figure 92.
Conflicts of private transport parking and unscheduled service provision

2.3.7
REDUCE IMPACT OF CLUSTERING OF UNSCHEDULED PUBLIC TRANSPORT PARTICULARLY IN TOURISM HOT SPOTS AND COMMERCIAL AREAS.

Issues

The high level of competition for the limited road space in major tourist hotspots between the different types of public transport operation and between public transport operators and other users leads to confusion and conflict, often leaving tourists with a poor impression of the level of transport organisation in the country. The problem is often compounded by highly concentrated peaks of tourist activity at these locations and the lack of space, poor enforcement and low level of cooperation between operators. This gives rise to illegal, haphazard parking of public transport vehicles and dangerous boarding and alighting of passengers in busy sections of the road.

Figure 93.
Double parking by Hop-on Hop-off buses

Better organisation of public transport in tourism hotspots will require improved liaison between internal stakeholders, external stakeholders, such as the transport operators, tourism, local councils, etc. and enforcement bodies to determine the optimal level of parking, boarding and alighting space provision. The possibility of introducing ITS technology to better manage and enforce the correct usage of designated public transport spaces at busy locations should be investigated in combination with the use of satellite waiting areas from which operators can be electronically summoned in an orderly manner when it is their turn to pick up their passengers.

Measures

PRE

2.3.7.1
REVIEW AND IMPROVE POLICIES FOR TRAFFIC MANAGEMENT, DEMAND MANAGEMENT AND OPERATIONS OF UNSCHEDULED PUBLIC TRANSPORT

(S/M)

Better coordination is required between the authorities and all the stakeholders so as to find the optimal use of allocating road space. ITS and related IT systems can also be used to develop time slot tools to help manage the need for waiting at premium road space locations. The vehicles could then be located away from the location and then call in at the appropriate time slot.

Enforcement measures to ensure that the operators are utilising the allocated timeslot and to reduce illegal parking on spaces designated for public transport is required to ensure that such systems work effectively.

2.3.8
IMPROVE SUPPLY OF ALTERNATIVE FORMS OF SCHEDULED PUBLIC TRANSPORT

Issues

There are only two forms of scheduled public transport, bus service and ferry service, while the main unscheduled transport (coaches, taxis, minibuses, open top buses) are mainly geared for the tourist market and the transport of school children.

There is a lack of affordable alternative forms of public or collective transport that offer more direct service for commuting, business travel during work hours and for other purposes.

Measures

PD

2.3.8.1
CONTINUE THE PLANNING AND DEVELOPMENT OF A MASS RAPID TRANSIT SYSTEM WITH A VIEW TO ESTABLISHING A DETAILED PROPOSAL FOR PUBLIC CONSULTATION

(M/L)

Mass Rapid Transit (MRT) is the collective term often used for public transport systems in urban areas that are physically segregated from road traffic that are designed to carry large numbers of passengers, rapidly. Given their relatively high capital and operational costs and the requirement for fare levels to be competitive with other modes, MRT systems usually require mass ridership. The three main types of MRT systems are:

Busways: which generally comprise segregated sections of roadway within major corridors, with horizontal protection from other traffic, and priority over other traffic at junctions, which are generally signalised. Busways (shown in Figure 94 as "on HOV lane") are normally the preferred system for estimated patronage levels of up to around 8,000 per direction per hour;

Light Rail Transit (LRT): which are usually at-grade, with similar horizontal protection to Busways are commonly used in urban areas for expected patronage levels up to around 12,000 per direction per hour; and

Metros: which are fully segregated in the vertical plane, usually elevated or underground. It is the segregation that is critical to providing a rapid service, and the technology that allows a high mass ridership to be carried. Metro systems are normally introduced in urban areas where patronage levels are expected to reach 25,000 passengers per direction per hour.

Figure 94 also shows expected speeds for the various public transport systems as compared to their expected volumes carried. The figure shows that segregated light rapid transit (depicted as "exclusive row") operates at significantly higher speed with significantly higher volumes to be effective.

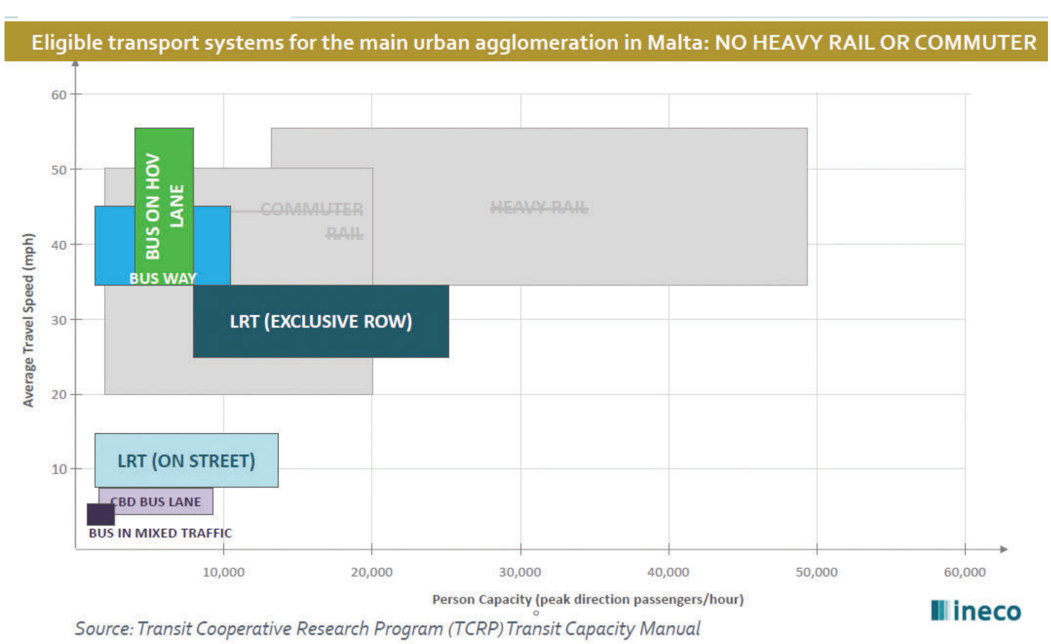


Figure 94.
Capacity and Travel Speeds of Public Transport Systems

Achieving the levels of mass ridership required to be financially and economically justifiable and the financial outlay for an MRT in Malta would require land use and policy changes to create critical mass which, if effected today, would be realised over the medium to long term.

Preliminary, pre-feasibility studies have been carried out in recent years which assess the potential for introducing a Busway system and a Light Rapid Transport system. This measure aims to continue the options analysis as part of a more detailed technical, financial and economic feasibility study which will identify possible MRT alignments, clear costings and explore potential sources of financing. The outcome of the studies will be a detailed proposal which will be presented for public consultation.

PRE

2.3.8.2
CREATE A FRAMEWORK FOR INTRODUCING DEMAND RESPONSIVE TRANSPORT

(M)

Conventional bus services have fixed routes and operate at pre-determined times with fixed stopping places. In sparsely populated areas, this means the bus usually has to travel round all parts of the village or hamlet to provide basic levels of accessibility - even when no-one wants to travel. This can lead to torturous routes, low frequencies and poorly used services.

New developments in technology - satellite tracking, on-screen and online information in call centres and buses, and routeing software, have made it possible to create collective services which respond more directly to the requirements of the individual passenger 'Demand Responsive Transport' (DRT). In DRT, seats may be pre-booked through a call centre or online and size of public transport vehicle offered can be adjusted accordingly. The collective transport is individually pre-booked and these bookings are grouped according to time and zone. So the journey may take longer than a taxi, but the advantages of DRT collective transport are that the service can be of high quality, almost door to door and can work out much cheaper.

This measure involves creating the policy and regulatory framework to supplement the current scheduled bus service in Malta and Gozo with demand responsive services and piloting a number of local feeder services using zero emission vehicles which would link peripheral areas to their regional public transport hubs.

The University of Malta is currently testing a prototype for a Shared DRT System for the Msida Campus. The lessons learned from this system and its accompanying research can aid in the implementation of future DRT systems in the Maltese Islands.

02.4 INTERMODAL OPERATIONAL OBJECTIVES

Intermodal transport is the use of various modes of transport by passengers or freight to link from one destination to another. Both passenger and freight intermodality is considered under this objective.

Further detailed measures pertaining to the development of air, sea and road transport that support this intermodality are also found under their respective sections of this master plan.

2.4.1 IMPROVE INTERMODAL SEAMLESS MOBILITY (TRAVEL INFORMATION, JOURNEY PLANNING SERVICES AND MULTI-MODAL TICKETING)

Issues

Improvements to the journey planner, synchronisation of timetables and possible incorporation of multimodal ticketing (to cater for all modes of transport) are required. Together with integrated travel card, the improved timetabling information would provide a better seamless intermodal experience.

The peak travel times for the airport do not coincide with the road traffic peak periods. Therefore the public transport operator needs to consider provision of services that coincide with this travel demand. The scheduled bus service at the airport also does not extend long enough into the evening to provide transport for late night flight arrivals (in particular low cost carrier passengers).

Likewise the scheduled bus service does not extend late enough in the evening to cater for arrivals or departures on the fast ferry to Sicily.

Measures

S

2.4.1.1
ENCOURAGE OPERATORS OF PUBLIC TRANSPORT TO INTEGRATE AND COORDINATE THEIR OPERATIONS OF TICKETING INFORMATION AND JOURNEY PLANNING

(S)

As most of the public transport in Malta is outsourced to private sector, Government needs to encourage these operators to integrate and collaborate by establishing an appropriate clearing mechanism and revenue apportionment. This will aim to provide seamless multi-modal ticketing and improve the efficiency of the multimodal chain for passengers.

Journey planning services could also be facilitated by requiring the operators to provide the information about their services in an open-data format, suitable for data aggregation by developers of such journey planners.

S

2.4.1.2
FACILITATE THE DEVELOPMENT OF A REAL TIME MULTI MODAL JOURNEY PLANNER

(S)

Improvement of the availability of real-time travel information on bus/ferry stops would facilitate the development of journey planners and mobile applications, which in turn would improve visibility of options for intermodal connections and of conditions during travel by passengers.

2.4.2
DEVELOP TRANSPORT HUBS TO ENCOURAGE INTERMODALITY

Issues

Utilisation of public transport in the congested urban harbour region could be increased by providing more modal choice. Improved intermodal transport hubs that provide safe, secure connections between the different modes of travel would significantly improve the use of non-road transport.

Interchange on the ferry links between Sliema and Valletta, and Valletta & Three Cities is complicated and not user friendly.

Links between Valletta/Sliema Ferry and Valletta City centre from Marsamxett is an issue due to differences in the vertical elevation of Valletta when compared to the quayside.

On the Three Cities side of Valletta, access of the vertical lift connecting the inner harbour ferry to Valletta is limited by the Upper Barrakka Gardens opening hours (7:00am and 9:00pm during winter and 7:00am and 11:00pm during summer).

Since the introduction of the harbour ferry services, patronage has been increasing year on year. The services are particularly popular with tourists, while the daily usage of ferries for commuting has been steadily picking up since services started operating after 19.00 hours. Patronage growth, however, is also restricted by the limited catchment area (pedestrian accessible area only such as Sliema, Isla, Bormla, Birgu) and the difficult vertical pedestrian access between the ferry landing place at Marsamxett and Valletta city centre.

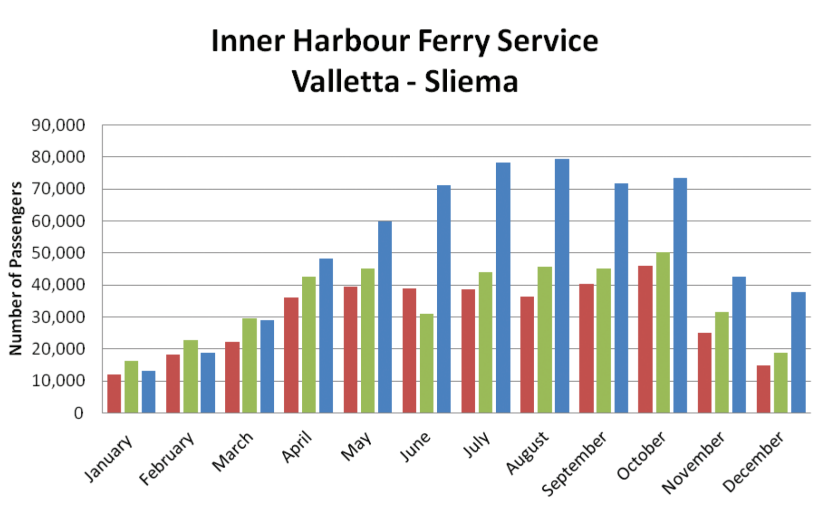


Figure 95.
Ferry Patronage: Sliema-Valletta

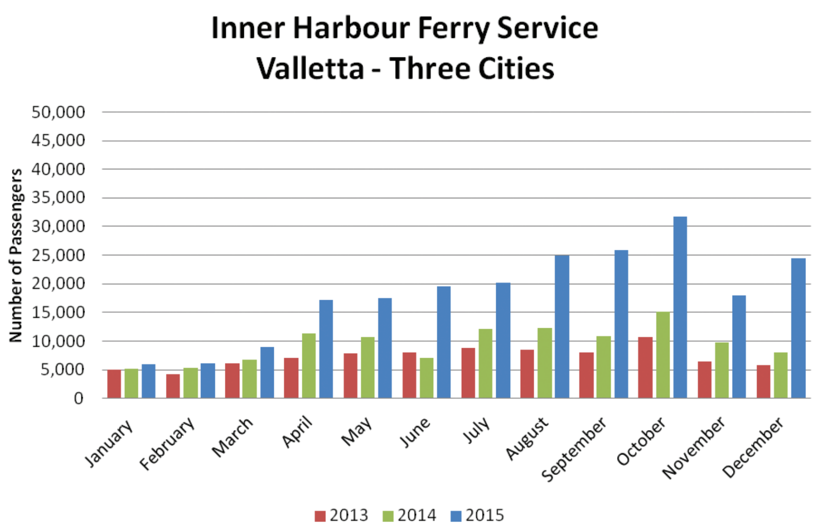


Figure 96.
Ferry Patronage:
Three Cities - Valletta

The current number of passenger carried out by ferry within the harbour area is relatively small (as shown in Figure 97) when compared with the total trips on the network. However, there is evidently a latent demand which could be further tapped with ferry service and infrastructure improvements and this could serve to alleviate some of the congested roads in the inner harbour areas.

Maritime transport links used to exist between a number of different localities, but these have been lost over time. The re-establishment landing place with adequate facilities for internal maritime transport services in localities such as St. Paul's Bay, Msida and St. Julian's could also encourage a modal shift.

Potential Trips	Day
Sliema - Valletta	3,667
Valletta - Sliema	6,541
Valletta - Three Cities	75
Three Cities - Valletta	122
Valletta - Msida/Pieta	3,173
Msida/Pieta - Valletta	2,446
Total	16,023

Figure 97.
Potential AM Peak hour by Commuters on Ferry to/from Valletta (NTM; Elaboration)

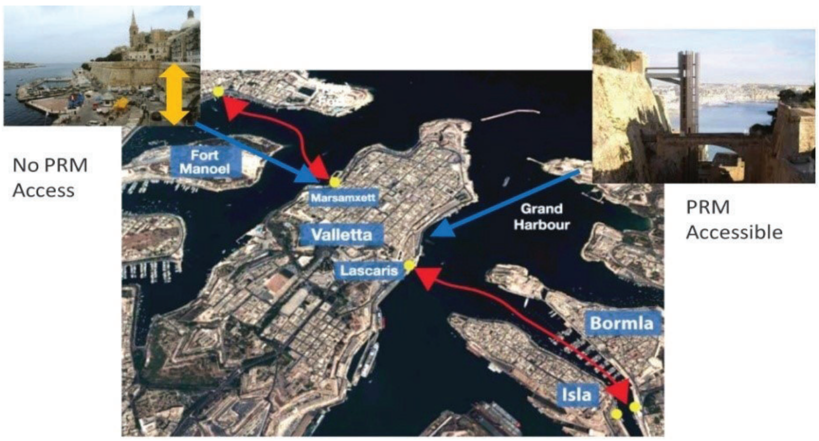


Figure 98.
Montage showing ferry connections to Valletta

Ferry operations are sometimes disrupted by bad weather since there is no breakwater system protecting the Port of Marsamxett, and further navigational aids are required to ensure safe use of the port areas.

The coastal areas have been identified under the Appropriate Assessment to be environmentally sensitive areas (see Chapter 5) and it possible that impacts on the Natura 2000 sites in their proximity need to be assessed when implementing measures listed below under this operational objective.

Measures

PT

2.4.2.1
IMPROVEMENT OF THE EXISTING FERRY LANDING PLACES

(S)

The physical upgrading of existing inner harbour ferry landing sites is necessary so as to better accommodate fast docking of the new vessels, to provide access for all.

Improvements to the shelters and information provision at ferry landing places will support this upgrade, as well as the development of facilities for alternative modes of transport such as and e-bikes. Cycle-racks and charging stations for e-bikes, will be established close to the ferry landing place. Circular bus routes shall also connect to the main public transport service and to P+R facilities.

PD

2.4.2.2
STUDY OPTIONS AVAILABLE TO IMPROVE WAVE CLIMATE IN THE PORT OF MARSAMXETT

(S)

As the Port of Marsamxett is developing capacity to support internal maritime transport links, it becomes important that disruptions to ferry operations by bad weather are reduced.

Preliminary options to provide a better wave climate in Marsamxett have determined such as an enhanced breakwater system, but a detailed analysis of the measure to be implemented also needs to be carried out in the context of the wider Port master plan.

Due consideration for the need for further navigational aids to mariners is also required to ensure the continued safe use of the port.

PT

2.4.2.3
ASSESS POTENTIAL FOR NEW FERRY LANDING PLACES

(S)

Studies to assess the potential for the introduction of new landing sites are required. These could explore the potential for ferry services for example at St Julian's, Msida and, St. Paul's Bay, as an extension of the existing service or as a new service. The development of these routes could provide better accessibility to Valletta where interchanges with other modes of travel are possible.

PD

2.4.2.4
IMPROVE THE VERTICAL AND PEDESTRIAN CONNECTIVITY BETWEEN THE SLIEMA-VALLETTA FERRY SERVICE IN VALLETTA AND THE CITY CENTRE

(S)

Pedestrian connectivity between the Marsamxett ferry landing place and the centre of Valletta remains difficult.

Options to improve the pedestrian connectivity need to be studied, with vertical connectivity taking heritage considerations into account.

PRE

2.4.2.5
PROVIDE AND REGULATE SPACE FOR USE OF BICYCLES

(S/M)

Infrastructure needs to be developed to encourage the use of active transportation modes (e.g. walking, bicycles, e-bikes) at transport hubs thereby supporting the ´last mile´ concept. Also the public transport network (and buses) could be modified to enable the carrying of bicycles where infrastructure supporting the safe use of cycles is not yet available.

2.4.3
IMPROVE LOGISTICS AND URBAN DISTRIBUTION OF GOODS IN THE MULTI-MODAL CHAIN BETWEEN PORTS, AIRPORT AND HINTERLAND

Issues

Freight transport and goods delivery frequently experience delays resulting from congestion while also actually contributing to traffic delays due to obstruction or double parking. This is particularly the case in urban areas of Malta.

Competing space requirements for residential, retail and freight delivery is common in locations where freight deliveries are required. Illegal parking on the bays also leads to delivery vehicles often wholly or partially blocking traffic while loading and unloading goods.

In Malta's compact urban areas, such temporary bottlenecks are highly unpredictable and can easily trigger local network failure or indeed issues within a wider catchment area. In this respect, measures seeking to rationalise and better manage urban goods distribution have a very important role to play in alleviating traffic congestion.

The negative impacts of freight delivery have been exacerbated in recent years with the promotion of new production and logistics patterns which prioritise just-in-time deliveries characterised by more frequent deliveries and half-empty truckloads.

In Malta, freight transport is probably the least regulated road transport sector. There is a lack of data on the freight market in general in Malta, and the inter-modal aspects of freight movements in the islands. In addition, data on the extent of break-bulk of freight to local and urban distribution is not readily available but studies on the freight movements are planned to be studied by Transport Malta.

Measures

S

2.4.3.1
IMPROVE THE MANAGEMENT AND REGULATION OF FREIGHT TRANSPORT AND URBAN LOGISTICS

(M/L)

City logistics strategies seek to efficiently bundle disparate freight movements within central areas and better organise their modalities.

This type of approach firstly seeks to reduce the overall number of freight deliveries which will in turn reduce the number of commercial vehicles on Maltese roads. Secondly, the better time management organisation of freight deliveries within busy centres can effectively reduce their impact during peak travel times. Finally, the resultant better fleet management and more efficient usage of delivery vehicles can lead to the lowering of operational costs for costs (less fuel used, less driving time, shortened waiting periods etc.)

Options to improve the last mile delivery of goods, could be explored through pilot projects, considering night-time delivery using low-noise vehicles and a coordination system for optimal scheduling.

S

2.4.3.2
SET UP A NATIONAL FREIGHT FORUM TO IMPROVE URBAN LOGISTICS

(S/M)

The development of a national freight forum could bring together stakeholders and interested parties with the aim of further improving urban logistics. These forums could consider the potential of logistics hubs or co-ordinated distribution in urban centres to increase the effectiveness and efficiency of urban distribution.

PD

2.4.3.3
ESTABLISH FREIGHT ROUTES FROM PORTS THAT UTILISE APPROPRIATE ROADS FOR THEIR WEIGHT AND DIMENSIONS

(S)

The increased dimensions and weights of goods carrying vehicles which operate between Malta's maritime ports and the hinterland (location where break of bulk takes place, hauliers warehouse and final destination) is resulting in increased damage to the road infrastructures which were only designed for light traffic.

In the mid-1990s, the Birzebbugia Local Council, backed by the then Traffic Control Board, had introduced a number of local traffic management and regulation measures aimed to divert heavy vehicles using Malta Freeport Terminal away from residential areas and onto the TEN-T network. The regulatory framework was highly effective but was ever extended to other urban areas beyond the locality's boundaries.

This measure will involve the examination of the main freight routes between the ports and other areas across Malta, to identify the roads that can be used for safe and efficient transportation of goods and to introduce appropriate traffic management and information systems to improve these freight corridors and increase efficiency of the transport network.

Further studies to support the improvement of break-bulk of freight and its distribution to local and urban centres using smaller greener freight vehicles is also required

S

2.4.3.4
IMPROVE PORT-PORT AND PORT-AIRPORT CONNECTIONS FOR FREIGHT.

(M/L)

The potential to improve port to port and port to airport freight logistics is high for a country as small as Malta. This sector is fully liberalised, so government could establish working groups to discuss and explore opportunities with all stakeholders in this sector.

02.5 INTERNAL MARITIME OPERATIONAL OBJECTIVES

2.5.1 ENSURE DEVELOPMENTS IN PORTS ARE BACKED UP BY LONG-TERM PLANNING TO SUPPORT LONG-TERM MOBILITY PATTERNS, SAFETY AND SECURITY

Issues

The ports have developed over the years and the appropriate infrastructures need to be reviewed to ensure that the functionality of the port continued to service the current and future needs of society. This review is now overdue and its strategic importance, as well as future plans for development of the port and its immediate hinterland need to form part of the holistic port master plan as described in the External Maritime sections of this master plan.

As the Port of Marsamxett develops into a leisure port, future provision for additional internal or external transport services will be required.

The inter-island ferries are owned by a separate company to the operational company and sustainability of this arrangement needs to be considered in the light of the long term replacement of vessels. Currently the operator of the Malta-Gozo ferry is compensated €5.5m over the six year period of the public service contract.

Measures

PRE

2.5.1.1
REVIEW THE FINANCIAL SUSTAINABILITY OF THE MALTA-GOZO LINK, INCLUDING OPERATIONS, MAINTENANCE AND ASSET REPLACEMENT TO DEVELOP A BUSINESS MODEL THAT MINIMISES THE NEED OF GOVERNMENT FINANCIAL SUPPORT

(S)

The inter-island ferry link has for many years not been profitable and while in recent years the situation has improved, the ferry has not managed to generate sufficient revenues for asset renewal. New ways of reducing the government funding under a public service contract needs to be considered and studied in detail, including possible publicity revenues, differential fares based on frequency of use or peak pricing, etc.

S

2.5.1.2
IMPROVE THE FRAMEWORK FOR COLLATION, ANALYSIS AND DISSEMINATION OF METEOROLOGICAL AND HYDROGRAPHIC DATA TO SUPPORT PLANNING, DESIGN AND OPERATIONS OF INTERNAL MARITIME TRANSPORT

(S/M)

The current framework for the collation and dissemination of offshore and inshore meteorological and hydrographic data is unstructured and responds to ad-hoc requests. There is a need for consistent and timely publication of this data so that it becomes more readily available both for operational needs, as well as to support long term planning.

PT

2.5.1.3
INTRODUCE MARITIME WEATHER STATIONS IN PORTS TO RECORD TRENDS WHICH ARE NECESSARY FOR PLANNING AND DESIGN

(S/M)

Detailed meteorological data of weather and wave climate in the ports and their approaches is not routinely collected, but is driven on a case by case basis. There is the need to develop port weather stations and data collection buoys that enable the generation of long term trends for planning and design of port and maritime infrastructures.

PD

2.5.1.4
ASSESS THE POTENTIAL FOR UNDERUTILISED PORT AREAS TO BE USED FOR INTERNAL TRANSPORT/MASTER PLANNING FOR SECONDARY PORTS

(M)

Access to the port interface is highly valuable and Government should consider the fair allocation of physical space to improve internal transport.

Where concurrent interests cause spatial conflict the development of holistic port master plans and their links to urban areas and other transport infrastructures would support long term planning by public and private stakeholders.

This measure is the establishing of a master plan for the secondary ports such as Marsamxett.

2.5.2 IMPROVE OPERATIONS AND ENFORCEMENT SO THAT INTERNAL MARITIME TRANSPORT IS PROPERLY REGULATED AND MONITORED

Issues

While government has outsourced the provision of internal maritime transport by concession, to make certain that value of money is achieved, the authorities need to ensure contract compliance. Monitoring therefore must be carried out in a systematic, routine manner to guarantee continued compliance. Appropriate resources need to be allocated to enable this regulatory process to be properly carried out.

The use of telematics applications in internal maritime transport can improve efficiency and safety of operations. Local commercial vessels (including harbour cruises) are not currently required to use Automatic Identification Systems (AIS) and therefore traffic management in the port and its approaches causes challenges for port control. The requirement for these vessels to deploy AIS would also enable better enforcement, monitoring and safety.

Measures

PRE

2.5.2.1
INTRODUCE AIS ON COMMERCIAL VESSELS OPERATING IN INTERNAL PORTS

(S)

Automatic Identification Systems (AIS) are currently required on seagoing vessels on international voyages. Systems to track these vessels are already in place, and the introduction of AIS on local commercial vessels would improve safety, security and port operations. These systems could also better address maritime security within the ports and their approaches.

PT

2.5.2.2
DEPLOY SYSTEMS TO BETTER IDENTIFY INTERNAL MARITIME TRANSPORT AND THEIR CARGOES TO IMPROVE TRAFFIC MANAGEMENT, SAFETY AND SECURITY

(M/L)

ICT systems are currently used to relay vessel information and cargoes (including dangerous cargo) to various maritime enforcement agencies. Provision of details of voyages and cargo through the European SafeSeaNet is currently only required for seagoing vessels on international voyages. The extension of the requirements to provide information about the vessel, its passengers and its cargo would improve safety and security in the area around Malta, if also applied to domestic maritime voyages.

PT

2.5.2.3
IMPROVE VISUAL INFORMATION ABOUT VESSEL MOVEMENT AND LOCATION FOR TRAFFIC MANAGEMENT

(M)

The visual information arrangements for the External Ports provide crucial information to the Vessel Traffic Management Information System (VTMIS) to enable proper traffic management in the TEN-T Core Ports and their approaches.

This system could be better extended to cover both the TEN-T Comprehensive Ports and other secondary ports and quays. This would enable the Port Control to be aware of the location of other vessels and craft and improve their ability to safely manage port vessel movements. It would also support improved security for these ports and quays.

2.5.3 ENSURE USERS COMPLY WITH CONDITIONS ESTABLISHED FOR PUBLIC ACCESSIBLE MARITIME FACILITIES AS SPECIFIED IN CONTRACTS FOR USE OF THESE INFRASTRUCTURES

Issues

A number of entities and private operators use the various infrastructures that support internal maritime transport. Inappropriate use of these infrastructures or their use in a way that is not in line with their design often results in damage that is avoidable. Resource challenges in proper oversight and management of contracts and engineering monitoring (e.g. the monitoring of berthing approach speeds, over-use of bow thrusters, etc.) is having a negative impact on the integrity and condition of these infrastructures.

Measures

PRE

2.5.3.1
ESTABLISH CLEAR GUIDELINES WITH THE PORT INFRASTRUCTURE USERS FOR OPERATORS TO BE AWARE OF AND USE INFRASTRUCTURE WITHIN DESIGN LIMITS

(S)

The condition of maritime infrastructure needs to be reviewed in relation its current use, its design and its potential future use. Once established, clear guidelines or conditions for use need to be determined and these conditions relayed to the users of the infrastructures.

PRE

2.5.3.2
MONITOR AND CARRY OUT ENFORCEMENT ON OPERATORS WHO MAKE INCORRECT USE OF INFRASTRUCTURE

(M)

Contracts for use of the infrastructures need to be established or updated with the conditions of use of the infrastructures. Inspections of the operations of the users then need to be carried out to ensure compliance with the conditions. Penalties for inappropriate use and non-compliance then need to be imposed so as to make good for any damaged infrastructure.

2.5.4
REMOVAL OF BOTTLENECKS AT TEN-T COMPREHENSIVE PORTS

Issues

The TEN-T Comprehensive Ports of Cirkewwa and Mgarr are vital for the regional connectivity and territorial cohesion, providing lifeline access to Gozo and connections to the TEN-T Core network.

While terminal facilities at Mgarr and Cirkewwa have been recently upgraded, the quays, equipment and other maritime infrastructures are suffering from insufficient maintenance over many years. To ensure the long term sustainability of these investments, the quays and breakwaters need to be assessed for damage, and appropriate remediation or upgrade carried out in line with expected future demands.

The limitation of capacity is due to the space limitation at the Port of Mgarr and open port layout at Cirkewwa, rather than the terminals. Capacity in the Port is limited due to environmental and heritage restrictions and therefore demand needs to be managed;

In order to meet increased demand at the Mgarr port a third operational berth would be required, beyond simply a sleeping berth or one used for cargo. If a fourth ship is required, three operational berths will be needed to meet the demand.

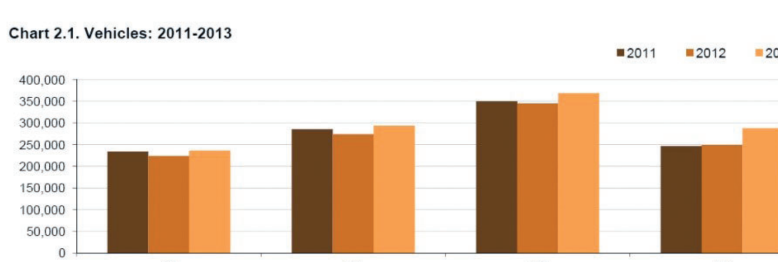


Figure 99. *Passengers and Vehicles Trend (2011-2013) between Malta and Gozo (NSO)*

Operational conflicts between the inter-island ferry operations and the yacht marina at the port of Mgarr do sometimes exit The port of Mgarr is also used for unloading and embarkation of passengers to Comino, as well as for local cruises. However, no proper landing place or facilities are provided for these activities in Comino.

The port of Mgarr is protected by a breakwater built in the 1970s. This location and design of the break water inhibits potential expansion of quay facilities within the harbour. Preventive maintenance has not been sufficiently carried out and deterioration of the quays is evident. The harbour requires routine dredging to maintain depths, and extensive dredging, required every 10 -15 years is overdue.

As it is not protected by a breakwater, the South Quay of at Cirkewwa requires extensive maintenance and possible reconstruction due to its exposure to the prevailing direction of wind, waves and storms.

The landside connections between the port of Mgarr and the rest of Gozo result in the most significant bottleneck for the port occurring during peak operations. These bottlenecks are due to the lack of sufficient space during peak periods in the vehicle waiting area and also to the fact that the access to the port is a single carriageway with single lanes in each direction road in the final stretch before the terminal and quays.

The Appropriate Assessment has identified that the measures under this Operational Objective are in the proximity of certain Natura 2000 sites (see Chapter 5) and due consideration as to the environmental impacts will need to be taken into account at project level.

Measures

PT

2.5.4.1
IMPROVE VISUAL INFORMATION ABOUT VESSEL MOVEMENT AND LOCATION FOR TRAFFIC MANAGEMENT

(M)

The improvement of the Mgarr and Cirkewwa breakwater systems require studies of the state of repair, expected future use and a determination of appropriate interventions to ensure the long term structural stability and sustainability.

PT

2.5.4.2
IMPROVE CIRKEWWA SOUTH QUAY

(M)

Following a detailed analysis of damage to the South Quay, extensive maintenance and possible reconstruction is required to be carried out.

The rehabilitation of the South Quay will ensure the functioning of the TEN-T Comprehensive Port of Cirkewwa in weather conditions that renders the North Quay unusable and therefore improve the resilience of the Port.

PT

2.5.4.3
IMPROVE CIRKEWWA SOUTH QUAY

(M)

A detailed assessment of the allocation of space in the Port of Mgarr, as well as the future demand for services is required. Once established, options to improve this TEN-T Comprehensive Port can considered including possible extension of the Port.

PT

2.5.4.4
DEVELOPMENT OF THE LANDING PLACE FOR THE FERRY SERVICE (INCLUDING FREIGHT) TO/FROM GOZO

(S)

Since the Sa Maison Port will be converted into a yacht marina, Government is currently looking for alternative facilities to improve internal sea freight transport in between the two islands, by re-locating domestic freight movements to the Port of Valletta.

PD

2.5.4.5
RE-INTRODUCTION OF AN EXPRESS PASSENGER FERRY LINK BETWEEN MALTA AND GOZO

(S)

The re-introduction of a fast passenger ferry link between Malta and Gozo needs to provide an additional mode to compliment the conventional ferry service in the short term. A new Public Service Concession contract for the operation of the Malta-Gozo ferry service is expected to be issued and awarded in 2016/17. This will include a public service obligation for the new service provider to operate a scheduled fast ferry service between Gozo and Malta. The new service provider will be required to carry out market studies it determine the optimal vessel size, type, as well as frequency of operation and landing place infrastructure on the north shore of the Port of Valletta or in the Harbour of Marsamxett, required for this service between Malta and Gozo, so as to provide good interconnectivity with Valletta and additional trip attractors such as the University.

This link would serve to improve commuting times between Gozo and the more inner harbour and central areas of Malta.

PD

2.5.4.6
RE-INTRODUCTION OF AN EXPRESS PASSENGER FERRY LINK BETWEEN MALTA AND GOZO

(M/L)

The quays in Marsamxett are used for local ferry services as well as tourism services. These services are exposed to poor wave climate in certain weather conditions. While this port is developing into a leisure port, these ferry services are a key part of the internal maritime transport system.

Measures to improve the wave climate in this port need to be analysed as part of the development plan for this port.

02.6 EXTERNAL MARITIME OPERATIONAL OBJECTIVES

2.6.1 ENSURE CONTRACTED PARTIES COMPLY WITH CONDITIONS ESTABLISHED FOR OPERATION OF MARITIME FACILITIES, AND AS SPECIFIED IN CONTRACTS FOR USE OF THESE INFRASTRUCTURES

Issues

Around €1.4bn of maritime infrastructure assets are estimated to exist in Malta and Gozo, with approximately €400m of these assigned to TM (the difference is largely due to the estimated value of the Malta Freeport infrastructures and those of Enemalta plc). Due to outsourcing of responsibility and maintenance of the infrastructure through concession contracts and other arrangements in recent years, this estimated asset value needs updating.

Concessions have been developed for a variety of port operations, quays and terminals. Concession contracts are an effective way to outsource operations and management of certain aspects of the port and its infrastructures. This allows the development of business opportunities by private sector enterprises in a way that is more efficient than that could be established by the public sector.

The definition of the Customs Free Zone in the Port of Marsaxlokk, currently under the remit of the Malta Freeport Corporation has allowed a very clear delineation of the area that is under concession to Malta Freeport Terminals Ltd.

Other concessions in the Port of Valletta have not been so clear cut, and extent of the "port" area is not as clearly defined. This somewhat complicates the definition of responsibilities both between the concessionaire and the Government, as well as between the various responsible entities within Government. Without clear responsibility delineation, the ability of Government to ensure that both it and the concessionaire fully comply with their concession contract can be difficult at best.

Measures

In response to these issues the following measures have been identified:

PT

2.6.1.1
DEVELOP CONTRACT MANAGEMENT SYSTEM TO ENSURE GOVERNMENT OBTAINS VALUE FOR MONEY.

OTH **(M)**

A well-structured contract management system will enable government to efficiently carry out inspections on the infrastructures under concession and to check whether or not contractual terms are being properly met.

Contracts can be highly complex and the variety of arrangements under different contracts does not facilitate streamlining of contract management. Therefore systems to manage these contracts need to be established to enable Government to extract best value for money for the contracted work or service.

In addressing the grey areas of responsibility in concession contracts, it is important to define the responsibilities of the various parties to the contract, as well as to define the government entity responsible for Government's part of the agreement. This will ensure that the respective entities take cognisance of their remit and responsibility and are able to dedicate the appropriate resource and therefore extract the best value for government.

There is also a need to review current contracts (especially long term contracts) to identify where the Government's needs have changed over time, or where loopholes or gaps exist. By redefining responsibilities Government may be able to reduce the gaps and ensure that the respective parties efficiently deliver their part of the contractual agreement and thus government can ensure that contracts are effective.

PD

2.6.1.2
DEVELOP INFRASTRUCTURE ASSET MANAGEMENT DATA BASE SYSTEMS (INCLUDING THE MILESTONES OF CONTRACT AND INSPECTIONS TO CHECK WHETHER OR NOT THEY ARE MET

(M)

Asset management data base systems enable the authorities to identify responsibilities, plan inspections and enforce the various aspects of the infrastructure contractual arrangements, including the milestones within each contract (e.g. major maintenance checkpoints, etc.).

Asset management systems assist in the proper documentation and management of assets. By containing the information in a way that is readily available, it would enable government and its entities to determine effective measures so as to maximise the useful life of the assets.

Asset management systems need to be supported by effective inspection regimes to ensure that the contractor is not overburdened, while at the same time ensuring that the Government receives value for money in line with contractual arrangements.

2.6.2
ENSURE DEVELOPMENT OF PORTS AND CONTIGUOUS AREAS ARE BACKED UP BY LONG-TERM PLANNING TO SUPPORT SUSTAINABLE GROWTH IN LONG TERM MOBILITY PATTERNS, RESILIENCE, SAFETY AND SECURITY.

Issues

Maritime ports are only as effective as the hinterland connectivity efficiency allows them. Recent recognition of the Port of Marsaxlokk and Port of Valletta as TEN-T Core Ports increases the understanding that these ports are an essential part of the EU transportation system and are crucial in ensuring cohesion and resilience.

Any port development (or development that has an effect in the proximity of the port) needs to recognise the importance of safe and efficient access to the port as an integral part of port development. As two important ports (Valletta and Marsamxett) sit within the most intensely urbanised areas of Malta, space for effective port operation is restricted.

Some areas of the port are in need of refurbishment and these may present opportunities to expand the landside operational areas adjacent to the port, thus enhancing the effectiveness of the port operation.

Current planning regulations study the impact of developments on road and port facilities on a project by project basis. This means that the effects of multiple developments in the proximity of each other are not considered holistically. In areas such as ports, where developments occur both within and in the immediate vicinity of the ports, a holistic approach is required so that allocation of space and others aspects are treated equitably for all stakeholders.

Long term studies of the Port of Valletta carried out in 1999 and 2007 had identified landside bottlenecks, which impede access to port areas for passengers and freight. Over the years, port side activities and traffic congestion on the land side has increased and this is now severely hampering safe and effective port operations. Similarly the identification of bottlenecks in the Port of Marsaxlokk limit the ability of the port to sustain future expected demand with the respective impact on the socio-economic fabric of Malta.

Since ports are highly integrated with their surrounding hinterland, and the land side, connectivity is essential to ensure efficient port operations. Regulation and action plans (e.g. urban areas and other transport infrastructures) would ensure long term sustainability of the port operations and also ensure that the port remains effective in servicing the community needs.

As the ports that are classified as TEN-T Core ports are the most critical external freight links for Malta, their integration into the rest of Malta's TEN-T network is crucial to ensure their effective operation. Both Valletta and Marsaxlokk suffer bottlenecks in land side the accessibility of the port, especially considering that freight movement necessitates larger vehicles (HGV's) that require suitable road transport links to be able to efficiently service the port.

While each port has is particularities, improvements of the land side access would greatly enhance the efficient, effective operation of the respective port and minimise the negative impacts that the operation have on the urban areas in their proximity.

Measures

In response to these issues the following measures have been identified:

PRE

2.6.2.1
DEVELOP 10-YEAR PORT MASTER PLAN DESIGNATING FUTURE LAND USES – TEN-T CORE PORT OF VALLETTA

(M)

Long term port master plans that enhance the ability of the port to act as a transport hub need to be developed. A clear long term master plan at port level would also enhance the ability of private stakeholder investment in port activity as it would provide confidence that investments would receive appropriate rates of return.

This process however needs to be guided by government such that the stakeholders collectively provide value to the whole of the port.

Master Plans for the Port of Valletta were last developed in 2006 by the Malta Maritime Authority. Over the years, however, these plans were never integrated into the 2006 Local Plan for the areas, and as a result, a number of changes and developments that are not compatible with these plans have proceeded and the Port Master Plan is now in need to review and update.

Maritime freight activity is well known to be supply-led and to ensure that Malta benefits from continued long term maritime connectivity, appropriate capacity analyses of each port and each area within the port needs to be included in the planning process. The potential for a logistics base including a customs free zone in this area could be considered.

By identifying potential future bottlenecks or capacity problems, appropriate measures to resolve, alleviate or mitigate these capacity issue can be planned bearing in mind that changes in the port areas can be complex, and infrastructure at the land/sea interface is costly and has a long implementation lead time.

The safeguarding of land for port use while taking into account future development, recognising the intermodal connections required with road transport and the storage and warehousing facilities required to enable the smooth operation of the facilities all need to be incorporated within the port master plan.

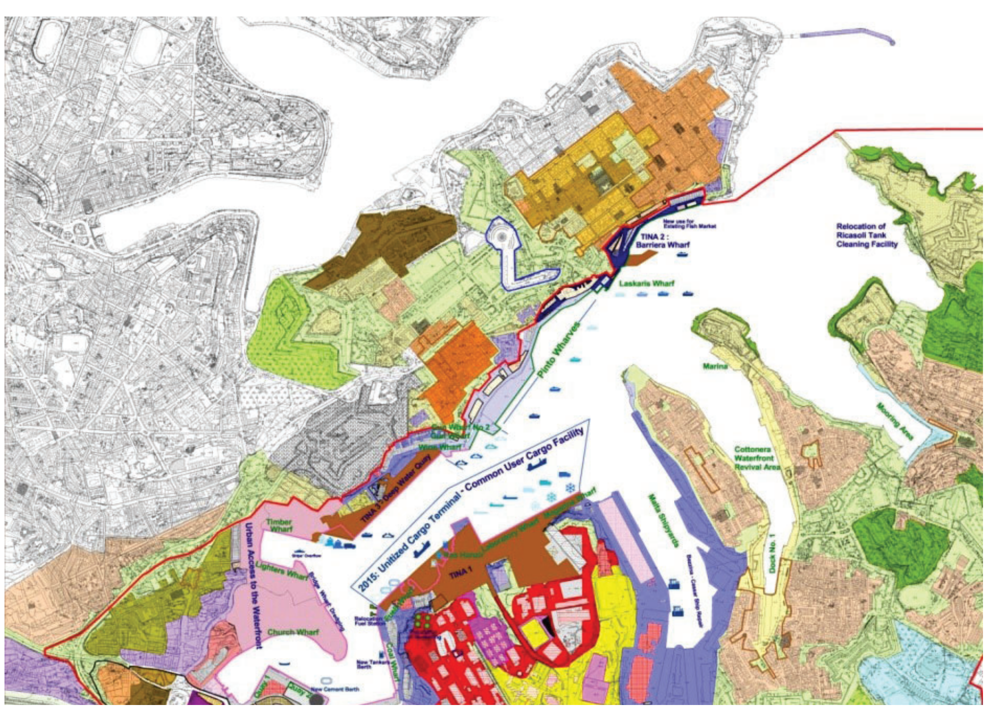


Figure 100.
Long-Term Vision - last developed by the Malta Maritime Authority in 2006

PRE

2.6.2.2

DEVELOP 10-YEAR PORT MASTER PLAN DESIGNATING FUTURE LAND USES – TEN-T CORE PORT OF MARSAXLOKK

(S)

While the main private sector operator in the Port of Marsaxlokk has developed plans for expansion up to 2020 (Figure 101) Government needs to establish long term plans for the whole of the port, incorporating not only the transport and logistics operations, but also other uses of the port such as energy production, bunkering, fishing, industry and residential and/or leisure activities.

Long term port master plans that enhance the ability of the port to act as a transport hub and a clear long term national master plan at port level would also enhance the ability of private stakeholder investment in port activity providing confidence that investments would receive appropriate rates of return.

This process also enables Government to decide which, and at what cost, relevant land space requirements can be allocated to the various and sometimes conflicting stakeholders such that all collectively provide value to the whole of the port.

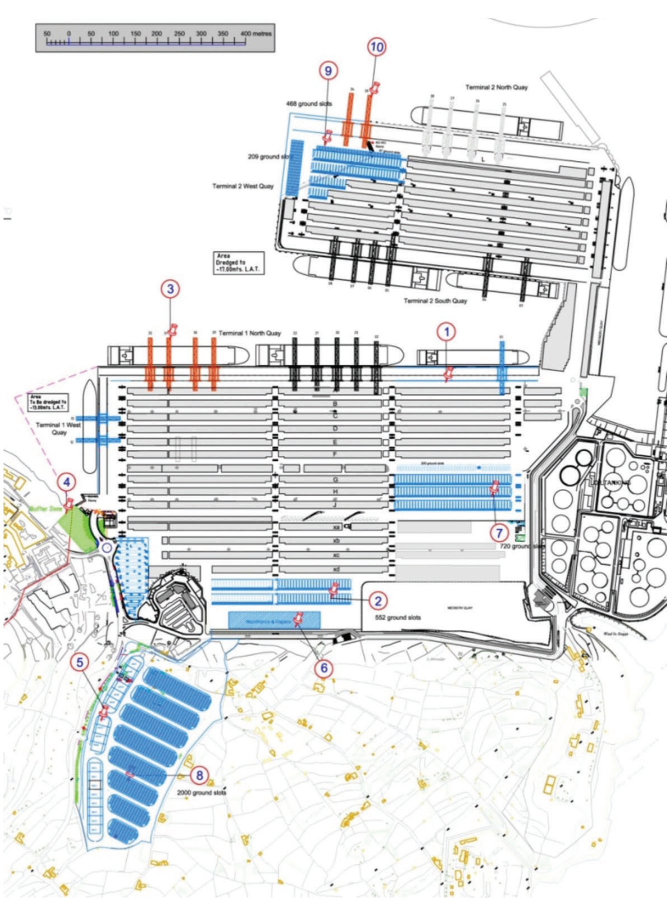


Figure 101.
Malta Freeport proposals as shown in MFT Master Plan

2.6.3
REMOVAL OF BOTTLENECKS IN THE TEN-T CORE PORT OF VALLETTA

Issues

Valletta is a historic port which is surrounded by bastions and very limited hinterland space available for port development and operations; development of new infrastructure in the Port is also restricted.

The breakwaters in the Port of Valletta are listed historical structures and their configuration limits accessibility into the port especially for larger ships over 340m.

Many of the quays were originally built during the 16th century and modified over the years, but today require extensive maintenance. There is a need to upgrade the quays to be able to safely handle modern sized vessels. Also, the deck loading of the quays for cargo operations is restricted due to structural load bearing capacity. Only smaller cranes can be used on Deep Water Quay due to deck loading restrictions and therefore results in operations being slower.

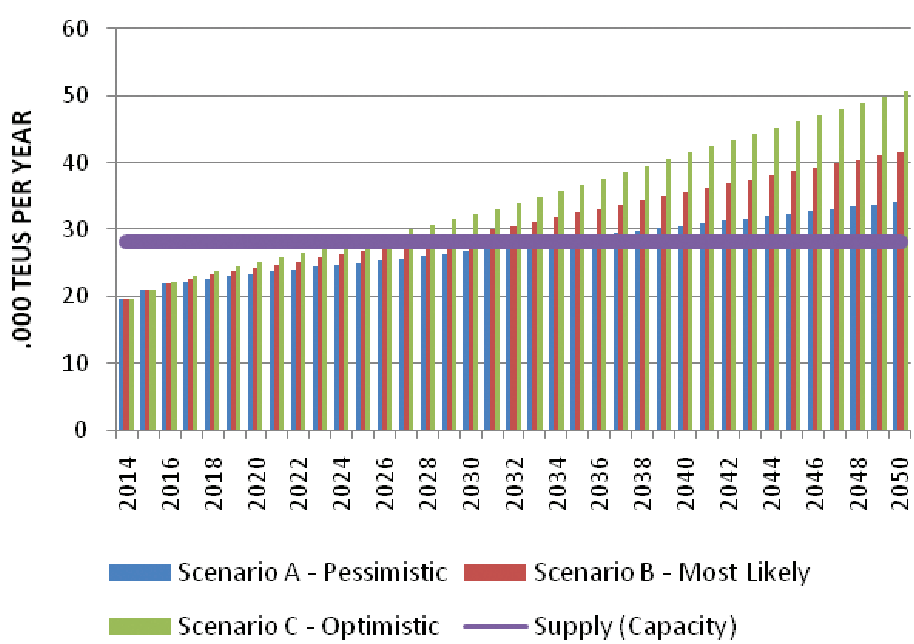


Figure 102.
Capacity and demand analysis for container traffic in the Port of Valletta

Figure 103.
Port of Valletta North and South Shore Freight terminals (Valletta Gateway Terminals Ltd)

The existing capacity of the facilities for unitised and general cargo at Grand Harbour is expected to be reached before year 2030. Increasing the capacity to deal with bigger vessels or increased demand is challenging due to the Ports heritage and environmental issues.

Analysis shows that the existing facilities for the cruise liner activity had reached capacity by 2014. During peak cruise days road congestion around the passenger terminal is high due to the demand and competing operations and therefore bottlenecks exist on the landside access.

Figure 104.
Port of Valletta North shore cruise liner berths (www.vallettawaterfront.com)

There are also capacity issues for freight with respect to storage facilities, mainly due to the lack of physical hinterland space. There is very little space for the staging of Ro-Ro cargo and trailers work in very restricted spaces thus reducing efficiencies. Warehousing and associated operations on the road around the port often cause temporary traffic congestion on the access road.

Measures

PT

2.6.3.1
DEEP WATER QUAY PHASE II

(S)

This measure addresses the need for additional upgrading of DWQ to enable it to handle ships between 40,000 and 80,000 tonnes displacement which is higher than the current limitation.

Improvements in the ability to handle these vessels will also address the freight capacity limitations within the Port.

PT

2.6.3.2
IMPROVEMENT OF HARBOUR WAVE CLIMATE

(S)

The breakwaters in the Port of Valletta are listed historical structures and their configuration limits accessibility into the port especially for larger ships over 340m. Wave climate within the port limits the all-weather operation and also movements within the Port. Upgrade of the breakwater rip rap and spending beach would significantly improve the overall wave climate within the Port.

Preparation for these improvements also requires detailed wave climate surveys and prediction modelling to establish the best possible options to be deployed.

Connected to this is the need to dredge the entrance to the port within the breakwater system in order to provide a larger turning circle for the larger ships.

PT

2.6.3.3
EXTENSION OF LABORATORY WHARF TO FUEL WHARF AT RAS HANZIR

(S)

This measure is aims to increase port capacity through the building of a new quay and additional hinterland within the port and is in line with the Port Masterplan developed in 2006. In view of the fact that new passenger infrastructure for large ships at Barriera Wharf (forming part of the 2006 Masterplan) could not be developed due to heritage considerations, the only other site within the harbour where new 'greenfield' development can take place is in a currently dilapidated area between Laboratory and Fuel wharves along the southern shore of the Port of Valletta.

This measure involves the construction of a new quay and additional hinterland. The new quay will be designed for modern cargo operations and will have a higher deck loading capacity than Deep Water Quay, thus allowing larger cranes to be deployed for cargo and especially for unitised cargo. This new facility will compliment adjacent existing Ro-Ro and bulk cargo terminals, thus effectively creating a hub for cargo operations in Valletta in line with the 2006 masterplan. It will relieve Deep Water Quay (which has loading restrictions) of unitised cargo and in turn concentrate Ro-Ro and Lo-Lo cargo at the new facility and the adjacent Laboratory wharf. This new terminal will provide an additional quay for one large cargo ship or two small ships and additional space with port terminals for secure staging of trailers (which often end up parked in public roads outside port areas) and yard storage of containers.

The new facility will remove a port bottleneck by reducing waiting times for berth availability, providing flexibility for berthing space for multiple operations to be carried out simultaneously, and will provide much needed extra yard space for staging and storage.

2.6.4
REMOVAL OF BOTTLENECKS IN THE TEN-T CORE PORT OF MARSAXLOKK

Issues

The Port of Marsaxlokk is situated at the southern tip of Malta and hosts a number of freight terminals - primarily Malta Freeport Terminals Ltd (MFT). Strategically located on the main trade route in the Mediterranean between Gibraltar and the Suez Canal the MFT has become one of the largest transhipment terminals in the Mediterranean.

The Port of Marsaxlokk offers more space to develop than does the Port of Valletta, however it comprises a variety of mixed and possibly incompatible uses including: the Container Terminal, Oil Terminal and Storage, power generation plant, bunkering of petroleum products, fishing and aquaculture, apart from industrial, residential, leisure and tourism uses.

However landside access can be improved as the current access road which connects the TEN-T Core Road Network to the TEN-T Core Port is inadequate both in terms of capacity and structure.

To date 18,000 TEU vessels can only be handled at Only Terminal 2, so investments to enable other quays to handle these latest ship builds are in hand.

Future demand is expected to exceed the current capacity of MFT of 4m TEU annually.

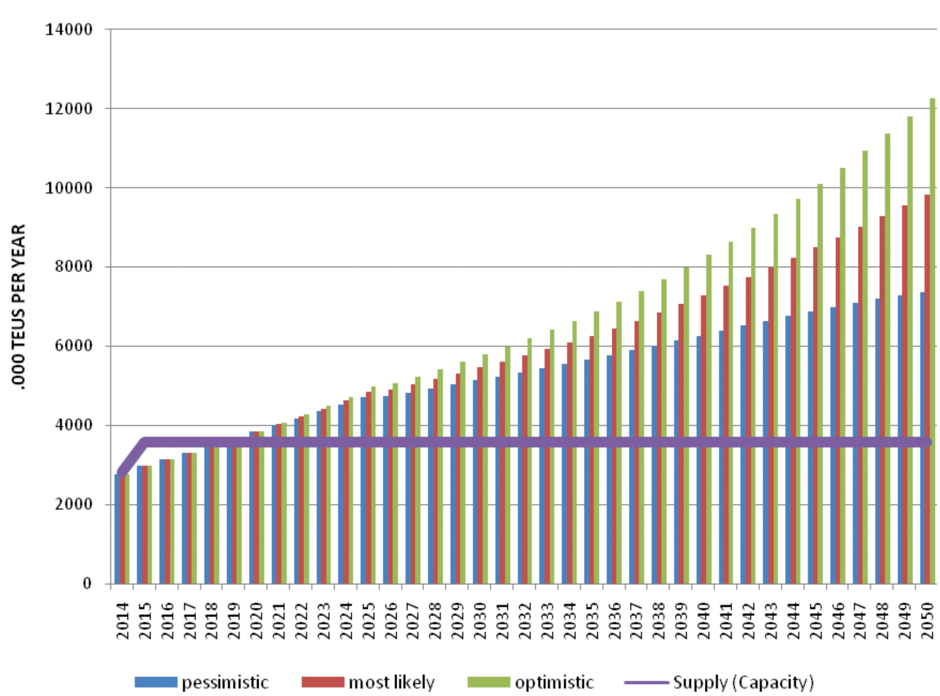


Figure 105.
Capacity and demand analysis for container traffic in the Port of Marsaxlokk

International developments in shipping such container vessels carrying 20,000 to 22,000 TEU or using LNG as bunkers have not been studied in depth and plans to address these expected future challenges are under development.

Malta Freeport Terminals Ltd has further developed the Terminal 1 yard by 40,000m2 creating an additional 1,000 ground slots for storage.

The quay side cranes can now reach 25 containers across (outreach of 72m and capacity of 85 tonnes) for both Terminal 1 North Quay and Terminal 2 North Quay. MFT has constructed the crane beam and installed the quay side crane rail on Terminal 1 North Quay. The crane-rail was extended by an additional 360m.

The Oil terminal's capacity is limited due to the shortage of space for storage but also quay availability.

The Appropriate Assessment has identified that the measures under this Operational Objective are in the proximity of certain Natura 2000 sites (see Chapter 5) and due consideration as to the environmental impacts will need to be taken into account at project level.

Measures

PT

2.6.4.1

DEVELOP 10-YEAR PORT MASTER PLAN DESIGNATING FUTURE LAND USES – TEN-T CORE PORT OF MARSAXLOKK

(M)

Following a number of new developments in the port and projected increases in size of vessels, the breakwater system at the Port of Marsaxlokk needs to be upgraded to increase the safety, capacity and all weather access of the port.

Long term demand forecasts and options testing need to be carried out to optimise the configuration of the breakwater system.

PT

2.6.4.2

TERMINAL 2 SQUARING OFF OF NORTH WEST SIDE (9)

(S)

North Quay of Terminal 2 is used for high volume ship to shore operations. This quay will be squared off. With this extension the North West side of Terminal 2 will increase quay length from 513m to 660m to cater for more and larger vessels, while increasing storage area for the stacking of containers. It will also increase ground slots by 677. This measure will provide additional capacity beyond the current 4m TEU per year.

PT

2.6.4.3

PROCUREMENT OF 2 SUPER POST PANAMAX CRANES (10)

(S)

As container vessels of 20,000 TEU and above become more common, the quay cranes need to be able to reach across the width of the vessels for loading and unloading of containers.

Following the expansion of the North Quay to 660m quay length these new cranes will be equipped with 2 cranes that are capable of handling 25 containers across, and other 4 capable of handling 23 containers across. Upgrading of the current quay equipment is therefore required so as to be able to handle these vessels efficiently and safely.

PT

2.6.4.4
DREDGING OF ALL MAINLINE BERTHS TO 20M

(S)

As a transhipment node, Malta Freeport Terminals tranships between main line carriers (trans-continental) and feeder vessels, which then service other ports in the vicinity of Malta.

Main line vessels of up to 18,000 TEU are handled at Terminal 2 North and South Quays, as well as at Terminal 1 North Quay. Current depth at these berths is around 17m, but dredging to 20m is required to be able to handle larger mainline vessels of the range of 20,000 to 22,000 TEU.

PT

2.6.4.5
INVESTMENT IN IT SYSTEMS

(S)

Two separate improvements to the IT systems of the terminal are envisaged namely:

- Container data OCR
- Terminal Operating Systems

Using advanced cameras on the gantry cranes, Optical Character Recognition (OCR) will be deployed to be able to identify each container. This will assist the efficiency container identification, important for details of movement, location, safety and security. The cameras will also record the images of containers so as to record prior damage, and assist in verifying damage claims, thereby improving efficiency of the terminal.

The Terminal Operating System (TOS) will be upgraded to enable to use of semi- or fully-automated equipment deployments. The upgrade includes enhancements to the server farm and the related storage systems that host the critical IT systems of the Terminal.

PT

2.6.4.6
DEVELOPMENT OF ENGINEERING FACILITIES (6)

(S)

New engineering facilities covering an area of 7,700m2 will be developed and fully geared up to effectively meeting increasing demands for engineering services following the higher volumes that will be handled in the future.

PT

2.6.4.7 FREEPORT SERVICE FUEL STATION

(S)

The planned service station will be used for refuelling, servicing and washing of technical equipment. This is planned so as to improve the sustainability of the terminal's equipment and technical fleet, which currently includes about 140 tug masters and trailers, 40 vans and minibuses, and 16 reach stackers. This station is not intended to service the RTG's which are not planned to be serviced by this facility.

This measure is located within the current footprint of the Freeport and will be expected to improve these facilities in line with current environmental standards.

PT

2.6.4.8 UPGRADE OF SOUTH ROAD ACCESS TO FREEPORT

(M)

The South Road is located on the hinterland of the port and leads to the main access point between the TEN-T Core Road network and the Malta Freeport Terminal. It provides access to the Terminals, Distripark facilities, Oil Terminals, storage for other petroleum products and other facilities located in this TEN-T Core Port.
Over the years the flow of heavy vehicles using this road has increased rapidly and has led to accelerated deterioration of the road structure, necessitating the modification of the road geometry. The measure includes reconstruction, straightening and widening of around 500m of the South Road.

PT

2.6.4.9 OIL TERMINAL QUAY DEVELOPMENT

(M)

With changes in the global fuel and bunkering market expected over the next few years, the terminals handling petroleum products will need to be upgraded or changed (in the case of LNG).

Further tanks will be added to the tank farm by reclaiming land and the increases in demand for these services will also be complimented by jetty expansion which will provide increased berthing capacity for loading and unloading of black and white petroleum products.

PT

2.6.4.10 PETROLEUM PRODUCT DISCHARGE POINT REPLACEMENT

(S/M)

The oil terminal dolphins which receive all of the aviation fuels and most of the road transport fuels (petrol and diesel) in the Port of Marsaxlokk are now approaching the end of their expected useful life and are in need of being replaced.

Other petroleum discharge points in the Port of Marsaxlokk are also in need of review and where appropriate decommissioning.

PD

2.6.4.11
ASSESSMENT OF MFT MASTER PLAN - SITE EXPANSION

(S)

Further proposals by the Malta Freeport Terminals Ltd include a number of measures that fall outside the site boundary of the Freeport Terminal. These include (as depicted in Figure 101):

1 Distripark Facilities development (5)
2 Container Stacking Yard – 720 slots (7 linked with 5)
3 Off-Dock Container Yard Development – 2,000 slots (8)
4 Investments in Yard Equipment
5 Container Maintenance and Repair Facility

Further analysis and study of the costs and benefits of these measures needs to be undertaken so that Government can assess whether and at what cost the requested additional space can be made available.

2.6.5
ENSURE EQUIPMENT, TOOLS AND HUMAN RESOURCES FOR THE USE, MONITORING AND ENFORCEMENT OF MARITIME AREAS ARE UPDATED AND TO IMPROVE SAFETY AND SECURITY.

Issues

Transport Safety and Security measures are often not visible to the user as when they are effective, the transport system works smoothly. These include infrastructure components as well as oversight and monitoring by Port Control officers. Navigational aids to mariners are key infrastructures that exist both on land and on buoys at sea and are important in maintain the safety of navigation. However these infrastructures are costly are not given their due importance, with the resultant heightened risks of accidents.

Albeit that in recent years increased security risks have arisen due to high migration levels, changes in the international geo-political environment, and changes in technology, equipment, tools and resources to ensure safety and security are often seen to be a lesser priority. As a result they are therefore afforded less resources in terms of updating and upgrading. However levels of safety, security and preparedness for incidents only become apparent and important when an event or incident happens and these resources are required.

A key driver in ensuring that these systems and aids are maintained appropriately is the availability of appropriate financing resources to maintain the aids to EU and international standards. In Malta lighthouse fees are not usually charged to the users of these services and this has meant that this important part of ship safety equipment is not afforded appropriate attention and update.

To ensure that Malta remains resilient to safety and security issues, and is able to recover from any such incident in the shortest possible time, risk management based analysis would best guide the allocation of resources. The risk level needs to be set and published by government and appropriate resources, to remain able to manage these risk events, should be allocated to the entities that are tasked with managing safety and security.

Monitoring of activities of vessels in the ports and their approaches is also a key tool to maintain safety of navigation and likewise suitable sustainable long term funding needs to be established to ensure that the monitoring process remains effective.

Measures

In response to these issues the following measures have been identified:

PRE

2.6.5.1
RESEARCH NEW SOURCES OF FUNDING TO DEAL WITH MONITORING REQUIREMENTS

(S)

Funding of safety and security infrastructures and oversight measures remain challenging, especially in the light of new risks developing in the region. As increasing complex navigational systems are demanded by users, the lack of specific lighthouse charges means that sustainable long term funding of the costs of use, maintenance and upgrade are not established.New and alternative sources of funding to deal with both monitoring requirements need to be identified so that incidents are prevented. Whichever source of funding is identified, it should be ensured that the cost of providing these services is borne by the users of the service.

S

2.6.5.2
ENSURE EQUIPMENT AND TOOLS FOR THE MONITORING AND ENFORCEMENT OF MARITIME AREAS ARE UPDATED AND ENABLE THE REQUIRED REGULATORY CONTROL TO ENSURE SAFETY AND SECURITY

(S)

The oversight and enforcement of maritime traffic in and around Malta is a 24/7 exercise and infrastructure and tools for the monitoring and regulation of the port and its approaches, so as to ensure that Malta is able to remain vigilant as required by legislation and expected by its citizens. In this respect, continuous update of the equipment, infrastructure and tools used to carry out this monitoring requires appropriate funding and resources so as not to result in long term decline that then necessitate drastic, expensive interventions and resources.

PT

2.6.5.3
UPGRADE VTMIS TO MONITOR AND ENFORCE MARITIME AREAS TO ENSURE SAFETY AND SECURITY

(S)

The Vessel Traffic Management Information System (VTMIS) is essential for the monitoring and enforcement of maritime areas and to enable the required regulatory control to ensure safety and security. The first system was established in 2004-2006 and has brought about significant improvements in port management and security.

With technology changes and improvements, the system is now in need of upgrade to be able to handle current and future expected operations in the ports and their approaches.

S

2.6.5.4
UPGRADE ICT TOOLS TO INTERCHANGE INFORMATION WITH PORT STAKEHOLDERS AND OPERATORS TO ENSURE SAFETY AND SECURITY OF MARITIME AREAS

OTH

(M)

Improvements in the data flow between the regulatory authorities and port stakeholders has seen exponential growth in recent years, culminating with the Maritime Single Window Directive that requires the linking up of all stakeholders involved in the operational chain in the Ports.

Further developments of these ICT tools are now needed to ensure that the desired efficiency of port operations is achieved. Better, timely and accurate information will enable the operators (as one of the stakeholder types) to ensure continued safety and security of the ports.

2.6.6
REDUCE THE ENVIRONMENTAL IMPACT OF PORTS ON THE NEARBY URBAN AREA.

Issues

Port operations are a crucial link in economic and social development; however they also have downside effects on the immediate urban areas. In particular, these are environmental impacts such as noise, sea and air pollution derived both from the vessels using the port as well as the industry related to the port.

Across the EU, measures are being put in place to mitigate the impact of transport on other part of society, and maritime activities, especially those in port areas, are no exception. A delicate balance between economic activity and the rights of citizens that live and work in the proximity of the port is being achieved step by step and this process is also required in Malta.

The Port of Valletta is a thriving economic hub, but vessels and services (e.g. bunkering, tugs, ship repair, among others) result in significant levels of sea, air and noise pollution. Similarly the Port of Marsaxlokk has long been challenged by the noise pollution generated when un/loading containers from vessels and its impact on the neighbouring towns and villages.

Measures

In response to these issues the following measures have been identified:

PRE

2.6.6.1
CHECK THAT PORT INFRASTRUCTURES AND OPERATIONS COMPLY WITH THE CONDITIONS ESTABLISHED IN THE ENVIRONMENTAL IMPACT ASSESSMENT

(S)

As part of the implementation of the pre-implementation “environmental impact assessment” that is required from developments in the port area, a comprehensive and continual methodology of checking that these developments comply with their stated environmental impacts is required.

A monitoring programme for the key environmental impacts needs to be established such that it provides government with long term information about the impacts of port activities, and enables Government to take enforcement or other actions to reduce impacts where these are exceeded or at risk of being exceeded.

PRE

2.6.6.2
IMPLEMENT NEW POLLUTION MITIGATION MEASURES

(M)

As technologies develop and new developments arise in the port areas, measures to limit the environmental impacts can be deployed, this opening up new opportunities to leverage the port use. An example of this would be the implementation of shore-supply infrastructures to enable ships that are alongside to connect to the electrical network, power down their auxiliary engines and thus reduce air, sea and noise pollution that would otherwise be generated.

Some mitigation measures may require interventions by the private sector and regulatory measures may be needed to encourage compliance and upgrade to use these new tools.

PRE

2.6.6.3
SUPPORT THE USE OF LESS POLLUTING EQUIPMENT

(S/M)

Similarly, government may need to consider support mechanisms to encourage the stakeholders in the ports to use less polluting (air, sea and noise) equipment. This may be in the form of fiscal incentives such as tax breaks to replace infrastructures or equipment to an established standard. Also disincentives such as increased fees when using older or non-compliant equipment could also be implemented to support the change.

2.6.7
PROVIDE ALTERNATIVE FUEL INFRASTRUCTURE TO PROMOTE EFFICIENCY AND COMPETITIVENESS.

Issues

Aviation fuel is discharged by tanker at the Marsaxlokk dolphins and in 2007, the dolphins were reviewed by the Malta Maritime Authority and found to be beyond economic repair and with an expected lifetime of 10 years.

At the same time, alternative fuels (including biofuels and cryogenic fuels) are being developed for the maritime and aviation markets. In this respect the transfer stations for fuels are in need of modification or replacement so as to be able to handle future demand for these types of fuels. Parallel to the fuels required for bunkers, developments in the standards of air quality and noise are bringing the need for shore-supply connections to be made available for vessels when alongside. While studies carried out in 2015 by Transport Malta indicate that the implementation of such shore-supply is not yet viable, Government needs to consider whether long term competitiveness and socio-economic factors demand the implementation of measures that address the demand while mitigating the impact of transport on the environment.

Measures

In response to these issues the following measures have been identified:

PD

2.6.7.1
DEVELOP AN LNG DEPLOYMENT ACTION PLAN FOR THE TEN-T CORE PORTS

(S)

With LNG beginning to appear as a viable future fuel in use in the maritime sector, and the legal requirement that TEN-T Core Ports provide LNG as a bunker fuel, Malta is required to implement actions to enable the provision of this type of bunker fuel.

With opportunities developing due to the use of LNG at the new power plant at Marsaxlokk, development of an action plan for deployment of bunker facilities in the TEN-T Core Ports in Malta now becomes important framework for private sector involvement in this deployment.

PD

2.6.7.2
DEVELOP A SHORE SUPPLY ACTION PLAN FOR THE TEN-T PORTS.

(S)

Following initial studies that show that shore-supply deployment suffers from the bottleneck of lack of demand arising from the interplay of infrastructure needs both on board and at the various ports that the vessels enter. To address this bottleneck, an appropriate action plan for its deployment needs to be established such that the vessels using the Maltese ports have visibility of the timelines to deployment.

Such visibility will encourage both the operators, and other ports to likewise deploy shore supply services for the mutual benefit of all stakeholders.

PT

2.6.7.3

REPLACE OBSOLETE BUNKER DISCHARGE INFRASTRUCTURE

(S/M)

The 2007 report recommended that the aviation fuel infrastructures were put into managed decline and alternative fuel transfer infrastructures deployed by the end of the expected useful life of the infrastructure.

However, this replacement process has not yet started and the aviation fuel transfer process retains significant risk and in need of replacement.

02.7
EXTERNAL AVIATION OPERATIONAL OBJECTIVES

2.7.1
SAFEGUARDING SPACE WITHIN THE AIRPORT AND ITS CONTIGUOUS AREA TO ENSURE DEVELOPMENTS SUPPORT LONG TERM SUSTAINABLE GROWTH IN THE AVIATION SECTOR.

Issues

Airside facilities continue to be challenged by resource availability (especially space) and the airport must develop and implement plans to ensure the maintenance of the quality of the services to airport users (both business and leisure travellers).

This implementation must be supervised from a national perspective to ensure that the priority of the airport is that of air passengers in preference to other peripheral development.

Likewise, development of the contiguous zones around the airport for activities that do not necessarily need to be in the proximity of the airport compromise the long term sustainability of the airport, and its ability to expand to meet forecast air transport growth.

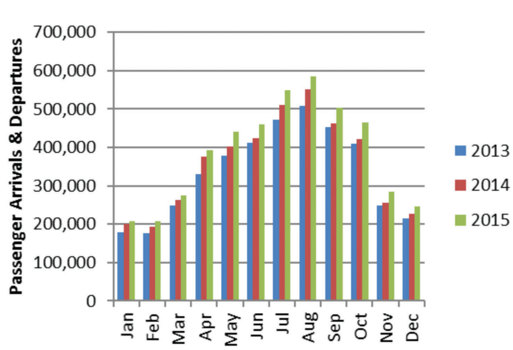


Figure 106.
Airport Passenger Movements by Month (2012-2015)

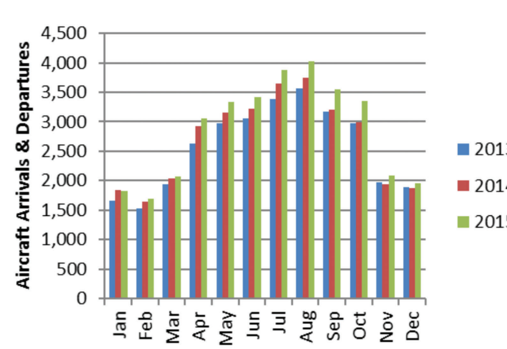


Figure 107.
Airport Aircraft Movements by Month (2012-2015)

This in turn would result in restraints on this same expected growth and its economic benefits.

Temporary aerial firework displays in the peak season (i.e. peak both for aviation volumes and firework enthusiasts) affect the continued operation of the airfield. It is also noted that certain climatic conditions resulted in temporary airport closure, such as when firework smoke causes aerodrome visibility issues.

The Malta International Airport terminal is already near its design capacity[15] of 5m passenger per year, and forecasts of increasing passenger throughput will necessarily result in deteriorating passenger experience.

Likewise, the forecast increases in aircraft landings puts pressure on the airside resources with bottlenecks in infrastructure and operations hindering the effective and efficient flow of passengers through this important TEN-T Core Node.

Space in the proximity of the airport is regularly being allocated to activities that are not necessarily needed in the proximity of the airport and this could hinder possible future developments that need to be in the vicinity.

Measures

In response to these issues the following measures have been identified:

PD

2.7.1.1

DEVELOP AN AIRPORT MASTER PLAN THAT PRIORITISES DEVELOPMENTS AND IMPROVEMENTS AIRSIDE TO SUPPORT LONG TERM AIR TRAVEL GROWTH EXPECTED AND IMPROVES THE SAFETY AND SECURITY OF THIS TRAVEL MODE.

(S)

This measure would develop a holistic plan for both the runway and the terminal subsystems to address all outstanding bottlenecks and problematic zones for traffic (aircraft/ground vehicles), establishing a priority of measures that need to be taken considering their cost/benefit and long term sustainability.

Such a plan would holistically address the safety and security aspects of this travel mode, necessarily prioritising air transport improvements and the aviation industry cluster ahead of land side development – since the latter (e.g. offices of banks, telecom operators, etc.) could be located elsewhere rather than in the proximity of the airport or in conflict with airport operations.
The Airport Master Plan will determine the spatial extent of the airport and its future needs as supported by demand forecasts and capacity analyses. Options that may be available need to be considered in detail, giving due consideration to the core aviation business of the airport.

[15] *Design capacity refers to the capacity to provide "good passenger experience" and above this level, arrival/departure experience would start to deteriorate, primarily to the detriment of the MICE and tourism economy which is affected by the all-round experience of the business and tourism product.*

The airport master plan would also consider the possibility of improved allocation of space in remote parts of the airport for aircraft carrying dangerous goods, high security cargo, etc. However due consideration needs to be made to provide appropriate safety and security measures.

PD

2.7.1.2
ENSURE THAT THE AIRPORT AND ITS SURROUNDING AREAS ARE SAFEGUARDED FOR AERONAUTICAL DEVELOPMENTS

(S/M/L)

Considering that airport operations include the approaches to the runways (by aircraft), safety zones established in the flight paths must be maintained both for safety of the persons on the ground and for the aircraft passengers.

Buildings in the vicinity of the flight path, especially tall or highly visited buildings, constitute safety dangers to aircraft through potential intrusion into defined safety zones that protect aircraft in flight, as well as radio equipment protection zones and could endanger life and property. Once these areas are defined in the master plan, they must be safeguarded for the exclusive use of aeronautical developments such that the core aviation business will have access to these scarce resources.

These areas include both the perimeter and the height of buildings in the public safety zones on the runway approaches. This should be supported by detailed topographical and obstruction height data on a continuing basis.

2.7.2
REMOVE BOTTLENECKS AT THE TEN-T CORE AIRPORT

Issues

Developments at the TEN-T Core Airport must address the long term bottlenecks identified. Malta International Airport has a stated capacity of 5m passengers per year.

Figure 108.
Capacity of the passenger terminal area and runway in Malta International Airport (Elaboration)

From the analysis carried out, the airport terminal sub-system is approaching its capacity limits of 5m passengers per year and expected growth by 2025 will be approaching 6m passengers per year (see Figure 109)

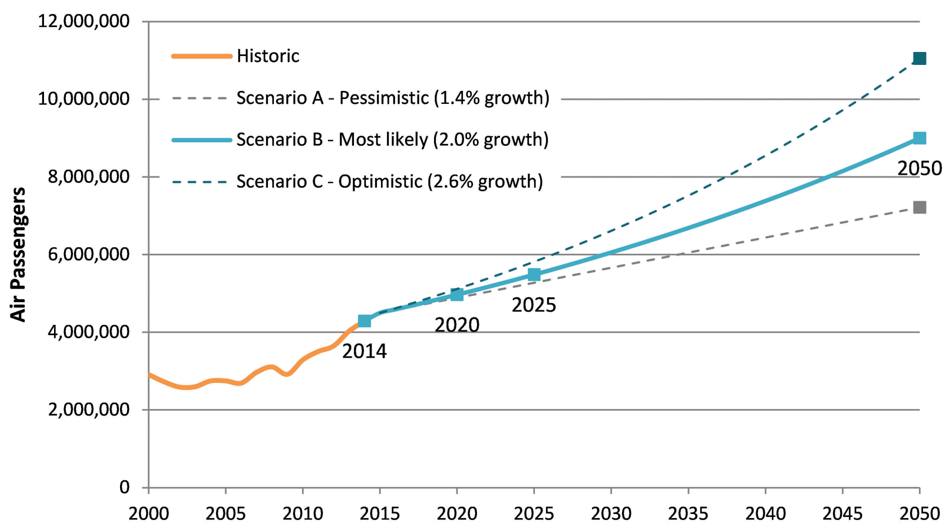


Figure 109.
MIA Annual Passenger Traffic Forecast (NSO Transport statistics; Elaboration)

The Airport can be considered as five Airport Development Zones, each divided into sectors according to location as indicated by Figure 110. The sectors have no particular representation, however they show schematically the different areas of the airport and its surrounding contiguous land space which should be preserved for airport activities if the long term capacity of the airport to support the Maltese islands is to be ensured.

The measures aim to remove infrastructure bottlenecks to address the need to increase airport capacity to meet expected demand. They also provide improved efficiency and safety through developments in air traffic control and Single European Sky.

The Appropriate Assessment has identified that the measures under this Operational Objective are in the proximity of certain Natura 2000 sites (see Chapter 5) and due consideration as to the environmental impacts will need to be taken into account at measure level.

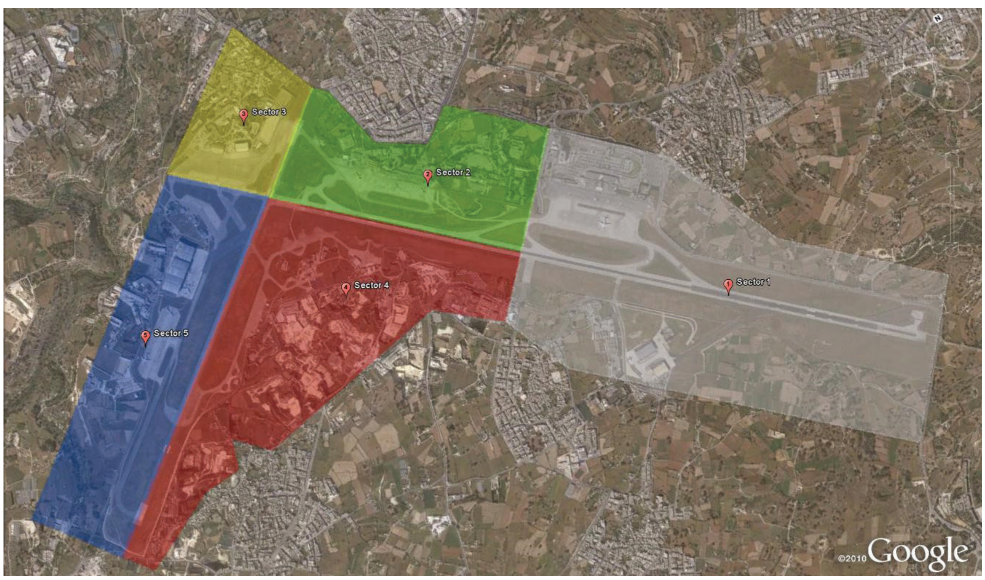


Figure 110.
Malta International Airport Development Zones (Transport Malta)

Measures

PD

2.7.2.1
CARRY OUT FEASIBILITY STUDIES FOR THE DEVELOPMENT OF THE PARALLEL TAXIWAY TO RUNWAY 31/13 TO ENSURE CONTINUED SUSTAINABILITY OF THE MAIN RUNWAY AND APPROPRIATE SAFETY ACCESS TO THE DISTANT POINTS OF THE AIRPORT.

(S)

This measure addresses the underlying assumption that the runway subsystem can theoretically handle 40 movements per hour including a parallel taxiway. The level of runway occupancy resulting from the use of Runway 31/13 to access the threshold is difficult to estimate and depends on time/day specific peaks in the subsystem.

A detailed feasibility of the development of the taxiway would thereby start the process to ensure the subsystem is able to sustainably handle expected air traffic volumes in the longer term.

PT

2.7.2.2
IMPROVE THE MANOEUVRING AREAS FOR THE RUNWAYS WHERE EXCESSIVE RUNWAY OCCUPANCY CAUSES BOTTLENECKS IN AIRSIDE TRAFFIC AND AIRCRAFT CONFLICTS

(M)

The manoeuvring areas for runways and taxiways are sometimes the cause of excessive runway occupancy due to bottlenecks or limitations of the infrastructure. This occupancy reduces the capacity of the runway to handle aircraft, and is especially felt at peak times.

The runway subsystem efficiency can be improved at these points and also where airside traffic and aircraft conflicts, by minor infrastructural changes, and would result in better handling of the movement needs on the airfield.

As of 2014, key improvements to taxiway C and taxi lanes T, U & W were identified that would support the better use of Apron 9 and its approaches. Indeed taxiway C has been upgraded since.

Improvements to reduce runway occupancy times are also required between taxiway F and taxiway G. Options of either a parallel taxiway between taxiway F and taxiway H, or the enhancement of the taxiway H area infrastructure to improve the manoeuvrability of wide bodied aircraft that vacate the main runway need to be considered. There is also need to consider improvements to taxiway B for wide bodied aircraft due to increased volumes at Safi Air Park.

PT

2.7.2.3
MAINTAIN THE SHORTER RUNWAY 23/05 IN FULL OPERATIONAL STANDARD TO ENSURE AIRPORT RESILIENCE AND ABILITY TO MAINTAIN THE PRIMARY RUNWAYS

(S/M/L)

Runway 31/13 is longer and more frequently used and therefore is a priority to maintain in full operational order. However this prioritisation means that the need to maintain the shorter runway RWY 23/05 in full operational standard, thereby ensuring airport resilience is not given sufficient priority, such that it remains a visual approach only runway.

Maintaining the shorter runway at full operational capacity also enables the easier maintenance the primary runway, rather than necessitating closure of the airport.

PT

2.7.2.4
UPGRADE OF THE AERONAUTICAL INFRASTRUCTURE AND TECHNOLOGY TO ENABLE RUNWAY 23/05 UP TO INSTRUMENT LANDING SYSTEM STANDARD (ILS) AND RNAV CAPABILITY

(M)

The Air Navigation Service Provider (ANSP) is a key stakeholder in the provision of technology that enables the safe landing and departure of aircraft. Currently the ANSP is subcontracted by MIA to maintain the ILS equipment on runway 31/13 and further developments of ILS on runway 23/05 would also need resources at the ANSP.

Maintenance of the continued safe use of Malta's only airport requires the improvement of the shorter runway from its current visual approach only status to that of ILS. This will ensure that even if Runway 31/13 is unavailable for extended periods of time, air transport would generally be able to continue (except in stronger cross-wind conditions) until such time that the main runway returns to service.

While new technologies such as RNAV may be considered to be the way forward, ILS status for the runway would still need to be established since not all aircraft are RNAV enabled.

PT

2.7.2.5
ENHANCING THE AIR NAVIGATION SERVICES FACILITIES

(S/M)

Air traffic services are still provided from the area of the air traffic control tower which was developed in the early 1970's to service approach and ground operations. An ATC operations room was later added to the Tower complex that provides Approach and Area Control (ACC) services.

Improvements to the quality of the working environment of the air traffic control (building) as well as the tools used to ensure aviation safety and security (e.g. primary surveillance radar and Automatic Dependent Surveillance–Broadcast) are required to ensure long term safety and security.

Communication services and flight data exchange using new technologies including IP services would also provide resilience in the interfacing with other ACC's adjoining the Malta region.

2.7.3
IMPROVE MANAGEMENT OF OPERATIONS, INFRASTRUCTURES AND EQUIPMENT BY TAKING ADVANTAGE OF NEW TECHNOLOGIES

Issues

As for other transport sectors, the aviation sector suffers from difficulty in managing the infrastructure assets to ensure efficient allocation of maintenance resources to effectively safeguard the lifetime of the asset or to determine appropriate replacement timelines.

Using current technologies to determine the status of the infrastructure could enhance the ability to determine and prioritise appropriate methods of maintenance and replacement to minimise unscheduled downtime.

Measures

In response to these issues the following measures have been identified:

S

2.7.3.1 DEVELOP ASSET MANAGEMENT SYSTEMS AND DATABASES TO ALLOW EFFECTIVE INSPECTION AND MANAGEMENT OF INFRASTRUCTURES (AIRFIELD)

(S)

Develop asset management systems and databases comprising infrastructure characteristics including dimensions, construction and past upgrade dates; people/company responsible; etc. Such systems would improve planning for scheduled maintenance and upgrades reducing the opportunity for failures that result in unscheduled downtime of the asset.

Part of such systems would include routine inspection of the infrastructures to assist in the prioritisation of mitigating measures, or early warning of the need for replacement.

S

2.7.3.2 DEVELOP ASSET MANAGEMENT SYSTEMS AND DATABASES TO ALLOW EFFECTIVE MANAGEMENT OF INFRASTRUCTURES (TERMINAL AND SERVICES)

(S)

The implementation of Airport Operations Databases (AODB) would greatly enhance the quality of information available to the airport operator and its stakeholders including passengers.

Development of these asset management systems and databases would include infrastructure characteristics; construction and past upgrade data; people/companies responsible; etc. Such systems would improve planning for scheduled maintenance and upgrades reducing the opportunity for failures that result in unscheduled downtime of the asset, thereby increasing the resilience of the airport.

2.7.4 MAINTAIN HIGH LEVELS OF SAFETY AND SECURITY OF AIRCRAFT IN THE MALTA AIRSPACE AND THE AIRPORT

Issues

The long term safety and security of aircraft and the airfield are crucial for the continued trust in the aviation sector as a safe and reliable means of transport. The fact that a significant portion of Malta's economy (including tourism, industry and business travel) is entirely dependent on this sector makes this matter especially important for the islands.

It is therefore imperative to maintain the safety and security systems thereby ensuring continued confidence in the aviation systems. This would help ensure that the chances of incidents occur on the airport are minimised and mitigated as they would otherwise undermine the public perception of the safety of the systems in place.

Up to 50% of all air accidents occur just before the threshold of the runways, and therefore the continued maintenance of the public safety zones in the final approach to the runways is imperative.

Significant numbers of aircraft overfly the Maltese airspace both north/south, as well as east/west, and technology improvements in air traffic control are continuously needed to ensure continued safety and security.

Measures

In response to these issues the following measures have been identified:

PRE

2.7.4.1
KEEP THE SAFETY PROGRAMME UPDATED

OTH **(S/M/L)**

The national aviation safety programme is an essential component to ensure the continued safety of the aerodrome and the aircraft registered in Malta. Recently compiled, the safety programme requires routine review to ensure that is maintained in an up-to-date status at all times.

S

2.7.4.2
IMPROVE WILDLIFE CONTROL SYSTEMS IN THE AIRPORT

OTH **(S)**

The airport has been designated under national legislation as a nature reserve, thereby restricting the ability to implement or improve wildlife control systems without falling foul of environment protection legislation.

However, as aircraft safety is crucial, methods to control wildlife that could endanger aircraft operations should be maintained, and this unusual arrangement (of the airfield being designated as a nature reserve) should be revisited to balance the need for safety with the need to safeguard wildlife.

PT

2.7.4.3
IMPROVE SECURITY OF THE REMOTE APRONS AND PARKS ON THE AIRFIELD TO A LEVEL RELEVANT TO THEIR LONG TERM USE

(M)

Improve the security levels around the remote aprons and aircraft parks to enable their use for high security or dangerous goods carrying aircraft.

This would improve the effective use of spaces currently underutilised for aircraft operations and release more secure areas for other aviation use.

PT

2.7.4.4
IMPROVE AIRFIELD SAFETY BY UPDATING AERODROME GROUND TRAFFIC MANAGEMENT.

(M)

Airside traffic is not controlled by the usual road rules outside the airport, but is the remit of the airport operator. Policy development to manage the use of the airfield has not kept up with the infrastructure and as equipment has the capability to move at speed. Updates to aerodrome traffic management could improve the safety and efficiency of the aerodrome.

A study on improved airside traffic circulation is required so as to be able to introduce suitable airside traffic regulation including traffic management and control mechanisms.

S

2.7.4.5
IMPROVE AVIATION SAFETY BY MAPPING OBSTACLE CLEARANCES AND MAINTAINING THIS OBSTACLE CLEARANCE MAPPING AND REGULATION TO EU AND INTERNATIONAL STANDARDS ON THE APPROACHES OF THE AIRPORT

OTH **(S/M)**

While various NOTAMs[16] have been issued (including permanent obstacle warnings resulting from the Malta Freeport Terminal cranes), it is important that the airport continues to maintain international and EU standards of safe and clear areas in the flight paths, in particular in the airport flight safety zones. In this respect legislation should be updated to include provisions safeguarding the aerodrome against activities and developments in the surroundings that may cause unacceptable risks for aerodrome operations.

Outside the precincts of the aerodrome, continued collaboration between the entities responsible for spatial data (to be used as Aeronautical Data) is required to ensure that the ICAO Regulations and EU Aeronautical Data Quality Implementing Regulation can continue to be fully and safely implemented in Malta. This would require the establishment of an agreement between the entities for responsibility to survey, maintain and make available obstacle data as required by international standards (and from 2017, EU standards) on the approaches of the airport.

The development and implementation of an obstacle permission process for new risks needs to be established so as to safeguard the aerodrome approaches to these standards.

PT

2.7.4.6
UPDATE SERVICE CONTRACTS OF AERONAUTICAL IMPORTANCE

(S)

Terminal charges already include an element of replacement costs for these systems so the terminal operator must ensure appropriate allocation of capital funds to smoothly replace equipment as becomes obsolete.

Preparations to replace the ILS system, upgrade its capacity to current and future requirements and to introduce complimentary supporting technologies (including RNAV) are required such that all are in place by 2022.

[16] *Notice to Airmen*

PT

2.7.4.7
INTEGRATE NEW AVIATION TECHNOLOGIES WHILE SAFEGUARDING THE SAFETY OF AVIATION SERVICES

OTH **(M)**

Recent technology improvements such as those relating to the use of Remotely Piloted Aircraft Systems (aka drones) have the potential to develop into mainstream aviation technologies.

Regulatory frameworks need to be developed to assist the uptake of these new technologies, while at the same time safeguarding the safety and security of both current aviation systems as well as the general public.

2.7.5
MITIGATE THE IMPACT OF THE AIRPORT ON THE SURROUNDING ENVIRONMENT

Issues

Pollution of all forms is created by airport machinery and operations. This includes, inter alia, air, noise, light pollution and greenhouse gas emissions.

These external costs are be borne by the surrounding environment and can be a significant socio-economic impact on the surrounding environment. In that Malta is a small country, the impact of the airport on the whole country is therefore significant.

Measures

In response to these issues the following measures have been identified:

S

2.7.5.1
ENSURE THAT AIRPORT INFRASTRUCTURES AND OPERATIONS CONTINUE TO COMPLY WITH THE CONDITIONS ESTABLISHED IN THEIR PLANNING AND OPERATIONAL CONDITIONS

(M/L)

The developments of airport infrastructures are routinely required to obtain environmental permits and these provide ex-ante assessments of the expected external impacts of the infrastructure. It would therefore be possible to measure the impact ex-post and ensure that the projected environmental impacts are not exceeded, or to ensure measures are taken to bring these impacts in line with the permits provided.

PRE

2.7.5.2
SUPPORT THE USE OF LESS POLLUTING/NOISY EQUIPMENT

(M)

Support by regulatory, financial or other means, to ensure use of less polluting or noisy equipment would encourage the private sectors involved to update or upgrade their equipment to consider the external costs and impacts of the equipment.

PRE

2.7.5.3
IMPLEMENT NEW MITIGATION MEASURES

(M/L)

Where such improvements in equipment cannot be made, other mitigation measures should be implemented including infrastructural (e.g. aircraft engine testing bays).

PT

2.7.5.4
UPDATE SERVICE CONTRACTS OF AERONAUTICAL IMPORTANCE

(S)

Aviation fuel is received by tanker at the Marsaxlokk dolphins, piped to Has-Saptan storage area and then on to the airport fuel farm. The infrastructure for this activity is generally over 60 years old and poses a risk that needs immediate attention.

In 2007, the dolphins were reviewed by the Malta Maritime Authority and found to be beyond serviceable repair with an expected lifetime of 10 years. It was recommended that during this time these fuels infrastructures were put into managed decline and alternative fuel transfer infrastructures deployed.

Likewise, the pipeline connections to the airport are known to be in poor condition and in need of replacement.

2.7.6
IMPROVE AVAILABILITY AND ACCESS TO AVIATION TRANSPORT STATISTICS

Issues

Transport statistical data, especially real-time data is crucial to be able to analyse and assess policy options appropriately and can also improve the efficiency of the transport system. Citing confidentiality and bureaucracy, many operators make collection, collation and dissemination of aviation transport data difficult and time consuming.

Measures

In response to these issues the following measures have been identified:

S

2.7.6.1
INTRODUCE CONTRACT CLAUSES REQUIRING CONCESSIONAIRES AND CONTRACTORS TO PROVIDE REGULAR INFORMATION TO THE AUTHORITIES

OTH

(M)

This measure addresses both the historical statistical data needed to inform policymakers, but also addresses the need to encourage operators to provide data (including real time data) to both the authorities and to other commercial operators to enable better integration of the transport by air with other modes such as public transport.

2.7.7
IMPROVE AIR CONNECTIVITY FOR COMMERCIAL PASSENGERS, FREIGHT AND BUSINESS TRAVELLERS.

Issues

Limitations due to Malta being an archipelago of islands mean that passengers arriving in Malta by air have limited connectivity options to other parts of Malta. Civilian domestic air transport is very limited, other than scenic tourism flights and technical flights due to there only being one civilian landing point (MIA). Development of other civilian landing points such as heliports could open up new avenues of economic development not currently available (e.g. business tourism, health services, etc.).

These ad hoc, domestic services are frequently premium services and a business model that would be more achievable than would a regular scheduled passenger flights from one part of Malta to another. Needless to say, appropriate infrastructure and resourcing would need to be established to ensure long term sustainability of these connections.

Optimisation of airport slots is also sometimes problematic with the conflicting needs of the various airport users (commercial airlines, business aviation and passengers) showing room for improvement.

General aviation is given secondary priority in the aerodrome, with aircraft being located far from airport services, or in locations that create bottlenecks for this expanding sub-sector.

While it is recognised that space is a premium and allocation is a continuous headache, other measures to mitigate the bottlenecks and difficulties in supporting this sector should be explored.

Measures

In response to these issues the following measures have been identified:

S

2.7.7.1
ESTABLISH NEW BILATERAL AGREEMENTS WITH NON-EU COUNTRIES

OTH

(M)

Further development of the network of bilateral (and multilateral) air services agreements with non-EU countries would help develop the network available to air carrier operating to/from Malta.

PRE

2.7.7.2
IMPROVE THE TRANSPARENCY AND FAIRNESS OF THE ALLOCATION OF AIRPORT SLOTS

(S)

Critique as to the allocation of slots, and the allocation of ground resources such as apron parking and other priority use of infrastructures and services could be addressed by insuring an independent entity chairs the committee. Stronger representation of Government policy within the committee could be in the form of the Director General of Civil Aviation.
This would also ensure that the allocation of scarce resources in the aerodrome would also receive input from government priorities which extend beyond the narrower commercial interests of the airport.

S

2.7.7.3
ENCOURAGE ROUTE DEVELOPMENT TO ATTRACT NEW AVIATION SERVICES

(S)

The route development of air networks to Malta is a crucial aspect of aviation services and to carry out destination marketing and to attract new airlines to Malta. Formal inclusion of the transport regulator in the committee would help address other aspects of air transport, such as that relating to high value just in time freight services.

Holistic linking of the needs of manufacturing and services industries to outbound worldwide connectivity would better support export oriented business development in Malta. Major hub airports across the EU contribute to the international connectivity from regional airports such as that in Malta, and this connectivity should be maintained and improved in the longer term.

PRE

2.7.7.4
DEVELOP A POLICY FRAMEWORK THAT ENABLES THE DOMESTIC USE OF HELICOPTERS

(M)

Domestic heliports could be developed to enable the local transfer of persons (and possibly cargo) within the islands of Malta and Gozo. This could involve the policy framework for navigation aids and other safety of operation for heliports connected with hospitals, hotels and other civilian use.

PD

2.7.7.5
RESERVE DEDICATED AREAS (LIKE AIRCRAFT PARKING AND TERMINAL BUILDINGS) TO SUPPORT GENERAL AVIATION

(S)

General aviation has different air terminal and apron need to that of commercial aircraft. Users of general aviation are frequently premium tourism or business drivers and dedicated areas in the airport to improve the user experience would serve to support this sub-sector.

PRE

2.7.7.6
IMPROVE AIRPORT TRAFFIC CIRCULATION TO SUPPORT BUSINESS AVIATION

(S/M)

Business aviation has not fully developed in Malta yet, and improvements in circulation of airside traffic would greatly enhance the product that the airport provides to this sub-sector.

In this respect efforts should be made to ensure that the experience on the ground in Malta is compatible with improvements in turnaround time and service provision being a key driver address the issues identified for business aviation.

PRE

2.7.7.7
STUDIES TO CONSIDER THE DEVELOPMENT OF A TERMINAL TO SUPPORT GENERAL AND BUSINESS AVIATION

(S/M)

General aviation and business jets are not efficiently supported other than through the commercial passenger terminal. Studies to determine the feasibility of a general aviation and business jet terminal and its ideal location within the airport area should be undertaken.

2.7.8
IMPROVE THE FREIGHT CONNECTIVITY BETWEEN THE AIRPORT AND PORTS

Issues

The Airport is separated from the Port of Valletta (in particular for passengers) and from the Malta Freeport (in particular for freight) by only a few kilometres. However passengers and freight have disproportionate bureaucratic (and legal) hurdles to overcome to transfer efficiently between ports and the airport, including the inability to remain in a "free zone" status. Significant opportunities exist to exploit this geographical proximity and therefore provide services that operate similar to that of the Malta Freeport but also including air transport.

Measures

In response to these issues the following measures have been identified:

PRE

2.7.8.1
COORDINATE WITH DIFFERENT AUTHORITIES THE SIMPLIFICATION OF THE PROCESS FOR TRANSIT CARGO BETWEEN THE AIRPORT AND PORTS

OTH

(L)

Simplification of the process for transit cargo between the airport and ports would go a long way to address the issue of bureaucracy. Supported by better coordination between the different stakeholders and authorities, the air/sea connection could be better exploited.

PD

2.7.8.2
CONSIDER FAST ROUTES BETWEEN THE CARGO AREAS IN THE AIRPORT AND PORTS

(M)

Land-side bottlenecks in the vicinity of the airport terminals (both passenger and freight) have developed and will continue as a result of further intensification of business services in the vicinity of the airport.

To address this issue, options for faster routes between the cargo areas of the ports and airport could be considered, including freight priority routes.

2.7.9
PROVIDE ALTERNATIVE FUEL INFRASTRUCTURE TO PROMOTE EFFICIENCY AND COMPETITIVENESS.

Issues

The 2007 report for the Malta Maritime Authority recommended that the aviation fuel infrastructures in the Port of Marsaxlokk were put into managed decline and alternative fuel transfer infrastructures deployed by the end of the expected useful life of the infrastructure.

PD

2.7.9.1
DEVELOP A DEPLOYMENT ACTION PLAN FOR THE TEN-T CORE AIRPORT FOR CURRENT AND ALTERNATIVE FUELS

(S)

However this replacement process has not yet started and the aviation fuel transfer process retains significant risk and in need of replacement.

Measures

In response to these issues the following measures have been identified:

With new aviation fuels beginning to appear as viable options in the aviation sector, Malta would benefit from a clear action plan for deployment of these fuels where mitigation of environmental and climate change impacts can be addressed.

With opportunities developing for the use of alternative fuels in aviation, the development of studies and an action plan for deployment of refuelling facilities at the TEN-T Core Airport in Malta now becomes important framework for private sector involvement in this deployment.

PT

2.7.9.2
CONSIDER FAST ROUTES BETWEEN THE CARGO AREAS IN THE AIRPORT AND PORTS

(S)

While the airport is a major player in the use of fuels that generate greenhouse gases and contribute to climate change, no studies have yet been carried out to identify if ground-supply deployment would help mitigate these effects.

Studies for address negative impact on Malta need to be carried out and an appropriate action plan for ground supply deployment established if found to have positive impact. Furthermore, visibility of the timelines to deployment would assist aviation stakeholders to upgrade/update their equipment to be able to take advantage of such provision.

02.8
OBJECTIVES COMMON TO ALL MODES

A number of objectives considered in this master plan are common to all modes of transport and have been grouped as follows:

- Sustainable Financing
- Climate change adaptation and mitigation
- Research & Innovation
- Transport Accident Safety Investigations

2.8.1
SUSTAINABLE FINANCING

Issues

Financing of transport infrastructures and services are often invisible to the user. Most government revenues from transport are collected and form part of the consolidated fund, necessitating specific claims on an annual basis for any costs or investments that are planned.

This causes some difficulties in the long term as entities responsible to provide transport resources are often allocated insufficient funds to be able to deliver to the level expected from them by the public. There is therefore need to identify new and sustainable financing mechanisms to compliment this current budgetary system.

Measures

PRE

2.8.1.1
SOURCES OF FINANCING THAT LEVERAGE POTENTIAL REVENUE FROM TRANSPORT INFRASTRUCTURES AND OPERATIONS

(M)

As grant funding for infrastructure becomes scarcer, new financing mechanisms at EU level such as the European Fund for Strategic Investments (EFSI) may need to be exploited. At a national level the start of a National Development Bank in Malta would also be a welcome new source of financing. This will require a change in approach, since these forms of financing need to involve the private sector and to be self-sustaining, or in other words require capital repayment.

Other local grant based funds (such as the urban improvement fund) could be considered for specific local projects.

PRE

2.8.1.2
CREATE DIRECT LINKS BETWEEN REVENUE GENERATION FROM TRANSPORT AND TRANSPORT INVESTMENT

(M)

In maritime transport and aviation, users are routinely contributing fees and charges that are related to usage.

Apart from fuel taxes, in road transport there is no direct relationship between usage, licences and fees paid to government.

Other charges related to enforcement (e.g. speed cameras, traffic fines, vehicle access charges, parking management, etc.) are assumed by the public to be invested in transport, but this is not the case. As demands to Increase funding for services and infrastructure investment continue to escalate, Government could consider hypothecating some or all of these revenue streams to the infrastructure and services needs of transport.

2.8.2 CLIMATE CHANGE ADAPTATION AND MITIGATION

Issues

Over the last 50 years the mean temperature of the Maltese Islands has increased by 0.23°C every ten years (in total: +1.15°C) changing the climatic environment for transport infrastructures and rolling stock. Long term climate change effects such as increased rain intensity, sea level rise and extreme weather events could have a great impact on the operation and reduce the transport infrastructures in Malta and Gozo. Between 1990 and 2007, greenhouse gas emissions (GHG) increased by 49% in Malta. The transport sector contributed for 44.7% of GHG emissions in Malta in 2014 (MSDEC, 2016).[17] However, Malta is obliged to pursue climate change mitigation and adaptation policies under obligations agreed jointly with its EU partners at both regional and international levels.

Measures

PRE

2.8.2.1
ESTABLISH THE SHARE OF GREENHOUSE GASES FROM TRANSPORT THAT WOULD FAIRLY CONTRIBUTE TO CLIMATE CHANGE TARGETS AND MONITOR PROGRESS OF THIS MASTER PLAN IN LINE WITH THESE TARGETS

(S)

As Malta's commitments to reducing greenhouse gas (GHG) emissions from transport become more burdensome, the extent to which effective mitigation efforts are required needs to be clearly identified with a view to establishing short term targets so as to achieve the long term goals in the strategy.

This Transport Master Plan contains a number of important measures which, when implemented will reduce the carbon footprint of transport by reducing these GHG emissions. The marginal abatement cost for each measure in transport should therefore be considered in the light of national targets. The individual and combined effect of these measures should be closely monitored and compared in relation to the target for transport.

[17] *MSDEC (2016) GHG Inventory for Malta*

PD

2.8.2.2
ASSESS THE IMPACT OF CLIMATE CHANGE AND SEA LEVEL RISE ON TRANSPORT INFRASTRUCTURES

(M)

To date few studies have been carried out to determine the potential impact of climate change and sea level rise on transport infrastructures (including road, ports and airport).

Climate change impacts on the transport sector were not considered when developing the Structure Plan in 1990 and subsequent Local Plans. Current standards for design and planning of transport infrastructure now require appropriate consideration for both mitigation of, and adaptation to, climate change impacts.

PD

2.8.2.3
INCORPORATE CLIMATE CHANGE CONSIDERATIONS AT THE PLANNING AND DESIGN STAGE TO REDUCE RETRO-FITTING COSTS

(S)

The geographical and topological conditions make Malta naturally prone to flooding, which would have in any case to effect significant investment to upgrade its road network in the short to medium term irrespective of climate change considerations.

Consideration of impacts at planning and design stage would make adaptation less costly by avoiding "retrofitting" measures which are frequently more costly and disruptive.

2.8.3 RESEARCH & INNOVATION IN TRANSPORT

Issues

Local research into road transport construction materials and maintenance techniques is at a rudimentary level, reflecting the lack of resources allocated to infrastructure inspection, data collection and testing of new materials and technologies. Additionally, there is no clear relationship between education and research establishments (MCAST, University) and the transport authorities leading to gaps between policy needs and research carried out by these institutions.

The piloting and testing of use of new materials, technologies and work methods is hampered by cumbersome procurement procedures which require conformity with published standards.

Measures

S

2.8.3.1
IMPROVE LINKS BETWEEN GOVERNMENT AND TRANSPORT RESEARCH ESTABLISHMENTS TO ENCOURAGE RESEARCH IN AREAS OF POLICY RELEVANCE

(S/M)

Targeted research into improving the quality of transport infrastructure and transportation planning (new materials, technologies and working methods) relevant to Malta is needed so as to ensure optimal infrastructure investment. Research such as: the integration of urban design, the transport fabric and the use of recycled materials in construction should be further explored. Research will not be limited to road engineering but incorporate the wider remit of transportation studies. Research in the fields of maritime and aviation transport should also be improved. Interdisciplinary research should also be encouraged.

Effective research will require increased resources (both financial and human) and clearer working relationships between transport authorities and research establishments to help align priority research needs and research projects to be undertaken. Programmes could be created to link research between academic institutions and Transport Malta such that research is beneficial to Transport Malta´s research needs.

The integration of urban design, the transport fabric and the use of recycled materials in construction should be further explored.

PRE

2.8.3.2
DEVELOP A FRAMEWORK THAT FACILITATES THE TESTING AND PILOTING OF INNOVATIVE TECHNOLOGIES AND NEW MATERIALS IN THE DEVELOPMENT OF TRANSPORT INFRASTRUCTURES

(M)

The use of new and innovative technologies is hindered by infrastructure design and construction standards and current procurement rules. Examples of these technologies include autonomous vehicles, drones, pavement materials, etc.

A procurement framework needs to be established where unique products and single suppliers can be commissioned to demonstrate and test their technologies. The legal framework also needs to be updated to facilitate the testing and piloting of the technologies and materials that will encourage innovation to address this gap.

PRE

2.8.3.3
USE OF TRANSPORT INFRASTRUCTURE FOR ENERGY GENERATION

(M)

Innovation in transport infrastructures has now developed methods of generating and saving energy and these methods should be explored for their potential in the Maltese context.

S

2.8.3.4
DEVELOP RESEARCH CAPABILITIES TO EXPLOIT NEW DATA SOURCES INCLUDING "BIG DATA"

(S)

Transport is a large producer of data and information can be extracted from this data in an ever increasing variety of ways.

Linking in with Malta's developing expertise in ICT technologies and research, Government should encourage the exploitation of these technologies to improve services, planning, and traveller information across the transport network and its operations.

PRE

2.8.3.5
DEVELOP PROCESSES THAT FACILITATE THE PROCUREMENT OF TEMPORARY MEASURES AND THEIR ASSESSMENT

(S)

Best practice has shown that new design proposals can effectively be tested using temporary measures which can easily be reversed. Adopting such an approach would require a framework within which new proposals and their impacts can be researched.

S

2.8.3.6
IMPROVE LINKS BETWEEN GOVERNMENT AND TRANSPORT RESEARCH ESTABLISHMENTS TO ENCOURAGE RESEARCH IN AREAS OF POLICY RELEVANCE

(S)

The various transport operations, enforcement and control systems that Transport Malta uses to manage the transport network and service providers in Malta can be supplemented by data from third parties (both local operators and services, as well as global service providers) to enable more information to be extracted for strategic and operational planning.

Analytical processing of this data to make it useful for Transport Malta along with the underlying datasets would be valid data to be made open for external parties to utilise for systems and applications developed by the private sector.

For this purpose, the Authority needs to have an established process and protocol of internal data sharing and processing for external publication.

2.8.4
TRANSPORT ACCIDENT SAFETY INVESTIGATIONS

Issues

Transport accidents result in damage to property, personal injury and loss of life. These hidden costs to society can be reduced by appropriate transport accident investigations that identify causes and propose measures to address the cause. Government is a key player in the provision and regulation of transport in all modes. Established practice and experience of aviation and maritime transport investigations has shown that independent transport safety investigations can significantly improve transport safety.

The maritime and aviation sectors have established highly developed accident analysis mechanisms and are benefiting from the results of their investigation. On the other hand, the road transport sector, which has by far the highest number of accidents each year, does not yet benefit from the systematic methods of accident analysis and their resultant proposals for improvement.

The need to maintain the appropriate state of readiness has continued to challenge both the Bureau of Air Accident Investigations (aviation), as well as the Maritime Safety Investigation Unit (shipping), while no similar set up exists for Land Transport. It is therefore considered appropriate that Malta explores alternative models of transport accident safety investigation entities.

As seen in other parts of Europe, Malta could consider a transport accident safety investigation entity that combines all transport modes into a more comprehensive and appropriately resources transport accident safety entity.

This entity would be responsible for the collection, collation and dissemination of "no blame" transport accident investigation outcomes leading to improvements in transport safety policy to be taken up by the regulatory bodies and operators as appropriate. The amalgamation of all modes into one entity would encourage economies of scale (currently there is only one other distinct accident entity dealing with maritime accidents, and both suffer severe resource restraints.

Land transport stands to gain most as no transport accident safety investigation function currently exists. Once combined, these three should lead to improvements in safety in all modes of transport.

Measures

S

2.8.4.1
FURTHER DEVELOP THE TRANSPORT ACCIDENT INVESTIGATION BODY TO MAINTAIN APPROPRIATE RESOURCE LEVELS AS WELL AS KEEPING IT FUNCTIONALLY, FINANCIALLY AND LEGALLY DISTINCT FROM THE REGULATORY BODIES

(S)

PD

2.8.4.2
CONTRIBUTE TO THE ACTION PLAN FOR RESPONSE TO NATIONAL DISASTERS AND ACCIDENTS ON STRATEGIC INFRASTRUCTURE

(S)

National Disasters and accidents on the strategic infrastructure require a rapid, effective response to address both the persons involved in the incident, but also to reduce the impact on other users of the network. Such response requires established protocols, adequate simulation and preparedness training and collaboration mechanisms between the different entities involved.

Information on transport sector infrastructure and operation can be used to assist in risk management and incident response to address the consequences of, and the vulnerabilities to, specific threats of natural disasters, pandemics and public health emergencies, and high-consequence accidents. Transport system risks involve two sides a) Risk to the transport System and b) Risk from the transport system.

This measure involves the drawing up of an action plan to identify those strategic and tactical national disaster risks relevant to the road transport system in Malta and also identify the risks that could emanate from the road transport sector. These risks will need to be assessed and prioritised and suitable risk mitigation measures established in the Action Plan.


Malta National Electromobility Platform
PORT PVEV
PHOTO VOLTAIC ELECTRIC VEHICLE
Transport Malta
MINISTRY FOR TRANSPORT AND INFRASTRUCTURE
Italia Malta

03

APPRAISAL OF MEASURES

03.1
MEASURES IDENTIFIED AND PRIORITISED ON THE TEN-T CORE AND COMPREHENSIVE NETWORK

The planning, development and operation of the Trans-European Transport Network (TEN-T) is an important component within the wider context of the strategic policy framework set out for transport development in Europe[18]. The facilitation of seamless, safe and sustainable mobility of goods and persons, both at national and international levels, will contribute to economic growth and increased competitiveness within the European Union and should lead to improved accessibility and connectivity for all regions of the Union.

The new TEN-T policy embraces the challenge of facilitating increased growth in mobility through clearly defining a high quality, multi-modal 'comprehensive' network that will allow for better and more sustainable modal choices to be made in the future for passengers and freight. A dual-layer structure approach has been adopted to help prioritise the implementation of the network, with the identification of the backbone 'core' network as the basis for the development of a sustainable multimodal transport network which should stimulate the development of the entire 'comprehensive' network.

The completion of Malta's TEN-T core and comprehensive networks by the years 2030 and 2050 respectively, as required under the new TEN-T guidelines, shall require significant capital investment in air, sea and road transport infrastructure and further deployment of their respective traffic management systems.

3.1.1
NEW TEN-T GUIDELINES AND CONNECTING EUROPE FACILITY (2014-2020)

The replacement of Decision No 661/2010/EU on Union guidelines for the development of the trans-European transport network with Regulation (EU) No 1315/2013 of the European Parliament and of the Council resulted in:

a. Retention of Malta's two external maritime ports (Marsaxlokk and Valletta), two internal maritime ports (Mgarr and Cirkewwa) and the Malta International Airport, as defined under the previous guidelines; and

b. Extension of the TEN-T road network in Malta and Gozo from 51km to 112km.

The revision of the trans-European transport network policy has taken into account the evolution of the transport network across Europe; particularly in relation to changing trends in transport infrastructure ownership. This is important for member states like Malta where several long-term concession contracts for the operation and maintenance of key transport maritime and airport infrastructure facilities have been successfully entered into between Government and the private sector over the last two decades; with Government retaining a regulatory role. In this respect, private sector investment towards the completion of multimodal trans-European transport network has become increasingly relevant.

Malta's entire TEN-T Core network (22km road, Port of Valletta, Port of Marsaxlokk and Malta International Airport) has been defined on the Scandinavian-Mediterranean (Scan-

[18] *European White Paper entitled Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, 2011 and Europe 2020 Strategy*

Med) Core Network Corridor. The Scan-Med Core Network Corridor crosses almost the whole continent from north to south and includes seven EU Member States (Finland, Sweden, Denmark, Germany, Austria, Italy and Malta) and one Member State of the European Economic Area, Norway.

Section	Transport mode	Project
Palermo/Taranto - Valletta/Marsaxlokk	Ports, MoS	Port interconnections
Valletta - Marsaxlokk	Port, Airport	Upgrading of modal interconnection, including Marsaxlokk-Luqa-Valletta

Table 4.

The Scandinavian – Mediterranean Core Network Corridor as applied to Malta

Infrastructure sections and projects on the Scan-Med Core Network corridor have already been prioritised and pre-identified under Annex I Part I of Regulation (EU) No 1316/2013 of the European Parliament and of the Council on establishing the Connecting Europe Facility. In the case of Malta, these include the sections listed in Table 4.

3.1.2 OPERATIONAL PROGRAMME I (2014-2020)

Priority Axis 11 of the Programming of European Funds for Malta 2014-2020 (Operational Programme I (ERDF-CF) identifies investing in TEN-T Infrastructure as a priority in order to comply with the network completion dates. A total of approximately €90m of national and cohesion funds have been committed for implementation of TEN-T projects during this programming period. Under this priority axis, EU and national investment will focus on land transport and maritime transport with a view to reducing journey times and facilitating the movement of goods. The main areas identified for intervention under the Operational Programme (2014-2020) include TEN-T reconstructed or improved road, increased capacity of TEN-T seaports and Intelligent Transport Systems.

3.1.3 HORIZONTAL PRIORITIES

3.1.3.1 Innovative Management & Services

3.1.3.1.1 Single European Sky – SESAR system

The Single European Sky - Air Traffic Management Research and Development (SESAR) represents the technical pillar of the Single European Sky. The deployment of SESAR will improve the performance of air traffic management (ATM) in Europe by modernising and harmonising ATM systems, synchronising the deployment of essential ATM functionalities, enhancing civil-military interoperability, reducing fragmentation and consolidating the provision of air navigation services.

Malta Air Traffic Services (MATS) Ltd. is the fully-owned Government Company that is responsible for air navigation service provision. The following planned investments have been identified by MATS Ltd. for continued modernisation of air traffic management functionalities up to the year 2020.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.7.2.5	Enhancing air navigation services facilities - new ATC tower	MATS Ltd.	23.0	National / route charges

Table 5.
Table of Single European Sky Measures

3.1.3.1.2
Telematics Applications for Roads

Intelligent Transport Services (ITS) for roads of the trans-European transport network represent the "intelligent" interface between roads and other transport infrastructures. ITS effectively contribute to the optimal use of existing road space, more efficient traffic operations, enhanced road safety and reduced carbon emissions of the transport system.

Transport Malta is the Government entity responsible for the deployment of Intelligent Transport Systems. Malta's ITS Action Plan published in 2013 establishes a two-phase programme of investment and deployment of Intelligent Transport Systems. The following programmed investments have been identified by Transport Malta to be implemented up to the year 2020.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.2.11.1	CCTV / VMS / Traffic Control Centre (TEN-T)	Transport Malta	3.6	National / CF

Table 6.
Table of Telematics Applications for Roads Measures

3.1.3.1.3
Telematics Applications Systems for Vessels

A Vessel Traffic Management Information System (VTMIS) for TEN-T maritime ports was implemented between 2004 and 2006. With technological changes and improvements, the system is now in need of upgrade to handle current and future operations in ports and on their approaches. This upgrade is planned to take place before 2020.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.6.5.3	VTMIS upgrade	Transport Malta	2.5	National / CF

Table 7.
Table of Telematics Applications for Vessels Measures

3.1.4
PRIORITISATION OF MEASURES IN THE TEN-T CORE MARITIME PORTS

Malta's TEN-T core and comprehensive maritime ports were already defined on the trans-European transport network under the previous TEN-T guidelines. As a result, feasibility studies, port facility development plans and the works programmes for project pipelines up to 2020 are committed and implementation is ongoing in accordance with budget availability. In this respect, the Transport Master Plan 2025 takes on board the prioritised projects set out in the development plans for TEN-T maritime ports, as prepared by the infrastructure managers.

3.1.4.1
Port of Marsaxlokk

Maritime freight facilities within the Port of Marsaxlokk are primarily operated and maintained by private sector concessionaries; namely: Malta Freeport Terminals Limited which is subsidiary of CMA-CGM which operates as container terminal with transhipment facilities and Oil Tanking Malta Limited which is a subsidiary of Oil Tanking GmbH and offers tank storage for petroleum products.

The concession contract model adopted by the Maltese Government places the onus of responsibility for the regular maintenance, as well as the planning and the financing of investment in new infrastructure and equipment on the private operator. Any new infrastructure plans are assessed in relation to projected demand forecasts and are required to be approved beforehand by both Malta Freeport Corporation and Transport Malta, as regulators.

The Freeport Master Plan 2014-20 contains a number of mature project pipelines for infrastructural upgrade, procurement of new handling equipment and the upgrade of ICT systems for improved logistics and safety through private sector investment. The Freeport Master Plan mature project pipelines have been included in the Work Plan for the Scan-Med Core Network corridor.

Private investment in the Port of Marsaxlokk should be complemented by further investment in the port breakwater system and upgrade of the Freeport area south access road in the next operational programming period.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.6.4.2	Terminal 2 Squaring off NW side	MFT Ltd.	56.7	Private
2.6.4.3	Procurement of two super post Panamax cranes (MFT Ltd.)	MFT Ltd.	Complete	Private
2.6.4.4	Dredging mainline berths to 20m (MFT Ltd.)	MFT Ltd.	Not available	Private
2.6.5.4	ICT Investment in OCR and Terminal Operating Systems & Server Farm (MFT Ltd.)	MFT Ltd.	5.7	Private
2.6.4.6	Development of engineering facilities at Malta Freeport (MFT Ltd.)	MFT Ltd.	10.3	Private
2.6.4.8	South Road	Transport Malta	1.0	EU / National

Table 8.
Table of Core Port of Marsaxlokk Measures

3.1.4.2
Port of Valletta

The Port of Valletta contains both international sea passenger (ferry and cruise liner) facilities and freight (bulk, Ro-Ro and containerised) facilities.

The sea passenger terminal facilities are operated by private entities; namely: Virtu Ferries Ltd., a Maltese company operating high speed passenger /car catamaran between Malta and Sicily and Valletta Cruise Port, which is made up of Maltese and international shareholding companies.

In recent years, there has been significant heavy investment in both sea passenger terminals and, in the case of Malta-Sicily Ferry Service provider, in the procurement of new, modern catamaran vessels. In this respect, no major sea passenger project proposals have been identified for inclusion in the Operational Programme (2014-2020).

Freight terminal and handling facilities within the Port of Valletta are mainly operated and maintained by Government. The Feasibility and Environmental Impact Studies for Maritime Transport Infrastructural Projects prepared by ECORYS, Netherlands in 2006 has formed the basis for planned investment in the structural rehabilitation of quays and breakwaters to increase operational capacity within the port of Valletta. In this respect, significant investment in port infrastructure has already taken place during the operational programme 2007-13. The Transport Master Plan, 2025 continues with the infrastructure and vessel traffic management information system investment programme previously identified for this TEN-T Core Network Maritime Port.

Further public sector investment is planned for the port breakwater system.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.6.3.1	Deep Water Quay Phase 2	Transport Malta	6.9	National
2.6.3.2	Improvement of Harbour Wave Climate	Transport Malta	10.0	National / CF
2.6.3.3	New Cargo Infrastructure in the Port of Valletta at Lab Wharf (Phase 1)	Transport Malta	14.3	National / CF
2.5.4.5	Malta-Gozo Fast ferry infrastructure (also includes TEN-T port infrastructure in the Comprehensive Port of Cirkewwa.	Transport Malta	6.3	National / ERDF

Table 9.
Table of Core Port of Valletta Measures

3.1.5
PRIORITISATION OF MEASURES AT THE TEN-T CORE AIRPORT

Malta's TEN-T Core Airport node was already defined on the trans-European transport network under the previous TEN-T guidelines and, since 2004 there has been significant airport investment in infrastructure and operations by the private sector operator (in certain project investments, with the assistance of co-funding under the TEN-T financial instrument). The Malta International Airport Plc. is committed to investing further in airport infrastructure and ICT to optimise airport capacities in order to cater for the growing passenger demand. In this respect, the Transport Master Plan 2025 takes on board the planned prioritised measures, as prepared by the airport infrastructure manager.

3.1.5.1
Malta International Airport

Malta International Airport Plc., which operates under a concession agreement with Government, is responsible for the planning, operation and maintenance of airport infrastructure (terminal, runways and taxiways).

Malta International Airport Plc. has identified the following investments which aim to increase the airports' operational capacity.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.7.2.2	Improvements to Taxiway C and Taxi lanes T, U and W	MIA Plc	Not available	Private
2.7.3.2	Replacement of AODB (Airport Operations Database) system	MIA Plc	Not available	Private
N/A	Enlargement of the Non-Schengen Departures Concourse	MIA Plc	Complete	Private

Table 10.
Table of Core Airport Measures

3.1.6
PRIORITISATION OF MEASURES ON THE TEN-T CORE AND COMPREHENSIVE ROAD NETWORK

The strategically important 22.0 kilometre section of TEN-T Core Road Network in Malta as defined under Regulation (EU) 3015/2013 already formed part of the TEN-T road network under the previous TEN-T guidelines.

As the infrastructure manager, Government had commissioned extensive studies *Feasibility and Environmental Impact Studies for Transport Infrastructure Projects for Malta, BCEOM (2004)* and *Feasibility and Environmental Impact Assessment Studies for Gozo, EM Architects and AIS Environmental Ltd (2006)*. These studies have provided the necessary basis for the prioritisation of investment in road infrastructure, which has been funded both nationally and with the support of the EU Cohesion Fund and ERDF since 2004.

3.1.6.1
TEN-T Core Road Network

Only four sections of TEN-T core network have not been upgraded to Expressway standard. The removal of the traffic bottleneck at [nodes EA20a-EA21a] - Addolorata junction, Marsa is the most critical pre-identified section of modal interconnection (Marsaxlokk-Luqa-Valletta) that has not been completed. The Maltese authorities had submitted a funding application for Phase I of this project under the 2014 Connecting Europe Facility call. The project, which has healthy an Economic Internal Rate of Return (EIRR) of 23.7% and a robust Benefit to Cost Ratio (BCR) of 5.23, was subsequently selected for co-financing and implementation is currently underway. Malta will also be applying for Phase II of this project under the 2016 call of the Connecting Europe Facility.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.2.7.1-1	Remove traffic bottleneck at [nodes EA20a-EA21a] -Addolorata junction, Marsa – Phase I	Transport Malta	45.0	National/ CEF
	Remove traffic bottleneck at [nodes EA20a-EA21a] -Addolorata junction, Marsa – Phase II	Transport Malta	36.0	National/ CEF

Table 11.
Table of Core TEN-T Road Measures

Figure 111.
Visual of TEN-T Core Road Measure RD1 at Addolorata junction, Marsa

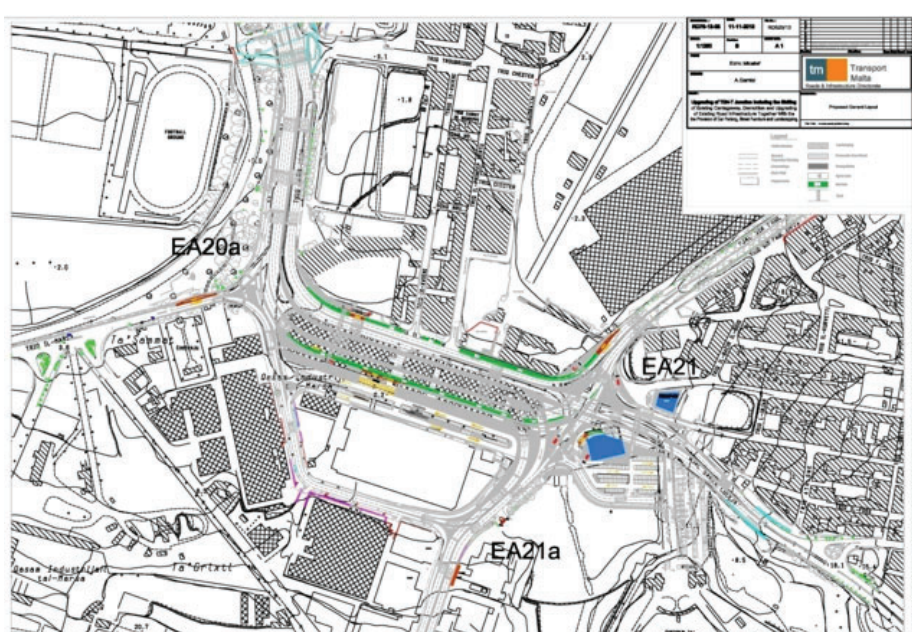


Figure 112.
Schematic of TEN-T Core Road Measure RD1 - Addolorata junction, Marsa

3.1.6.2
TEN-T Comprehensive Road Network

The Regional road section in Kappara between junctions EA14 and EA16 had formed part of the original strategic TEN-T road network. This section had previously been identified as a major traffic bottleneck on the TEN-T and works had been programmed under the Operational Programme 2007-13, however implementation was delayed due to issues of land acquisition.

The project pipeline had reached full maturity in 2014 following issuing of development and environmental permission, and agreement on the expropriation of third-party property. Based on the very positive outcome of the cost-benefit analysis (EIRR 21.4% and BCR 3.77), Government has proceeded to the issue the project tender and award the contract for works. Works on this project are currently underway.

Measure	Measure Implementation 2014-2020	Implementing Body	Cost (€m)	Funding
2.2.7.1-2 (RD2)	Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara	Transport Malta	35.0	National/ CF

Table 12.
Table of TEN-T Comprehensive Road Measures

Figure 113.
Schematic of TEN-T Comprehensive Road Measure RD2 - Kappara junction, Kappara

As aforementioned, these two projects have been considered committed projects. For this reason, instead of simulating them separately, they have been included within the modelled road network at the same time together with each of the other projects and scenarios appraised.

Apart from these two committed projects, there are 27 remaining sections on the TEN-T Road (Core and Comprehensive) network. The total investment cost to complete the upgrade of the TEN-T Core and Comprehensive Network is estimated to be in the region of €800m at current prices, (excluding the planned link Malta-Gozo subsea road tunnel which is at the feasibility study stage). The TEN-T Core network has four sections to be completed by 2030 at an estimated cost of €100m; and 22 sections, excluding the Malta-Gozo link still at study phase, on the TEN-T Comprehensive to be completed by 2050 at an estimated cost of €700m.

As it is neither technically nor financially feasible to complete the TEN-T Core and Comprehensive road network over the next 10 years, it is necessary to prioritise the selection of TEN-T road section for implementation. The three stages used in the road infrastructure selection process are outlined below:

Stage 1 - Screening

One of the primary objectives behind TEN-T policy is to develop a sustainable multimodal transport network through the optimisation or expansion of infrastructure capacity. This will be achieved through the removal of traffic bottlenecks and the bridging of missing links.

The screening stage of the TEN-T road infrastructure project prioritisation process involved a relative assessment of the level of traffic congestion in each of the 29 uncompleted sections of TEN-T, indicating the number of road transport users who would affected. The National Transport Model was used to forecast the following performance indicators for the most critical AM peak hour for the future forecast year 2025:

a) Level of Congestion (Volume / Capacity);
b) Number of vehicles; and
c) Number of passenger transport users.

The screening table below highlights those sections of TEN-T road network where the level of congestion is forecasted to be highest. This was then examined in the context of number of vehicles and passengers that would be adversely affected through longer journey times during the morning peak. The removal of traffic bottlenecks on these critical sections would, from this high level assessment, probably have the highest benefits in terms of reduction in journeys and reduction in vehicle operating costs.

The economic impact of a project is very important criterion in the prioritisation process. However, as the National Transport Strategy establishes five other strategic goals for which the measures in the national transport plan should aim to contribute towards; namely: environmental and urban sustainability, social development and inclusion, accessibility, safety and security, and public health, the next stage aims shortlist projects by compares relative project performance against these broader strategic goals.

No.	TEN-T Sections	Do Minimum - 2025			
		V/C	Veh. flow	PT Flow	TEN-T
1	Remove traffic bottleneck at [nodes EA20a-EA21a] - Adolorata junction, Marsa	>1.0	>3500	1500-1750	Core
2	Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara	>1.0	2000-2500	<500	Comp
3	Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa	>1.0	>3500	1500-1750	Core
4	Removal of bottlenecks, improving road infrastructure quality and reducing severance (where possible) on Regional road [Nodes EA16-WA19], Msida	>1.0	3000-3500	<500	Comp
5	Make more efficient use of road space and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta	0.3-0.6	2000-2500	>1700	Core
6	Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's	0.8-0.9	1000-1500	<500	Comp
7	Removal of bottlenecks between Birkirkara Bypass and Mosta Road [Nodes WA1-NA21] - Birkirkara, Lija	>1.0	2000-2500	1000-1250	Comp

No.	TEN-T Sections	Do Minimum - 2025			
		V/C	Veh. flow	PT Flow	TEN-T
8	Upgrading of Mriehel Bypass [Nodes WA18-WA8] and removal bottleneck / reduce functional conflict between traffic and urban activity [Nodes WA7 -WA18], Mriehel	0.3-0.6	1500-2000	0	Comp
9	Upgrade of Regional road [Nodes EA13-south of EA14] including Sun Yat-Sen tunnels and Guze Ellul Mercer bridge and reducing severance, San Gwann	0.8-0.9	1500-2000	<500	Comp
10	Malta-Gozo Fixed Link				Comp
11	Redesign to make more efficient use of restricted road space [Nodes WA23-WA19] / Upgrade of bottleneck [Node WA13], Luqa, Qormi	>1.0	1000-1500	<500	Comp
12	Removal of bottleneck and functional conflict between high traffic flows and urban activity at Notary Zarb Street and Mdina Road [Nodes WA8-west of WA10], Attard	>1.0	500-1000	<500	Comp
13	Remove bottlenecks at EA16 upgrading Birkirkara Bypass and reducing severance [Nodes EA16-WA1] - Birkirkara	0.6-0.8	2000-2500	<500	Comp
14	Removal of bottleneck and reduce severance between urban communities [Nodes SA12-SA11] - Triq Tal-Barrani, Tarxien	0.6-0.8	1500-2000	<500	Comp

No.	TEN-T Sections	Do Minimum - 2025			
		V/C	Veh. flow	PT Flow	TEN-T
15	Removal of bottleneck and upgrading quality of road infrastructure on Triq tal-Barrani and Sta. Lucija Ave. [Nodes EA21-SA11 and SA12-SA12b] - Ghaxaq and Marsa	0.3-0.6	1000-1500	<500	Comp
16	Upgrade of existing link and construct missing link from Tal-Barrani to Smart City [Nodes SA12-SD9-SD7], Fgura and Zabbar	0.3-0.6	500-1000	<500	Comp
17	Upgrade road quality at Valletta Ring Road [Nodes EA6-EA6]	0.3-0.6	<500	<500	Core
18	Upgrading alternative link from Victoria to ferry port [Nodes GA34-GA44-GA37] and removal functional conflict with urban activity [Nodes GD8-GA46], Nadur Road, Gozo	0.3-0.6	<500	<500	Comp
19	Removal of bottleneck at Victoria and removal of functional conflict between high traffic flows and urban activity [Nodes GA33-west of GA30] - Victoria Bypass, Gozo	0.3-0.6	<500	<500	Comp
20	Upgrading of road infrastructure quality on Marsalforn Road [Nodes GA32-GA41] - Victoria to Marsalforn, Gozo	<0.3	<500	<500	Comp
21	Redesign to address conflicting road function (high traffic volume and high urban activity area) [Nodes NA3-NA4] - Ghadira, Mellieha	<0.3	500-1000	<500	Comp

No.	TEN-T Sections	Do Minimum - 2025			
		V/C	Veh. flow	PT Flow	TEN-T
22	Removing bottleneck and functional conflict between high traffic volume and urban activity at Xemxija Road [Nodes NA6-NA7] - Xemxija Bypass, Xemxija	0.6-0.8	500-1000	<500	Comp
23	Removing bottleneck in Burmarrad at [Nodes ND2-NA8], St. Paul's Bay	0.6-0.8	1000-1500	<500	Comp
24	Upgrade of road infrastructure quality [Nodes ND12-NA22 and NAD3-NA22], Mosta	0.3-0.6	500-1000	500-1000	Comp
25	Remove conflict between high traffic flow and urban activity [Nodes SA13-SA12b] - Triq Tal-Barrani Triq Ghar Dalam, Ghaxaq	>0.3	500-1000	<500	Comp
26	Improve road quality and reduce traffic impact in village centre on Marsaxlokk Road [Nodes SA13-SD16], Marsaxlokk	<0.3	<500	<500	Comp
27	Upgrade quality of road infrastructure on Triq Hal-Luqa [Nodes WA22-SA11], Sta. Lucija	0.3-0.6	500-1000	0	Comp
28	Improve road infrastructure quality and reduce functional conflict between high traffic flows and urban activity on Ghaxaq Bypass [Nodes WA24-SA12a] - Ghaxaq	0.3-0.6	500-1000	<500	Comp
29	Upgrade of road infrastructure quality on Triq Hal-Tarxien [Nodes SA13a-SA12], Gudja	<0.3	<500	<500	Comp

Table 13.
Table of other TEN-T Road Network measures

Stage 2 – Short listing

This stage involved carrying out a more detailed review to understand how effectively each road section project would contribute other national medium to long term strategic goals as defined in Malta's National Transport Strategy, 2050.

The following sections present the analysis developed to appraise these TEN-T Road Projects using a Multi-Criteria Analysis approach which allows prioritization of the 29 projects.

Multi-Criteria Analysis

A Multi-Criteria Analysis (MCA) has been carried out in order to prioritize the 29 projects required to complete the TEN-T network (Core and Comprehensive), that takes into account economic, social and environmental indicators. The target of this analysis is to prioritise measures in order to ensure that only the infrastructure measures that better comply with the objectives are put together in the following stage (appraisal of multimodal scenarios).

Economic
Time saving (business users and transport providers)
Time savings that the projects will generate for both business users and transport providers, since the implementation of the projects will help to reduce bottlenecks, shorten travel distances, ease congestion, etc.
Economic Growth through Connectivity / Cohesion
The degree that the projects contributes to enhance connectivity and cohesion between different areas and regions of the country, promoting as well the economic growth and other economic activities such industrial, commercial or tourism activities.
Improve Public Transport Reliability and Efficiency
How the implementation of the project will help to improve the reliability and efficiency of the public transport systems by implementing new roads or upgrades and changes to the existing transport network.

Environmental and urban sustainability
Greenhouse Gas Reduction
The implementation of projects will help to reduce greenhouse gas emissions and promote the environmental and urban sustainability to a greater or lesser extent that needs to be evaluated.
Improved Quality of Landscape / Townscape
Similarly, quality of landscape or townscape will be affected by the implementation of new projects and the affection to this quality has to be evaluated.
Impact on Biodiversity (sensitive sites)
Some projects will have a great impact on biodiversity that has to be evaluated in order to complete the assessment of environmental and urban sustainability of the projects.

Social Development and inclusion
Integration of Isolated Communities
The implementation of some projects is needed in order to integrate isolated communities. The degree of this contribution has to be evaluated.

Accessibility
Physical Access to Infrastructures and Services
Projects may contribute to obtain physical access to infrastructures and services and then improving the overall accessibility of a community.
Contribution to Modal Shift
Modal shift is one of the key of objectives of the study and the level of contribution of the proposed projects to promotion of modal shift has to be independently evaluated.

Safety and Security
Reducing Risk of Accidents and Injuries
New projects are aimed and designed for reducing the risk of accidents and injuries, but the degree of contribution towards this objective has to be evaluated for each project.

Public Health
More Active & Healthy Lifestyles
Active and healthy lifestyles are required to be promoted in order to contribute to the improvement of public health.
Impact on Air Pollution Levels
The aim for implementing projects is to reduce the public health affection of transport and the impact on air pollution levels is a key factor.
Impact on Noise Pollution levels
Similarly, projects have different levels of impact regarding noise pollution, since some projects will contribute to the decrease of this pollution while other will tend to increase it.

Other Factors
Maturity
The maturity is a key factor that measures the advancement, strength and soundness of the project pipeline development as part of the overall transport strategy.
Project Certainty of implementation 2016-2025
The project certainty measures the degree of likelihood for implementing the project in a specific period of time.

Scoring system

The MCA has evaluated each of the 29 projects using the following scoring system:

Scoring system	
+++	Strongly positive
++	Moderate positive
+	Weak positive
0	Neutral
:	Not applicable
-	Weak negative
--	Moderate negative
---	Strongly negative

Table 14.
Scoring system of the MCA

An equal weighting has been applied to all of the criteria reflecting the national importance and commitment to attaining all of the strategic goals.

The maturity and project certain criteria were also used for project pipeline verification of the final shortlist at the end of the MCA process. The results of the MCA after evaluating each of the 29 projects according to the aforementioned criteria re-confirms the priority status given to committed projects at Addolorata junction [RD1], Marsa and Kappara junction, Kappara [RD2] and also provides a ranking of the remaining 27 projects.

Based on an estimation of financial budgets that are likely to be made available for TEN-T Road projects up to 2025, a further four road project sections were selected for a more detailed analysis.

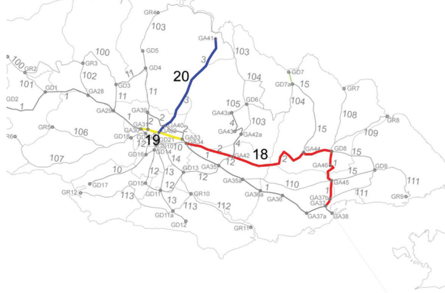


Figure 114.
Uncompleted sections of TEN-T Road Network in Gozo

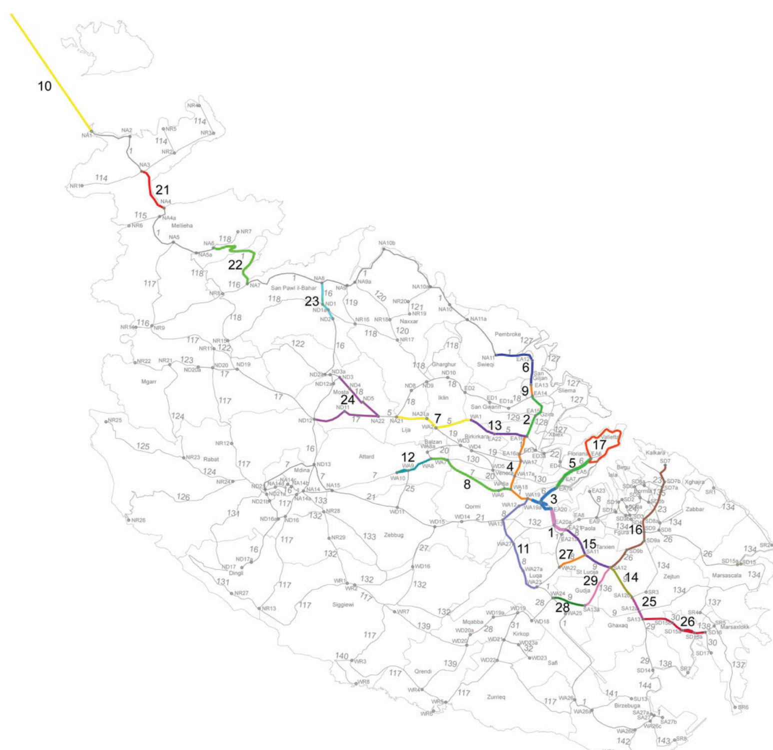


Figure 115.
Uncompleted sections of TEN-T Road Network in Malta

Impacts	Remove traffic bottleneck at [nodes EA20a-EA21a] -Addolorata junction, Marsa	Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara	Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's	Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa	Make more efficient use of roadspace and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta	Removal of bottlenecks, widening sections to three lanes, tunnel improvement and realignment Sta Venera, Mriehel bypass interchange [Nodes EA17-WA19], Msida	Removal of bottlenecks, Re-construction and re-alignment of Msida Valley interchange Psaila str to Tal Qroqq [Nodes EA16a-WA17a], Msida
Section Number (Map Reference)	1	2	6	3	5	4a	4b
Economic							
Economic Growth through Connectivity / Cohesion	+++	+++	++	+++	0	++	++
Improve Public Transport Reliability and Efficiency	+++	+++	+++	+++	++	+	+
Time saving (business users and transport providers)	+++	+++	+++	+++	0	+++	+++
Environmental and urban sustainability							
Greenhouse Gas Reduction	+++	+++	+++	+++	+	+++	+++
Improved Quality of Landscape / Townscape	-	+	+	0	+	-	-
Impact on Biodiversity (sensitive sites)	-	-	0	- -	0	- -	- -
Social Development and inclusion							
Integration of Isolated Communities	++	++	++	++	+	0	0
Accessibility							
Physical Access to Infrastructures and Services	+++	+++	++	+++	+++	0	0
Contribution to Modal Shift	+++	++	++	+++	++	+	+
Safety and Security							
Reducing Risk of Accidents and Injuries	+++	+++	+++	+++	+++	+++	+++
Public Health							
More Active & Healthy Lifestyles	+++	++	++	++	++	0	0
Impact on Air Pollution Levels	+++	+++	+++	+++	0	+++	+++
Impact on Noise Pollution levels	0	-	+++	+	0	+	+
Other Factors							
Maturity	+++	+++	+	+	+	+	+
Project Certainty of implementation 2016-2025	+++	+++	0	0	+	0	0
TOTAL IMPACT OF RELEVANT INDICATORS	33	32	30	28	17	15	15

Impacts	Removal of bottleneck and upgrading quality of road infrastructure on Triq tal-Barrani and Sta. Lucija Ave. [Nodes EA21-SA12] - Ghaxaq and Marsa	Upgrading of Mriehel Bypass [Nodes WA18-WA8] and removal bottleneck / reduce functional conflict between traffic and urban activity [Nodes WA7 -WA18], Mriehel	Removing bottleneck in Burmarrad at [ND2-Node NA8], St. Paul's Bay	Removal of bottleneck and functional conflict between high traffic flows and urban activity at Notary Zarb Street and Mdina Road [Nodes WA8-west of WA10], Attard	Removal of bottlenecks between B'Kara Bypass and Mosta Road [Nodes WA1-NA21] - Birkirkara, Lija	Remove bottlenecks at EA16 upgrading B'Kara Bypass and reducing severance [Nodes EA16-WA1] - Birkirkara	Removing bottleneck and functional conflict between high traffic volume and urban activity at Xemxija Road [Nodes NA6-NA7] - Xemxija Bypass, Xemxija
Section Number (Map Reference)	15	8	23	12	7	13	22
Economic							
Economic Growth through Connectivity / Cohesion	+	+++	++	++	++	+	++
Improve Public Transport Reliability and Efficiency	0	0	+	++	++	+	++
Time saving (business users and transport providers)	++	++	++	+	+++	+	++
Environmental and urban sustainability							
Greenhouse Gas Reduction	++	++	++	+	+++	+	++
Improved Quality of Landscape / Townscape	+	- -	-	- -	- - -	0	- - -
Impact on Biodiversity (sensitive sites)	-	- - -	-	-	- - -	0	- - -
Social Development and inclusion							
Integration of Isolated Communities	0	+	+	0	0	+	+
Accessibility							
Physical Access to Infrastructures and Services	0	+++	+++	0	0	+	++
Contribution to Modal Shift	0	0	0	++	++	0	+
Safety and Security							
Reducing Risk of Accidents and Injuries	0	+++	+	++	+	++	+++
Public Health							
More Active & Healthy Lifestyles	++	+	0	0	0	0	+
Impact on Air Pollution Levels	++	++	0	0	+	+	0
Impact on Noise Pollution levels	++	0	0	+	+	0	0
Other Factors							
Maturity	+	0	+	+	+	0	+
Project Certainty of implementation 2016-2025	+	+	0	+	-	0	- -
TOTAL IMPACT OF RELEVANT INDICATORS	13	13	11	10	9	9	9

Redesign to make more efficient use of restricted road space [Nodes WA23-WA19] / Upgrade of bottleneck [Node WA13], Luqa, Qormi	11	+	+	+ +	+	-	0	+	+	0	+	+	-	0	0	+	8
Upgrade of road infrastructure quality [Nodes ND12-NA22 and NAD3-NA22], Mosta	24	0	+	0	0	0	0	+	+	+	++	+	+	+	0	-	8
Removal of bottleneck and reduce severance between urban communities [Nodes SA12-SA12b] - Triq Tal-Barrani, Zejtun and Tarxien	14	0	0	++	++	- -	0	0	0	+	++	0	+	0	+	0	7
Redesign to address conflicting road function (high traffic volume and high urban activity area) [Nodes NA3-NA4] - Ghadira, Mellieha	21	+	+	+	+	- - -	- - -	0	+	+	+++	+	++	++	+	- -	7
Upgrade of Regional road [nodes EA13-south of EA14] including Sun Yat-Sen tunnels and Guze Ellul Mercer bridge and reducing severance, San Gwann	9	0	0	+	+	0	0	+	+	0	+	+	0	0	0	0	6
Upgrading of road infrastructure quality on Marsalforn Road [Nodes GA32-GA41] - Victoria to Marsalforn, Gozo	20	++	0	0	0	0	0	0	+	0	+	+	0	0	+	0	6
Remove conflict between high traffic flow and urban activity [Nodes SA13-SA12b] - Triq Tal-Barrani Triq Ghar Dalam, Ghaxaq	25	+	+++	+++	0	- -	0	0	+	0	+	0	0	0	0	- -	5
Upgrade of existing link and construct missing link from Tal-Barrani to SmartCity [Nodes SA12-SD9-SD7], Fgura and Zabbar	16	+	0	+	+	- - -	- -	+	+	-	+	0	+	+	++	0	4
Removal of bottleneck at Victoria and removal of functional conflict between high traffic flows and urban activity [Nodes GA33-west of GA30] - Victoria Bypass, Gozo	19	+	0	+	+	- - -	- - -	0	+	0	++	0	++	++	0	-	4
Improve road quality and reduce traffic impact in village centre on Marsaxlokk Road [Nodes SA13-SD16], Marsaxlokk	26	0	0	0	0	0	0	+	+	0	0	0	0	0	+	-	3
Upgrade quality of road infrastructure on Triq Hal-Luqa [Nodes WA22-SA11], Sta. Lucija	27	+	0	+	+	-	-	0	0	0	++	0	+	0	0	-	3
Improve road infrastructure quality and reduce functional conflict between high traffic flows and urban activity on Ghaxaq Bypass	28	+	0	+	0	0	0	0	0	+	+	0	0	0	0	-	3
Upgrade road quality at Valletta Ring Road [EA6-EA6]	17	0	0	0	0	0	0	+	+	0	+	+	0	0	0	- -	2

Impacts	Upgrade of road infrastructure quality on Triq Hal-Tarxien [Node SA13a-SA12], Gudja	Upgrading alternative link from Victoria to ferry port [Nodes GA34-GA44-GA37] and removal functional conflict with urban activity [Nodes GD8-GA46], Nadur Road, Gozo	Malta-Gozo Fixed Link
Section Number (Map Reference)	29	18	10
Economic			
Economic Growth through Connectivity / Cohesion	+	+	N/A
Improve Public Transport Reliability and Efficiency	0	0	N/A
Time saving (business users and transport providers)	0	+	N/A
Environmental and urban sustainability			
Greenhouse Gas Reduction	0	+	N/A
Improved Quality of Landscape / Townscape	0	- - -	N/A
Impact on Biodiversity (sensitive sites)	0	- - -	N/A
Social Development and inclusion			
Integration of Isolated Communities	0	+	N/A
Accessibility			
Physical Access to Infrastructures and Services	+	0	N/A
Contribution to Modal Shift	0	0	N/A
Safety and Security			
Reducing Risk of Accidents and Injuries	+	+ + +	N/A
Public Health			
More Active & Healthy Lifestyles	0	0	N/A
Impact on Air Pollution Levels	0	0	N/A
Impact on Noise Pollution levels	0	0	N/A
Other Factors			
Maturity	0	0	N/A
Project Certainty of implementation 2016-2025	-	0	N/A
TOTAL IMPACT OF RELEVANT INDICATORS	**2**	**1**	**N/A**

Table 15.
Table showing application of MCA scoring to the TEN-T Roads Measures

Stage 3 – Appraisal of Shortlisted Projects

Under stage 3 of the prioritisation process, an in-depth analysis of the six shortlisted projects identified in the stage 2 was carried out. For this stage in the analysis, cost estimates were provided and transport model was used to generate demand forecasts for each project. This enabled a more detailed quantified assessment to confirm that the four shortlisted highway interventions would have positive effect on the external impacts of traffic (cost of congestion, cost of accidents and environmental externalities).

It has been considered that the core projects (RD1 and RD2) will coexist with each of the other four, as they are committed projects. Consequently, the simulation of each project (RD3, RD4, RD6) has been done including RD1 and RD2 in the modelled road network at the same time together with the project which is being appraised.

The project RD5 has been appraised in terms of number of accidents only; by making some external calculations to the NTM (see 3.1.6.3.3).

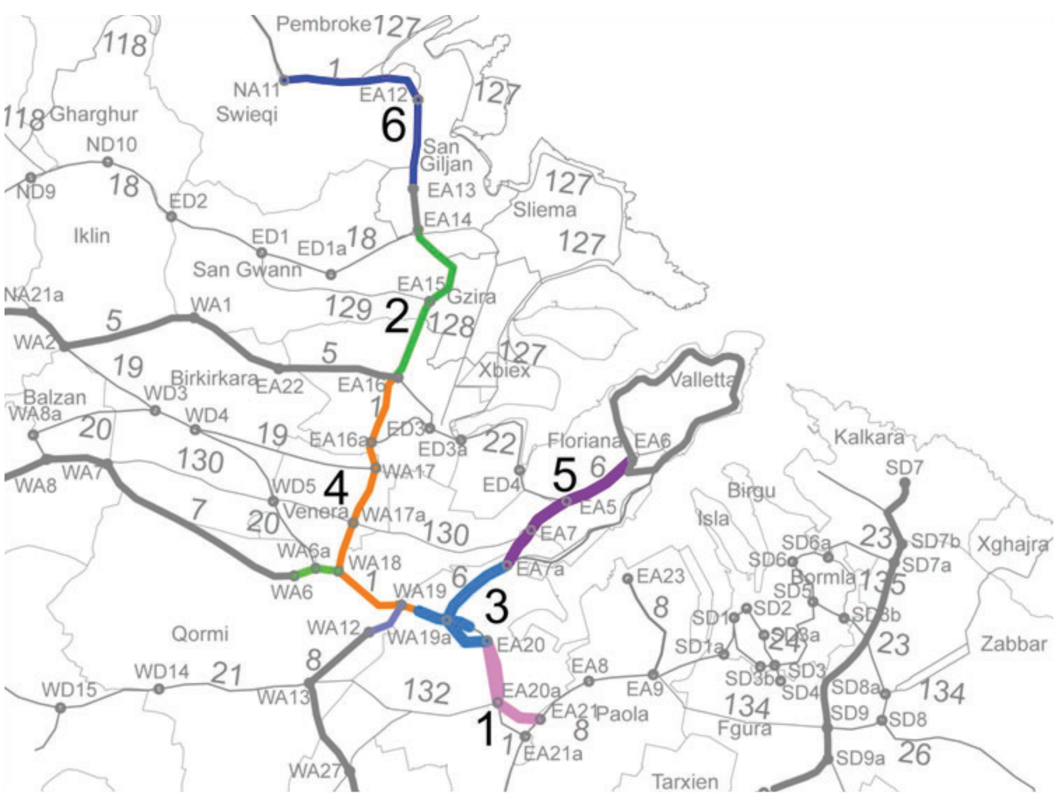


Figure 116.
Schematic of the TEN-T Road Network Measures

The following paragraphs summarise the main performance indicators and external impacts of traffic (cost of congestion, cost of accidents and environmental externalities) across the whole network, obtained from the simulation of each project implemented within the road network corresponding to the Do-Minimum scenario plus the core projects (RD1 and RD2). These outputs are compared with the results of the reference scenario (Do-Minimum).

Performance indicators

- **Travelled distance**, as an indicator of private traffic performance, represents the total distance travelled by all the vehicles in the network (light vehicles, heavy vehicles). It is calculated as the product of the number of vehicles driving on each link and the length of the link (the indicator unit is vkm).

- **Modal split**, or modal share across the whole network, is the percentage of travellers using a particular type of transportation (private car, public transport and other modes).

- **Travelled distance**, as an indicator of public and private traffic performance, represents the total distance travelled on board by all the passengers in the network by mode (private car, public transport). It is calculated as the sum, extended to all the links of the network, of the products of the number of passengers on board on each link and the length of the link (the indicator unit is pkm).

- **Average speed** of the entire network for each mode (private car, public transport), as an indicator of public and private traffic performance, is calculated as the ratio between the travelled distance and the time spent by the all vehicles in the network (the indicator unit is km/h).

External impacts of traffic

- The **cost of congestion** is based on the evaluation of the lost time spent across the whole road network due to congestion as difference between the actual total time spent into the network and the total travelled time at ideal "free flow condition", for each mode (private car, public transport and freight).

  The final cost of congestion related to the overall time lost into the network is made by two main components: the first one, most significant, as value of time (VoT applied to the total amount of hours lost into the network) and the second one, related to the VoC, as total idle fuel consumption (fuel consumption associated to idle/stop conditions applied to the total amount of hours lost into the network).

- The **cost of accidents** is estimated by using the value of statistical life proposed by the Guidance Manual for Cost Benefit Analysis (CBAs). Appraisal in Malta[19] (see Table 72) applied to the number of accidents by type (slight, grievous, fatal). The number of accidents by type is calculated based on the travelled distance (vkm) by all the vehicles across the whole network resultant from the simulation, and historical data of the number of accidents per vkm.

[19] *https://eufunds.gov.mt/en/Operational%20Programmes/Useful%20Links%20and%20Downloads/Documents/Guidance%20Manual%20for%20CBAs%20Appraisal_May2013.pdf*

– The estimated **environmental externalities** are the GHG (CO_2) emissions (climate change) and the air pollutants emissions (CO, PM, NOx, NMVOC). The calculation is based on the Tier 1 emission factors (Table 73), the fuel consumption per km (Table 74) and the travelled distance by type of vehicle in the whole network.

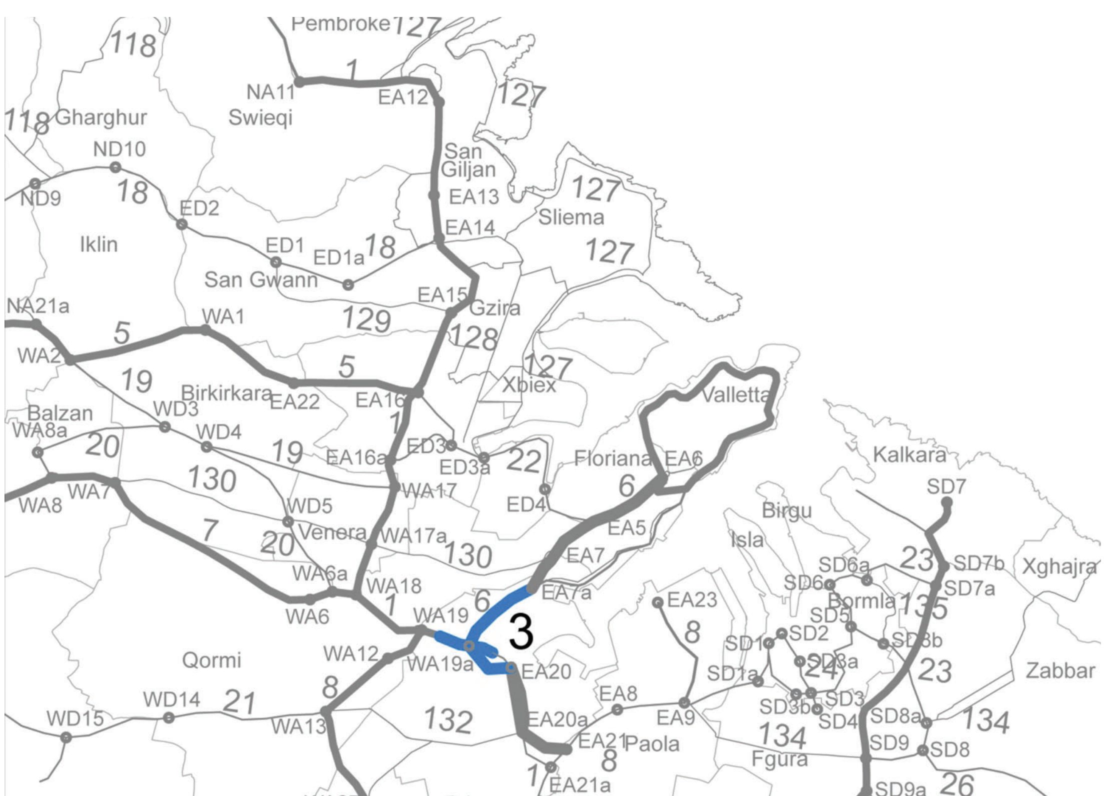
  Finally, the calculation of the yearly costs of air pollution and climate change is included.

3.1.6.3
List and results of Measures individually appraised

3.1.6.3.1
RD3: Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa

This project costing approximately €77m is located on a critical section of the TEN-T Core network and is closely associated with urban regeneration plans in the Marsa area. The project would involve the realignment of the existing road by removing the need to go through the roundabout EA20 for those vehicles travelling between node WA19a and node EA20a. The project will also include a road widening and the construction of a roundabout under the new road alignment.

Figure 117.
Schematic of the TEN-T Road Network Measure (RD3)



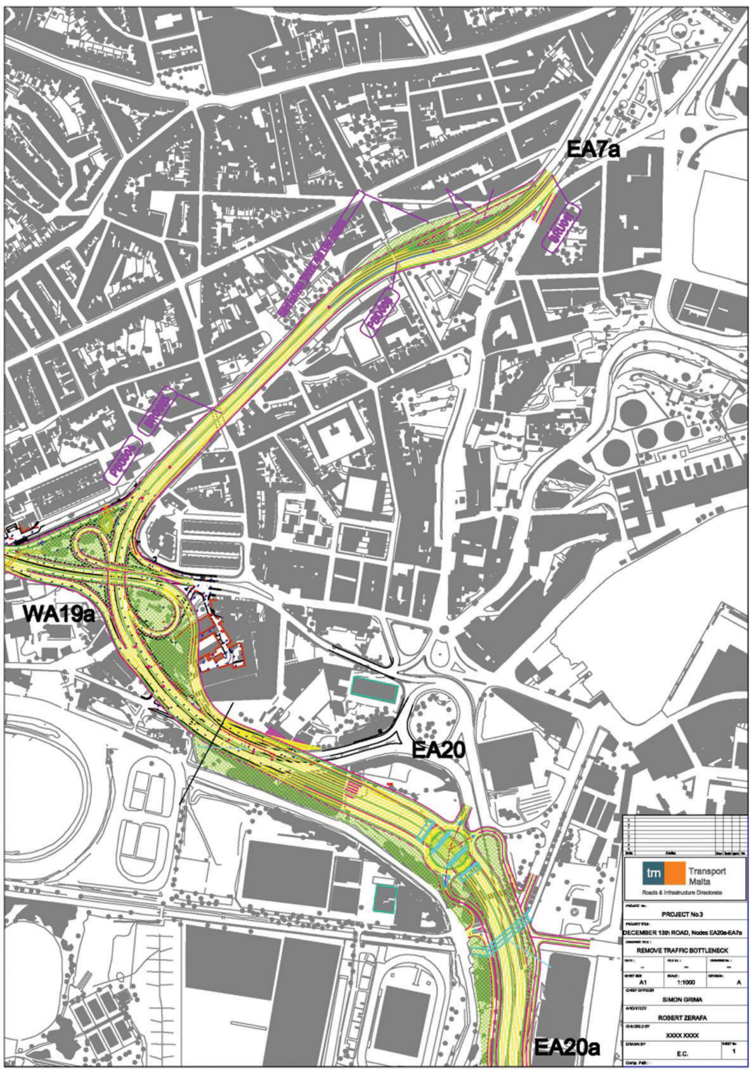


Figure 118.
Schematic of TEN-T Core Road Measure RD3 – December 13th Road, Marsa

Performance indicators

This measure supports the modal shift towards Public Transport, thus the private vehicle travelled distance (vkm) decreases, while the Public Transport passenger travelled distance (pkm) increases.

Both Public Transport and Private vehicle average travel speed increases due to the removal of the sharp bend and the separation of the Public Transport traffic which still runs through the roundabout and the private vehicle traffic that can use both paths.

Peak-hour travelled distance [vkm]					Yearly travelled distance [million vkm]	
Mode [20]	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD3**	**Do-Minimum**	**RD3**	**Do-Minimum**	**RD3**
LV	391,090	383,827	397,996	397,547	1,425	1,413
HV	47,231	46,520	24,851	24,912	124	123
LV + HV [21]	**532,782**	**523,387**	**472,547**	**472,282**	**1,796**	**1,781**

Table 16.
Measures of effectiveness: peak-hour and yearly travelled distance by all vehicles, RD3 project, 2025 (NTM; Elaboration)

Modal split						
Mode	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD3**	**Do-Minimum**	**RD3**	**Do-Minimum**	**RD3**
Private Car	72.3%	71.9%	79.0%	79.0%	75.7%	76.0%
Public Transport	16.7%	17.0%	15.2%	15.0%	16.0%	16.0%
Other Modes	11.0%	11.0%	5.8%	6.0%	8.4%	8.0%

Table 17.
Key mobility Statistics: peak-hour and yearly Modal Split, RD3 project, 2025 (NTM; Elaboration)

Peak-hour travelled distance [pkm]					Yearly travelled distance [million pkm]	
Mode	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD3**	**Do-Minimum**	**RD3**	**Do-Minimum**	**RD3**
Private Car	472,046	463,280	480,381	479,839	1,720	1,705
Public Transport	111,538	118,085	90,321	90,453	358	368
Total	**583,584**	**581,364**	**570,702**	**570,291**	**2,100**	**2,074**

Table 18.
Measures of effectiveness: peak-hour and yearly travelled distance by all passengers, RD3 project, 2025 (NTM; Elaboration)

[20] *Light vehicles or Private Car (LV), Heavy vehicles or Freight (HV)*
[21] *It should be noted that, when considering the whole network from a general perspective, the impact of the HVs is considered as three times the one of a LV, in order to homogenize the parameter and provide a basis for objective comparison*

Peak-hour LV and PT average speed [km/h]

Mode	AM		PM	
	Do-Minimum	RD3	Do-Minimum	RD3
Private Car	20.7	22.6	23.1	23.7
Public Transport	13.6	14.7	15.5	15.9

Table 19.
Measures of effectiveness: peak-hour average speed, RD3 project, 2025 (NTM; Elaboration)

External impacts of traffic

The removal of the bottleneck results in a reduction of lost time per passenger, which means that this measure contributes to reducing congestion. Similarly, the realignment reduces the accidents in the zone of influence of the measure by 50% for slight and grievous accidents and by 62% for fatal accidents. It should be noted that this reduction of accidents only applies to the area of the road network in the immediate vicinity of the measure. As a consequence, the reduction in total costs related to accidents on the whole network is relatively small.

The modal shift towards Public transport also helps reduce the impact of transport in air pollution and climate change. Indeed, since the travelled distance by private vehicle is lower than in the Do-Minimum scenario, the emissions are also lower. As a summary, this measure reduces the cost of the external impacts of transport in €58 million per year.

Annual cost of congestion					**Yearly travelled distance [million vkm]**	
Mode	**Lost time per passenger [h/year]**		**Cost of lost time [€m/year]**		**Cost of Consumption at idle [€m/year]**	
	Do-Minimum	**RD3**	**Do-Minimum**	**RD3**	**Do-Minimum**	**RD3**
Private Car	29.1	26.4	397.1	358.9	20.3	18.4
Freight	18.9	16.6	51.1	44.9	6.3	5.5
Public Transport	36.6	33.4	105.6	97.5	0.0	0.0
Total	**29.6**	**26.8**	**553.8**	**501.3**	**26.6**	**23.9**

Table 20.
Estimation of yearly cost of congestion, RD3 project, 2025 (NTM; Elaboration)

Annual cost of accidents

Scenario	Slight accidents [accidents/ year]	Grievous accidents [accidents/ year]	Fatal accidents [accidents/ year]	Cost associated to accidents
Do-Minimum	3,009.4	375.0	15.7	111.1
RD3	2,940.6	366.5	15.3	108.5

Table 21.
Estimation of yearly cost of accidents across the whole network, RD3 project, 2025 (Various sources; Elaboration)

CO_2 Emission (tons/year)

Year	
Do-Minimum	**RD3**
342,642	339,901

Table 22.
Climate change: estimation of yearly GHG (CO_2) emissions, RD3 project, 2025 (NTM; Elaboration)

Air pollutants emissions [tons per year]

CO [tons/year]		PM [tons/year]		NOx [tons/year]		NMVOC [tons/year]	
Do-Minimum	RD3	Do-Minimum	RD3	Do-Minimum	RD3	Do-Minimum	RD3
8,234	8,165	63.7	63.2	1,236	1,227	1,410	1,398

Table 23
Estimation of yearly production of air pollutants, RD3 project, 2025 (NTM; Elaboration)

Annual cost of accidents

Scenario	PM [€m/year]	NOx [€m/ year]	CO_2 [€m/year]	Total [€m/ year]
Do-Minimum	1.80	11.91	10.28	23.99
RD3	1.78	11.83	10.20	23.81

Table 24
Estimation of yearly cost of air pollution, RD3 project, 2025 (NTM; Elaboration)

3.1.6.3.2
RD4: Removal of bottlenecks, improving road infrastructure quality and reducing severance (where possible) on Regional road [Nodes EA16-WA19], Msida

The two phase project would cost an estimated €82m and would include the realignment of the Regional road at node EA16a, the widening of this road between node WA18 and WA19 and the realignment of the existing bridge at WA19.

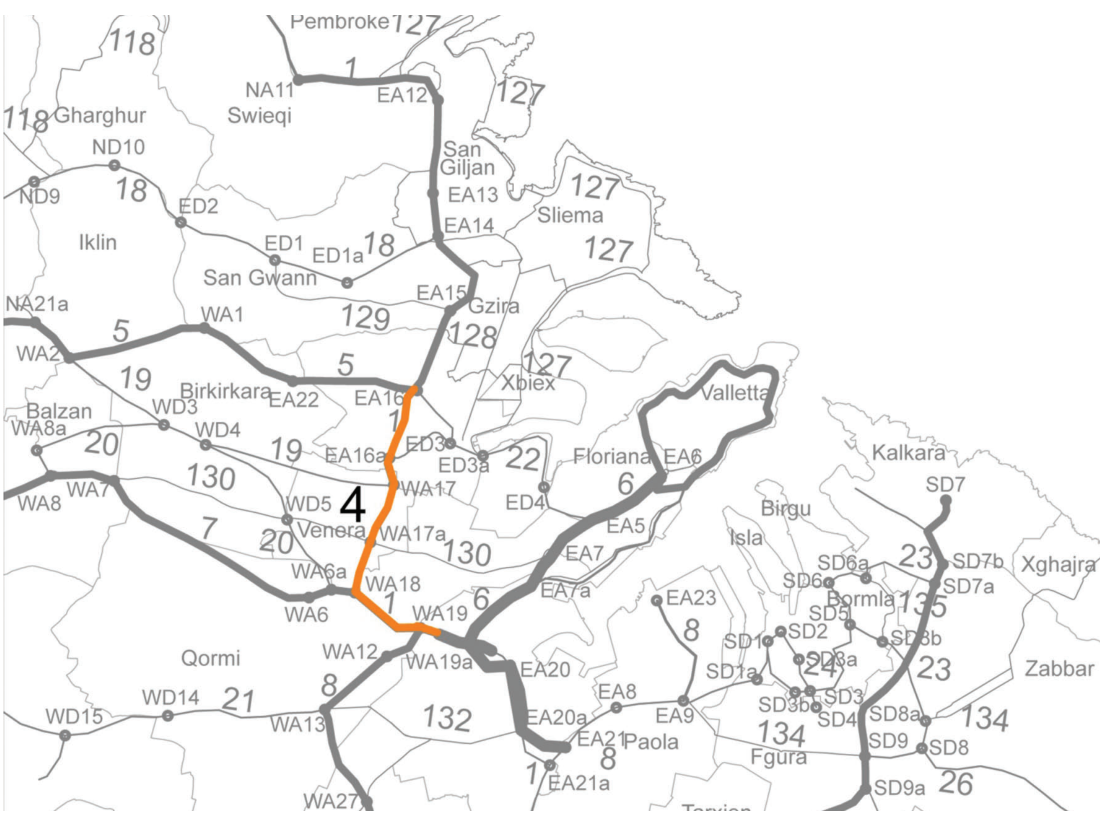


Figure 119.
Schematic of the TEN-T Road Network Measure (RD4)

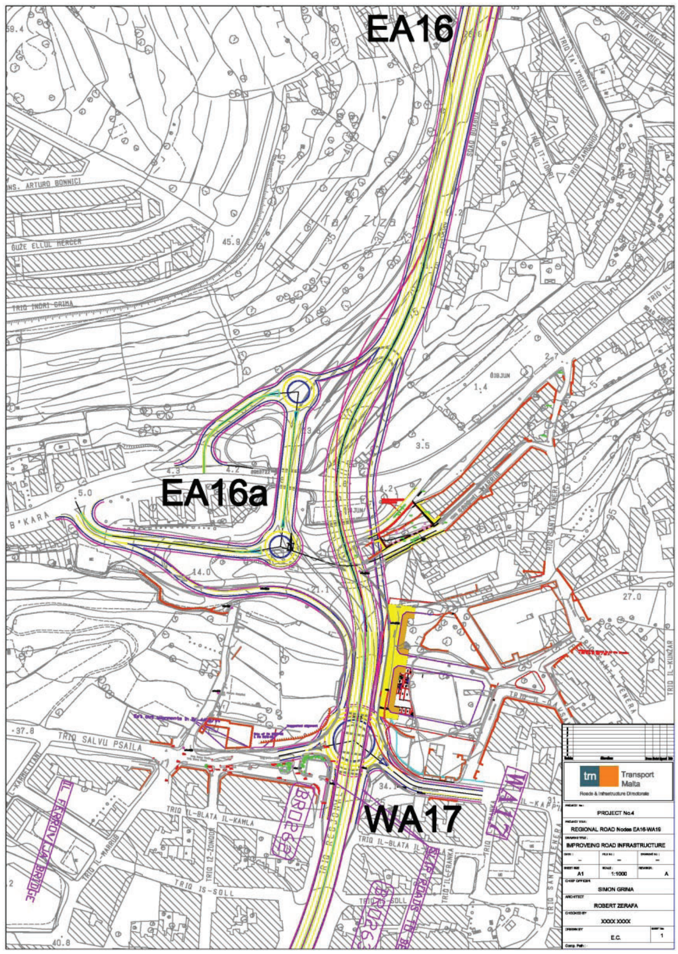


Figure 120.
Schematic of TEN-T Comprehensive Road Measure RD4 – Msida (1 of 3)

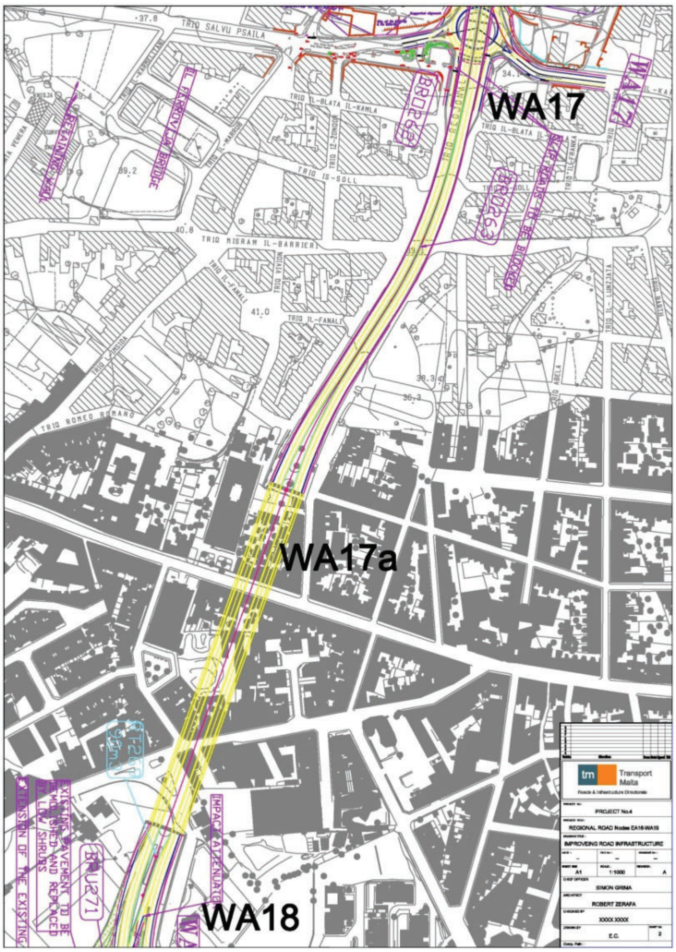


Figure 121.
Schematic of TEN-T Comprehensive Measure RD4 – Msida (2 of 3)

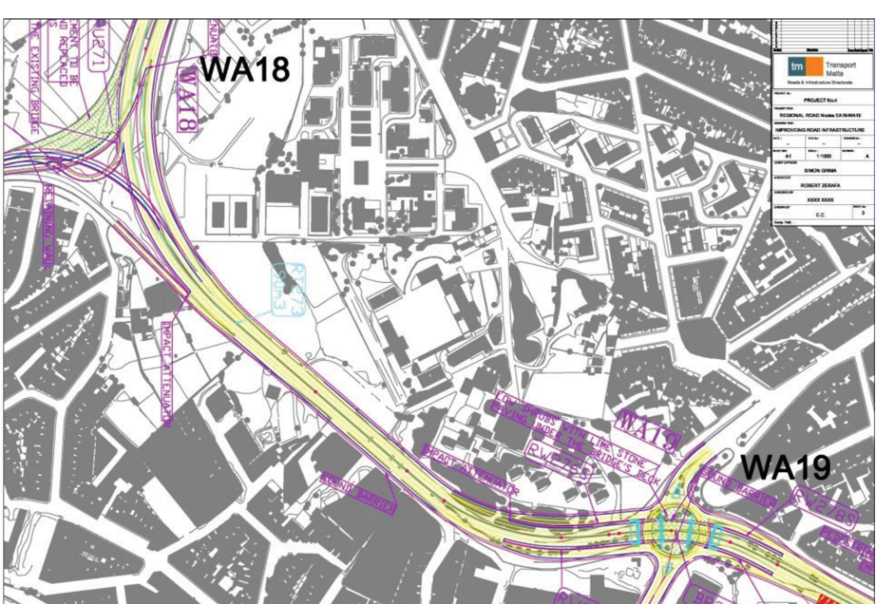


Figure 122.
Schematic of TEN-T Comprehensive Measure RD4 – Msida (3 of 3)

Performance indicators

The realignment and widening of the road and realignment of the bridge supports the modal shift towards Public Transport, thus the private vehicle travelled distance (vkm) decreases, while the Public Transport passenger travelled distance (pkm) increases.

Both Public Transport and Private vehicle average travel speed increases due to the removal of the speed limit and the reduction of distance and congestion after the realignment and widening.

Peak-hour travelled distance [vkm]					**Yearly travelled distance [million vkm]**	
Mode [22]	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD4**	**Do-Minimum**	**RD4**	**Do-Minimum**	**RD4**
LV	391,090	385,277	397,996	390,581	1,425	1,401
HV	47,231	46,803	24,851	24,730	124	123
LV + HV [23]	**532,782**	**525,686**	**472,547**	**464,772**	**1,796**	**1,769**

Table 25.
Measures of effectiveness: peak-hour and yearly travelled distance by all vehicles, RD4 project, 2025 (NTM; Elaboration)

[22] *Light vehicles or Private Car (LV), Heavy vehicles or Freight (HV)*
[23] *It should be noted that, when considering the whole network from a general perspective, the impact of the HVs is considered as three times the one of a LV, in order to homogenize the parameter and provide a basis for objective comparison*

Modal split

Mode	AM		PM		Yearly	
	Do-Minimum	RD4	Do-Minimum	RD4	Do-Minimum	RD4
Private Car	72.3%	71.8%	79.0%	78.1%	75.7%	75.0%
Public Transport	16.7%	17.2%	15.2%	16.0%	16.0%	16.6%
Other Modes	11.0%	11.0%	5.8%	5.9%	8.4%	8.4%

Table 26.
Key mobility Statistics: peak-hour and yearly Modal Split, RD4 project, 2025 (NTM; Elaboration)

Peak-hour travelled distance [pkm] / Yearly travelled distance [million pkm]

Mode	AM		PM		Yearly	
	Do-Minimum	RD4	Do-Minimum	RD4	Do-Minimum	RD4
Private Car	472,046	465,029	480,381	471,431	1,720	1,691
Public Transport	111,538	118,900	90,321	97,719	358	385
Total	**583,584**	**583,929**	**570,702**	**569,150**	**2,078**	**2,075**

Table 27.
Measures of effectiveness: peak-hour and yearly travelled distance by all passengers, RD4 project, 2025 (NTM; Elaboration)

Peak-hour LV and PT average speed [km/h]

Mode	AM		PM	
	Do-Minimum	RD4	Do-Minimum	RD4
Private Car	20.7	22.5	23.1	24.2
Public Transport	13.6	14.7	15.5	16.0

Table 28.
Measures of effectiveness: peak-hour average speed, RD4 project, 2025 (NTM; Elaboration)

External impacts of traffic

The removal of the bottlenecks in the road and bridge results in a reduction of lost time per passenger, which means that this measure contributes to reducing congestion. Similarly, the realignment reduces the accidents in the zone of influence of the measure by 50% for slight and grievous accidents and by 62% for fatal accidents. It should be noted that this reduction of accidents only applies to the area of the road network in the immediate vicinity of the measure. As a consequence, the reduction in total costs related to accidents on the whole network is relatively small.

The modal shift towards Public transport also helps reduce the impact of transport in air pollution and climate change. Indeed, since the travelled distance by private vehicle is lower than in the Do-Minimum scenario, the emissions are also lower. Since the area of influence of this measure is quite large, it is more effective than measure RD3 in reducing congestion costs and air pollution and climate change costs. Indeed, this scenario reduced the cost of the external impacts of transport in €64 million per year.

Annual cost of congestion

Mode	Lost time per passenger [h/year]		Cost of lost time [€m/year]		Cost of Consumption at idle [€m/year]	
	Do-Minimum	RD4	Do-Minimum	RD4	Do-Minimum	RD4
Private Car	29.1	26.0	397.1	351.3	20.3	18.0
Freight	18.9	16.3	51.1	44.1	6.3	5.4
Public Transport	36.6	33.8	105.6	101.1	0.0	0.0
Total	**29.6**	**26.6**	**553.8**	**496.5**	**26.6**	**23.4**

Table 29.
Estimation of yearly cost of congestion, RD4 project, 2025 (NTM; Elaboration)

Annual cost of accidents

Scenario	Slight accidents [accidents/ year]	Grievous accidents [accidents/ year]	Fatal accidents [accidents/ year]	Cost associated to accidents
Do-Minimum	3,009.4	375.0	15.7	111.1
RD4	2,905.5	362.1	15.1	107.2

Table 30.
Estimation of yearly cost of accidents across the whole network, RD4 project, 2025 (Various sources; Elaboration)

CO_2 Emission (tons/year)

Year	
Do-Minimum	**RD4**
342,642	337,380

Table 31.
Climate change: estimation of yearly GHG (CO_2) emissions, RD4 project, 2025 (NTM; Elaboration)

Air pollutants emissions [tons per year]

CO [tons/year]		PM [tons/year]		NOx [tons/year]		NMVOC [tons/year]	
Do-Minimum	RD4	Do-Minimum	RD4	Do-Minimum	RD4	Do-Minimum	RD4
8,234	8,095	63.7	62.8	1,236	1,219	1,410	1,386

Table 32
Estimation of yearly production of air pollutants, RD4 project, 2025 (NTM; Elaboration)

Cost of air pollution and climate change (€m/year)

Scenario	PM [€m/year]	NOx [€m/ year]	CO_2 [€m/year]	Total [€m/ year]
Do-Minimum	1.80	11.91	10.28	23.99
RD4	1.77	11.75	10.12	23.65

Table 33.
Estimation of yearly cost of air pollution, RD4 project, 2025 (NTM; Elaboration)

3.1.6.3.3
RD5: Make more efficient use of road space and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta

The main scope behind this project on the TEN-T core road network is road safety and the components are:

- Re-grading of the road to remove dangerous adverse camber;
- Installation of vehicle crash barriers between road and protected trees lining the road;
- Installation of pedestrian safety fences to prevent surface crossing at Bombes bus interchange between major bus stops and the provision of new pedestrian underpass facility at Porte des Bombes;
- Upgrading of two existing pedestrian underpass facilities on St. Anne's street to make the more pedestrian friendly and accessible;
- Improved layout of the road system on the approaches to the Portes Des Bombes monument.

As aforementioned, this project has been evaluated in terms of number of accidents only, by making some external calculations to the NTM, because the kind of improvements in this project are not possible to be modelled. The cost of this project would be approximately €3.7m.

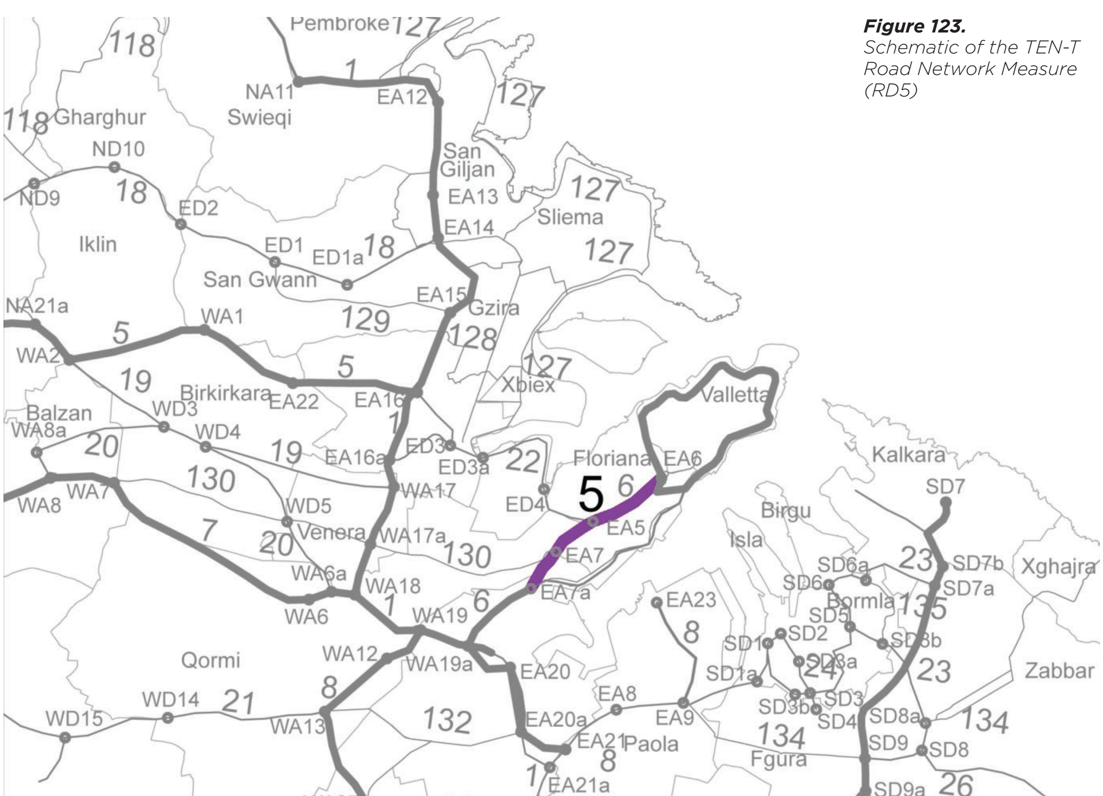


Figure 123.
Schematic of the TEN-T Road Network Measure (RD5)

This measure focuses only on the reduction in accidents which would result from the removal of the adverse camber and the safety measures (crash barriers and pedestrian safety fences). The accidents in the zone of influence of the measure will be reduced by 50% for slight and grievous accidents and 62% for fatal accidents

Annual cost of accidents

Scenario	Slight accidents [accidents/ year]	Grievous accidents [accidents/ year]	Fatal accidents [accidents/ year]	Cost associated to accidents [€m/year]
Do-Minimum	3,009.4	375.0	15.7	111.1
RD5	2,990.0	373.2	15.6	

Table 34.
Estimate of yearly cost of accidents across the whole network, RD6 project, 2025 (Various sources; Elaboration)

Figure 124.
Schematic of TEN-T Comprehensive Road Measure RD5 – Route 6 Blata l-Bajda to Valletta (1 of 2)

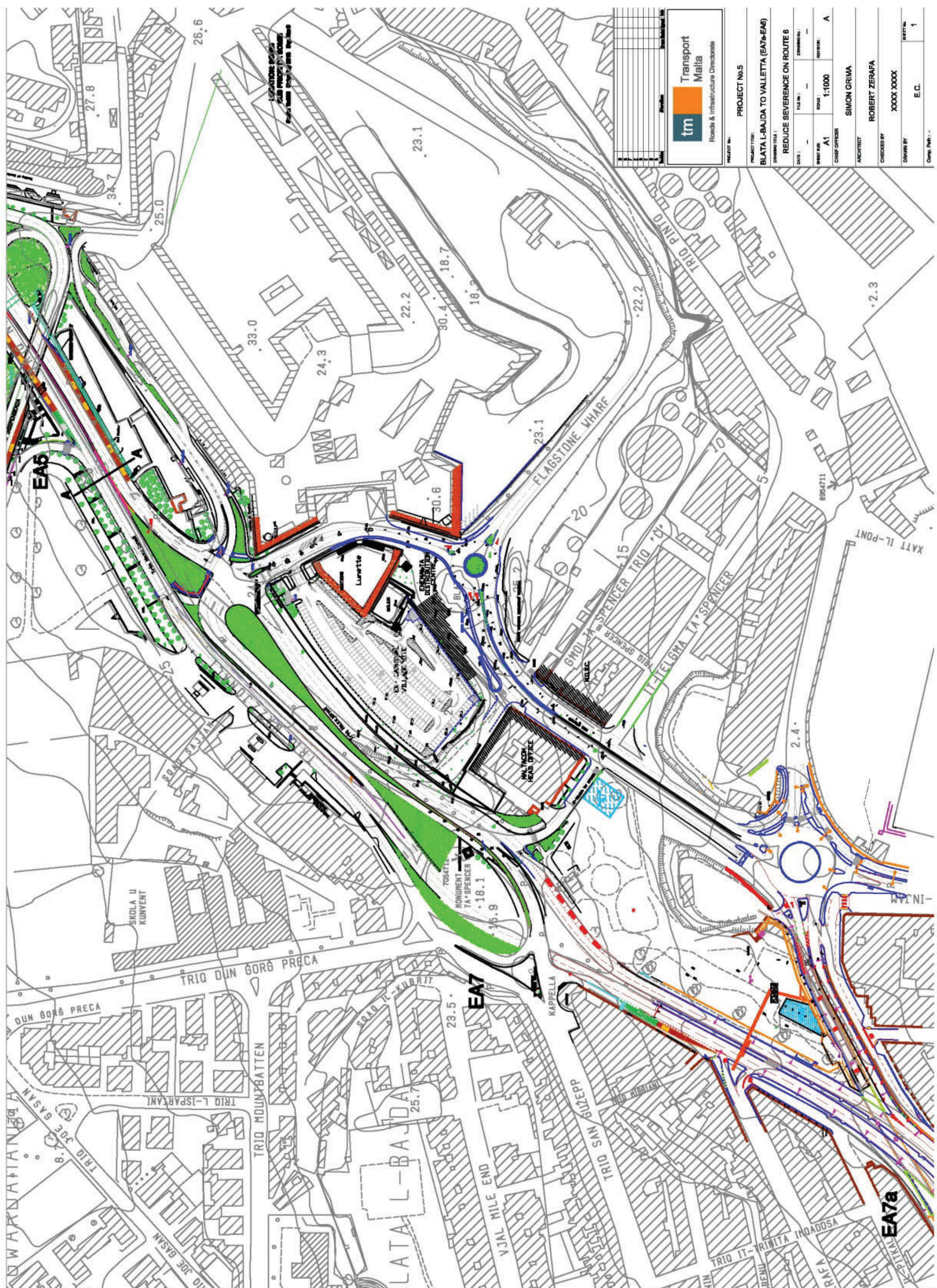
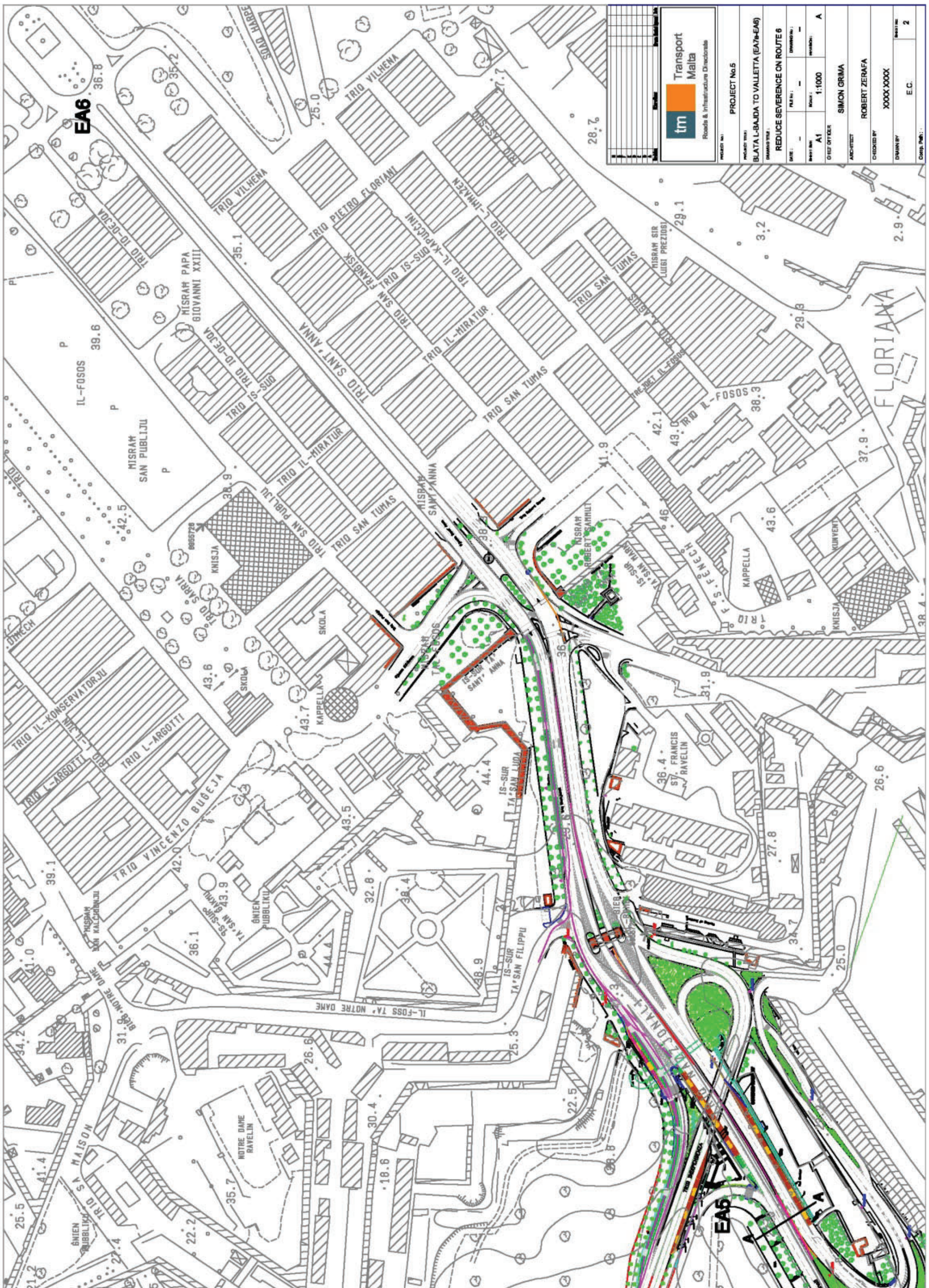


Figure 125.
Schematic of TEN-T Comprehensive Road Measure RD5 – Route 6 Blata l-Bajda to Valletta (2 of 2)



3.1.6.3.4
RD6: Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's

The project would cost in the region of €143.8m and is integral to the land use development and transport strategy plans, as set out in the draft Paceville Master Plan, which was published in September 2016 for public consultation. Under the preferred development strategy outlined in the draft Paceville Master Plan, the Paceville of St. Julian's would develop into a major residential, office and hotel hub that would be expected to attract an additional 7,500 residents and some 9,000 new employees. The infrastructure project (referred to as the Regional tunnel in the draft Paceville Master Plan) aims at splitting long-distance traffic from short-distance traffic by constructing an underpass under the existing Regional Road. Therefore, the current dual carriageway will turn into two single carriageways (one at street level and one underground).

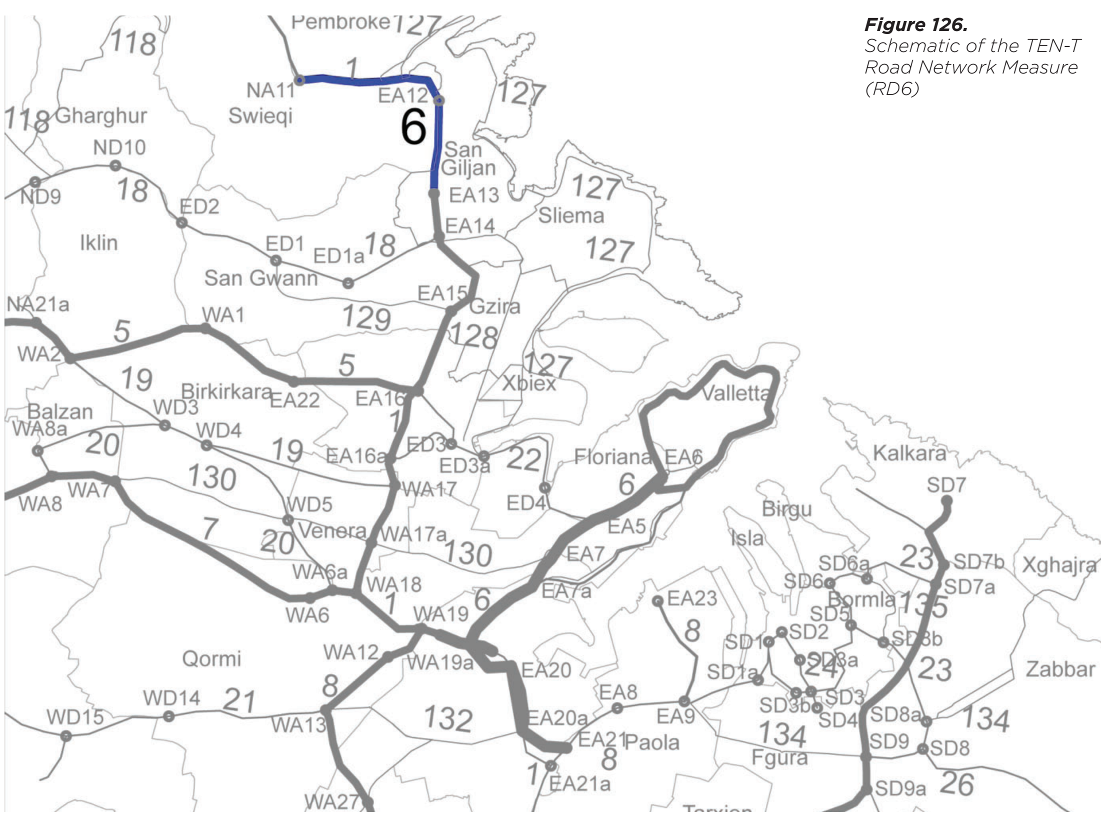


Figure 126.
Schematic of the TEN-T Road Network Measure (RD6)

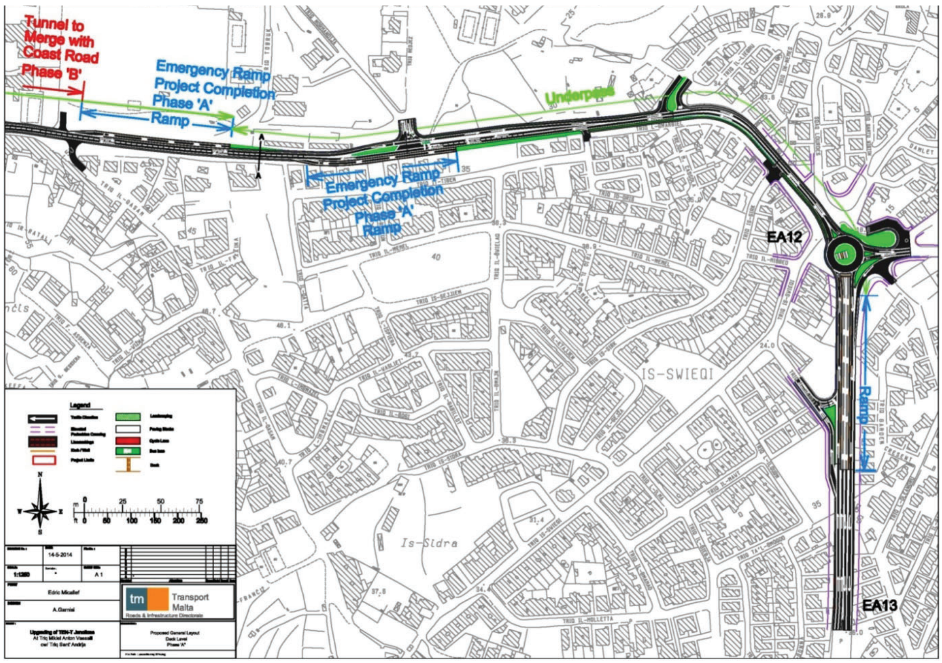


Figure 127.
Schematic of TEN-T Comprehensive Road Measure RD6 – Route 6 White Rocks Complex to Manuel Dimech Bridge, St Andrew's (Phase A)

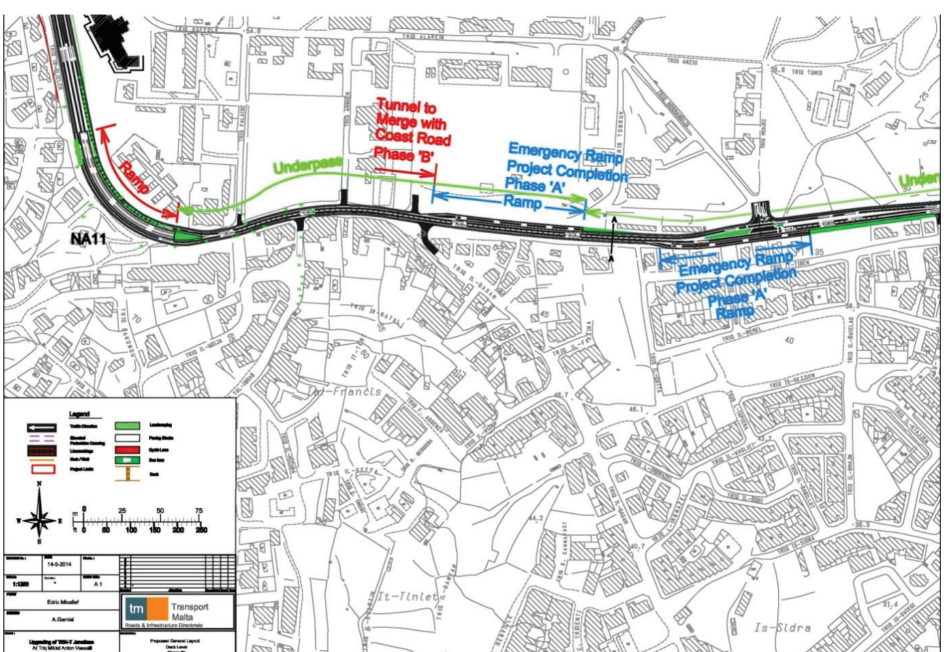


Figure 128.
Schematic of TEN-T Comprehensive Road Measure RD6 – Route 6 White Rocks Complex to Manuel Dimech Bridge, St Andrew's (Phase B)

Performance indicators[24]

This measure strongly supports the modal shift towards Public Transport. The traffic conditions improve noticeably after an urban Tunnel construction (removal of all at grade crossings); therefore, both the private vehicle and the Public Transport are benefitted from this measure. This is reflected in the average speed of travel which increases to from 20.7 to 22.9 km/h for private vehicles and from 13.6 to 15.5 km/h for Public Transport, the largest difference compared to the other road measures.

Peak-hour travelled distance [vkm]					**Yearly travelled distance [million vkm]**	
Mode [25]	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD6**	**Do-Minimum**	**RD6**	**Do-Minimum**	**RD6**
LV	391,090	386,133	397,996	383,514	1,425	1,387
HV	47,231	46,995	24,851	24,481	124	123
LV + HV [26]	**532,782**	**527,024**	**472,547**	**456,957**	**1,796**	**1,755**

Table 35.
Measures of effectiveness: peak-hour and yearly travelled distance by all vehicles, RD6 project, 2025 (NTM; Elaboration)

Modal split						
Mode	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD6**	**Do-Minimum**	**RD6**	**Do-Minimum**	**RD6**
Private Car	72.3%	71.7%	79.0%	77.7%	75.7%	74.7%
Public Transport	16.7%	17.2%	15.2%	16.4%	16.0%	16.8%
Other Modes	11.0%	11.0%	5.8%	5.9%	8.4%	8.5%

Table 36.
Key mobility Statistics: peak-hour and yearly Modal Split, RD6 project, 2025 (NTM; Elaboration)

[24] *The modelling of this individual measure does not take into consideration the traffic impact of the preferred land use development option for Paceville*
[25] *Light vehicles or Private Car (LV), Heavy vehicles or Freight (HV)*
[26] *It should be noted that, when considering the whole network from a general perspective, the impact of the HVs is considered as three times the one of a LV, in order to homogenize the parameter and provide a basis for objective comparison*

Peak-hour travelled distance [pkm]					Yearly travelled distance [million pkm]	
Mode	**AM**		**PM**		**Yearly**	
	Do-Minimum	**RD6**	**Do-Minimum**	**RD6**	**Do-Minimum**	**RD6**
Private Car	472,046	465,949	480,381	462,902	1,720	1,674
Public Transport	111,538	119,553	90,321	101,951	358	395
Total	**583,584**	**585,502**	**570,702**	**564,853**	**2,078**	**2,069**

Table 37.
Measures of effectiveness: peak-hour and yearly travelled distance by all passengers, RD6 project, 2025 (NTM; Elaboration)

Peak-hour LV and PT average speed [km/h]				
Mode	**AM**		**PM**	
	Do-Minimum	**RD6**	**Do-Minimum**	**RD6**
Private Car	20.7	22.9	23.1	26.3
Public Transport	13.6	15.5	15.5	17.6

Table 38.
Measures of effectiveness: peak-hour average speed, RD6 project, 2025 (NTM; Elaboration)

External impacts of traffic

The removal of all crossings and bottlenecks of the zone through the construction of a Tunnel results in a strong reduction of the external impacts of transport. First, congestion decreases in 5 hours less lost per year and passengers and second, slight and grievous accidents are reduced by 47% and fatal accidents are reduced by 68%. It should be noted that this reduction of accidents only applies to the area of the road network in the immediate vicinity of the measure. As a consequence, the reduction in total costs related to accidents on the whole network is relatively small.

The reduction of the congestion reduces the impact of transport in air pollution and climate change. Indeed, since the travelled distance by private vehicle is lower than in the Do-Minimum scenario, the emissions are also lower. Lower travelled distance is translated into lower emissions, and lower congestion is means that the costs related to consumption at idle and lost time are also reduced. Therefore, this measure reduces the costs of the external impacts of transport in €94 million per year.

Annual cost of congestion

Mode	Lost time per passenger [h/year]		Cost of lost time [€m/year]		Cost of Consumption at idle [€m/year]	
	Do-Minimum	RD6	Do-Minimum	RD6	Do-Minimum	RD6
Private Car	29.1	24.3	397.1	327.6	20.3	16.7
Freight	18.9	15.7	51.1	42.4	6.3	5.2
Public Transport	36.6	31.2	105.6	94.8	0.0	0.0
Total	**29.6**	**24.9**	**553.8**	**464.8**	**26.6**	**21.9**

Table 39.
Estimation of yearly cost of congestion, RD6 project, 2025 (NTM; Elaboration)

Annual cost of accidents

Scenario	Slight accidents [accidents/year]	Grievous accidents [accidents/year]	Fatal accidents [accidents/year]	Cost associated to accidents
Do-Minimum	3,009.4	375.0	15.7	111.1
RD6	2,996.5	373.3	15.6	110.5

Table 40.
Estimation of yearly cost of accidents across the whole network, RD6 project, 2025 (Various sources; Elaboration)

CO_2 Emission (tons/year)

Year	
Do-Minimum	**RD4**
342,642	344,205

Table 41.
Climate change: estimation of yearly GHG (CO_2) emissions, RD6 project, 2025 (NTM; Elaboration)

Air pollutants emissions [tons per year]

CO [tons/year]		PM [tons/year]		NOx [tons/year]		NMVOC [tons/year]	
Do-Minimum	RD6	Do-Minimum	RD6	Do-Minimum	RD6	Do-Minimum	RD6
8,234	8,018	63.7	62.4	1,236	1,210	1,410	1,373

Table 42
Estimation of yearly production of air pollutants, RD6 project, 2025 (NTM; Elaboration)

Cost of air pollution and climate change (€m/year)

Scenario	PM [€m/year]	NOx [€m/year]	CO_2 [€m/year]	Total [€m/year]
Do-Minimum	1.80	11.91	10.28	23.99
RD6	1.76	11.67	10.04	23.46

Table 43.
Estimation of yearly cost of air pollution, RD6 project, 2025 (NTM; Elaboration)

3.1.6.3.5
Economic Indicators

The results from the previous sections, as well as the shadow prices stated in the Guidance Manual for Cost Benefit Analysis (CBAs) Appraisal in Malta (May 2013), were used to estimate the costs and benefits associated with each project (RD3, RD4, RD6). A few assumptions were taken into account in order to perform the CBA:

- No inclusion of indirect effects: The guide above-mentioned states that, in general, the use of shadow pricing and the monetisation of externalities are appropriate to account for any indirect effects. In this particular study, where the size of the distortion in secondary markets is considered to be rather small and very difficult to measure, it was decided that shadow pricing was enough to measure these distortions.

- A social discount rate of 5% was used in order to calculate the ENPV and the BCR. This is the discount rate recommended by the EU guidance for CBAs carried out in cohesion countries during the programming period 2014-2020.

- Given the estimated investments, some operational and maintenance costs had to be assumed:

  - Small maintenance and operational cost: annual cost of 2% of the total investment from the beginning of the operational period to the end of the thirty-year period of evaluation,

  - Major road rehabilitation cost: 15% of the total investment 20 years after finalising the construction works.

- Linear growth in the costs (lost time, consumption at idle, air pollution and traffic accidents) from 2025 to 2050.

- All projects are completed by 2020.

Three economic indicators were calculated based on the afore-mentioned hypotheses:

- Economic net present value (ENPV);

- Economic internal rate of return (ERR); and

- Benefit-cost ratio (BCR).

The benefit-cost ratio is simply the ratio between the discounted values of economic benefits and discounted economic costs.

$$\frac{B}{C} = \frac{PV(C)}{PV(B)}$$

In the equation above, PV stands for present value and this is calculated by applying the social discount rate.

The ENPV is the sum of the discounted flows of benefits and costs. In the equation below, St represents the difference between benefits and costs in time t. As before, at represents the choice of discount rate (in this case, the social discount rate is chosen).

$$ENPV = \sum_{t=0}^{n} a_t S_t = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \dots + \frac{S_n}{(1+i)^n}$$

Finally, the EIRR can be estimated based on the ENPV. The EIRR is simply the rate of return that gives an ENPV with a value of zero.

The results shown in the next table are for the beginning of the year 2020; the Do-Minimum scenario is considered the base case. It has also been considered that all the projects are operating by the year 2020 and that they have a useful life of 30 years leaving no residual value after the year 2050.

As indicated in section 3.1.6.2 each individual project was modelled together with the RD1 and RD2 projects, so their costs are also taken into account in the CBA in Table 44 below

The results show positive outcomes for each of the scenarios individually meaning that all three projects should be carried out from a social welfare point of view. If compared between each other it can be seen that despite having the highest Economic Internal Rate of Return, RD6 has the lowest Net Present Value and Benefit to Cost ratio.

Socio-Economic Profitability

	RD3 (€m)	RD4(€m)	RD6(€m)
Socioeconomic benefits	**1,270.37**	**1,431.20**	**1,310.37**
Congestion time savings	1,155.50	1,273.48	1,228.88
Consumption at idle savings	54.70	63.40	59.88
Externalities - environmental costs savings	3.80	6.41	6.09
Externalities - accidents savings	56.38	87.92	15.51
Operation and maintenance costs	**-75.43**	**-71.42**	**-101.27**
Investments (including RD1 and RD2)	**-215.16**	**-220.38**	**-288.86**
ENPV [€m]	**979.79**	**1,139.40**	**920.24**
EIRR	**21.90%**	**24.74%**	**27.28%**
BCR	**4.37**	**4.90**	**3.36**

Table 44.
Economic indicators, RD3, RD4 and RD6 projects. (Elaboration)

The following figures show the cash flows over the analysed period for each of the projects. It can be noted that cash flows in the RD6 scenario decrease over time. According to the model results, external costs would grow faster in the RD6 scenario than in the Do-Minimum scenario, which means that the difference between both scenarios decreases with time. However, an intensification of developments expected in the Paceville zone, following the recently published draft Master Plan[27]. As a result, this situation is likely to change significantly in the future, expediting the benefits accruing to this project as demand on this part of the network increases.

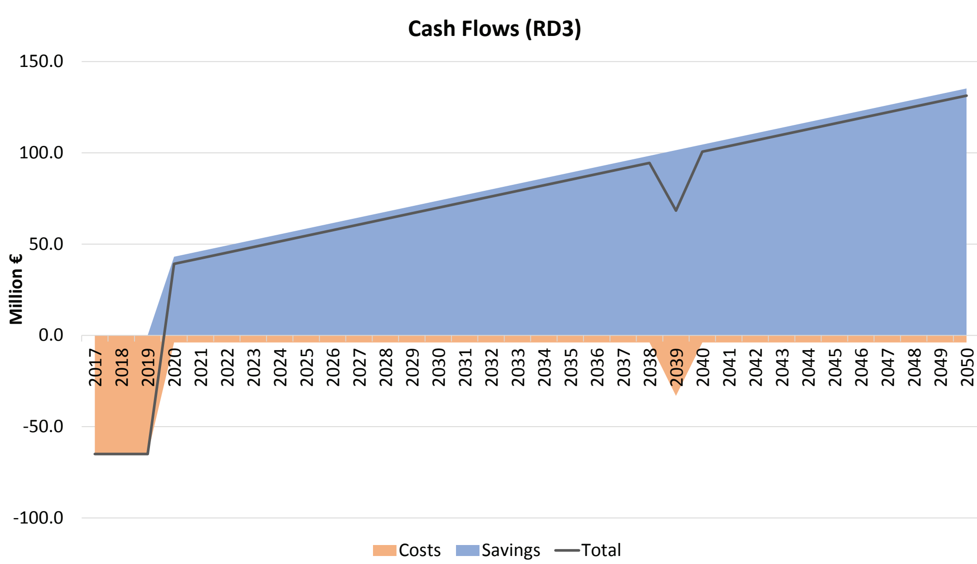


Figure 129.
Estimated Economic Cash Flows (RD3)

[27] *Paceville Master Plan http://www.pa.org.mt/pacevillemasterplan (seen September 2016)*

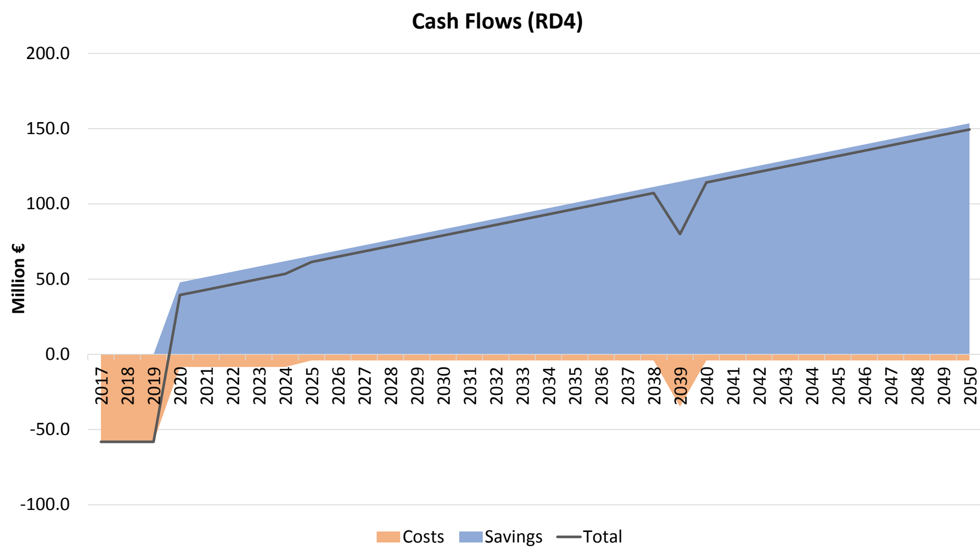


Figure 130.
Estimated Economic
Cash Flows (RD4)

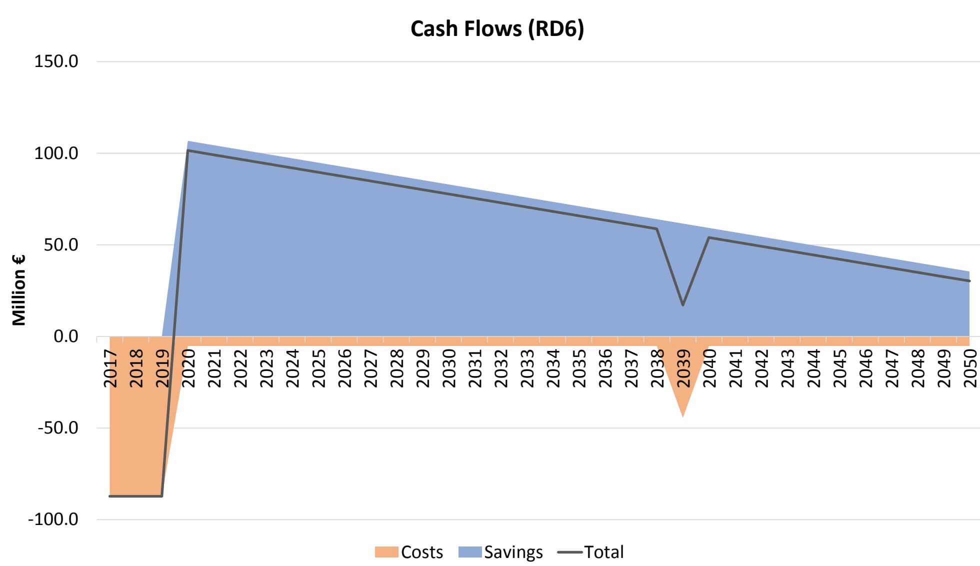


Figure 131.
Estimated Economic
Cash Flows (RD6))

03.2
IDENTIFICATION AND PRIORITISATION OF LOW CARBON TRANSPORT MEASURES

The current Partnership Agreement of Malta identifies the decarbonisation of the transport sector as a priority for 2014-2020. This agreement clearly states the Government's commitment towards creating a modal shift towards sustainable transport through further investment in public transport, promotion of internal sea transport and increasing the utilisation of green modes of travel.

Priority Axis 7 of Operational Programme I identifies the shifting towards a low-carbon transport sector through the promotion of sustainable regional and local mobility as a priority. Under this priority axis EU and national investment will focus on investment in collective public transport, multi-modal transport (including sea-landing places), green public transport and green urban space, as well as campaigns to influence behavioural patterns.

The measures identified in this section relate solely to the short term measures that have been identified in the above mentioned Partnership Agreement and Operational Programme I (2014 - 2020).

3.2.1
MULTI-MODAL TRANSPORT

3.2.1.1
Bus Service

The operation of the regular public passenger transport service for Malta and Gozo has been outsourced to the company Malta Public Transport Ltd. under a concession contract with Government. The bus operator is committed to providing a public transport service of the highest quality. In 2016, the operator has invested heavily in a number of measures aimed to improve reliability and seamless inter-connectivity.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
N/A	Introduction of nationwide bus travel card	MPT Ltd.	Complete	Private
2.4.1.2	Real time Information System for Journey Planning	MPT Ltd.	Complete	Private
2.3.1.1 (PT1 – PT7)	Public Transport Quality Corridors	Transport Malta	€7m	National

Figure 45.
Identified Projects – Multimodality (National and/or Private Funding)

Government intends to support the private investment in the public transport system, as part of a multi-modal chain by optimising the park and ride utilisation rates by creating intermodal hubs for cycling, bus and P+R facilities.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.3.2.1	Park and ride optimisation	Transport Malta	€4.6m	National / ERDF

Figure 46.
Identified Projects – Multimodality Public Transport (Possible OP I 2014-2020)

3.2.1.2
Improvement of Ferry Landing Places

Under the Public Service Concession Marsamxett Steam Ferry Services Ltd. was required to improve the quality and capacity of its cross harbour ferries. Complimentary to this investment by the private sector that was carried out in 2015, government was committed to improving the landing places for these vessels such that the vessels reduce the amount of time for docking and the turnaround time. This would result in the opportunity to increase frequency and capacity across these links.

Government is also committed to developing new landing places to enhance the capacity to other multimodal hubs within the congested central area.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.4.2.1 (IM1)	Improvement existing harbour ferry landing places	Transport Malta	€2.3m	National / ERDF
2.4.2.3 (IM3)	Assess potential and implement new ferry landing places	Transport Malta	€4.5m	National / ERDF

Figure 47.
Identified Projects – Multimodality Alternative Transport (Possible OP I 2014-2020)

3.2.1.3
Promotion of Cycling

As cycling becomes more prevalent, the development of quality cycling corridors would better allocate more space to the various road users and improve the general safety and security of cycling.

This active transport mode will contribute to certain mobility needs while creating neither air pollution nor carbon footprint.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.2.2.5	Development of Cycling Corridors	Transport Malta	€10.0m	National / ERDF
2.2.2.6	Gozo Cycle sharing scheme	Transport Malta	€3.5m	National / ERDF

Figure 48.
Identified Projects – Multimodality Active Transport (Possible OP I 2014-2020)

3.2.2
OTHER SEAPORTS

3.2.2.1
Malta-Gozo Fast Ferry Port infrastructure

Supporting the commitment to modal shift, the Government is planning for the implementation of the Fast Ferry link between Gozo and the harbour region by the development of a public service concession. Tied with this is the need to ensure a safe landing place in Malta and Gozo to ensure that passengers can dis/embark the vessels safely.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.5.4.4	Development of the of the landing places for the ferry service to/from Gozo	Transport Malta	€6.3m	National / ERDF

Figure 49.
Identified Projects – Sea Ports (Possible OP I 2014-2020)

3.2.3
CLEAN URBAN TRANSPORT AND INFRASTRUCTURE

In line with Malta's continuing mobility needs and policy to increase the modal share of public transport private bus operator Malta Public Transport Ltd., invested further in improving the environmental performance of its fleet of buses by adding 33 low emission vehicles to its fleet.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
N/A	Procurement of additional 33 Euro VI emission standard buses	MPT Ltd.	Complete	Private

Figure 50.
Identified Projects – Clean Transport (National and/or Private Funds)

Through its electro-mobility strategy, Government will augment this private investment by promotion of innovative green public transport. A demonstration project has been designed for the deployment of a fleet of electric buses to replace convention fuel buses in the island of Gozo. This project has been developed within the Eco-Gozo strategic framework.

Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.2.5.3	Gozo e-Buses	Transport Malta / MPT Ltd.	8.0	National / ERDF

Figure 51.
Identified Projects – Clean Transport (Possible OP I 2014-2020)

3.2.4
INTELLIGENT TRANSPORT SYSTEMS

Following the first round of deployment of ITS under the previous operational programme, the Government has committed to deploying further tranches of technology infrastructure in the non-TEN-T sections of the road network in Malta and Gozo. This infrastructure links with telematics application infrastructure in the TEN-T network outlined in section 3.1.3.1.2 and together these give priority to public transport and reduce traffic bottlenecks by better managing the road infrastructure across the whole network.

Figure 52.
Identified Projects – Intelligent Transport Systems (Possible OP I 2014-2020)

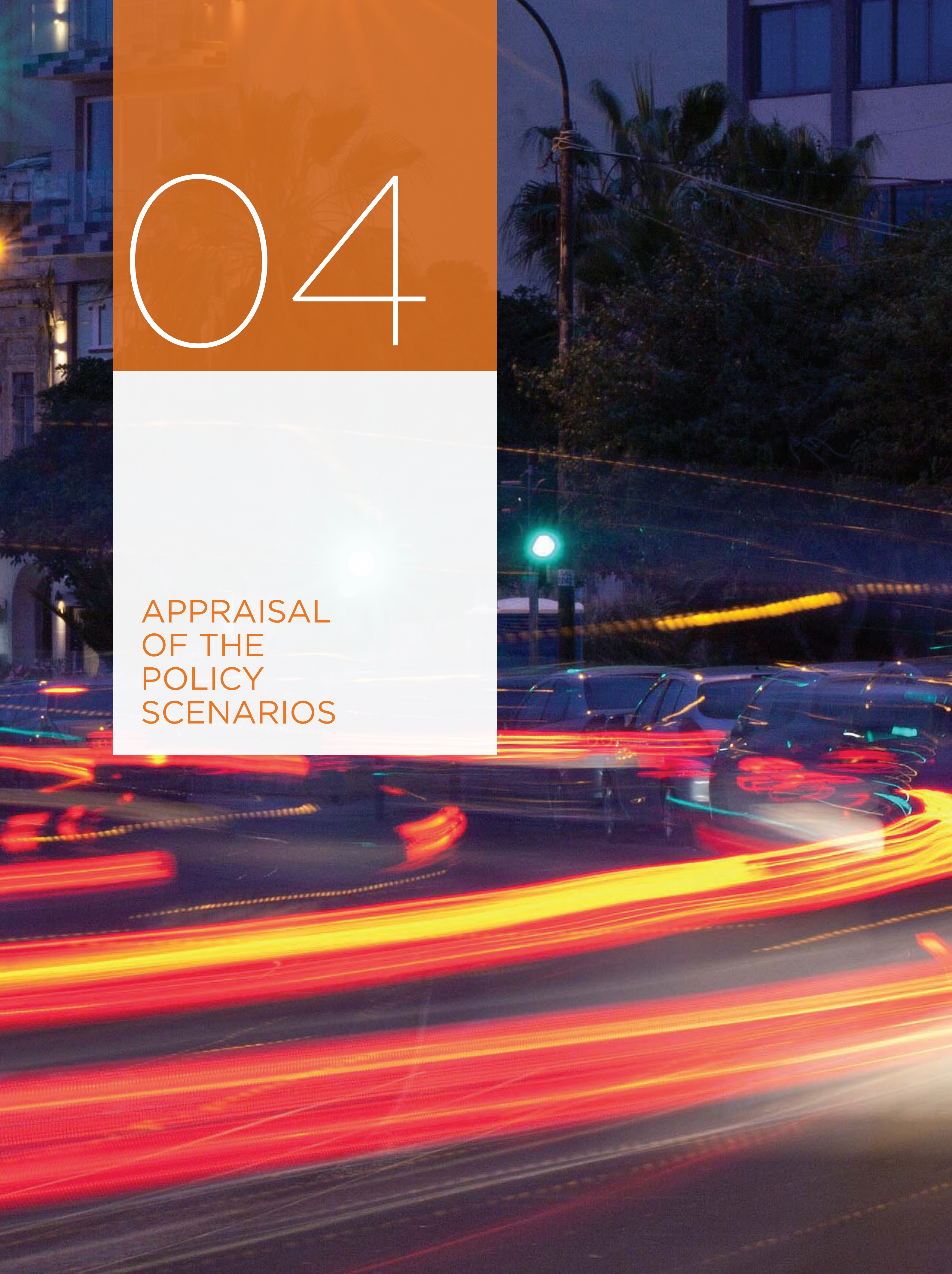
Measure	Project Implementation 2014-2020	Implementing body	Cost (€m)	Funding
2.3.4.2	Deployment of Variable Message Signs, CCTV across road network and traffic control centre	Transport Malta	2.7	National / ERDF
2.2.11.4	Micro-simulation tool to enable assessment and traffic management bottlenecks	Transport Malta	0.8	National / ERDF
2.4.1.2	Improved mobility information for users	Transport Malta	0.4	National / ERDF

03.3
OTHER TRANSPORT MEASURES IN THE TRANSPORT MASTER PLAN

Infrastructure and equipment measures listed in the previous sections are necessarily complimented by other regulatory, enforcement, planning, policy frameworks and/or research and studies. These are essential supporting measures for the development of the transport sector over the period up to 2025.

A summary of these measures are listed in Annex I – List of Supporting Documents of this document and detailed further in the *Transport Master Plan - Supporting Document 1 – List of Measures* that accompanies this document.


222
IMMUNE
Please GIVE WAY to the bus
BUS 105



04

APPRAISAL OF THE POLICY SCENARIOS

04.1
INTRODUCTION

While measures should be appraised individually in order to prioritize investments, a measure is very likely to be implemented simultaneously with other measures or once other measures have been already implemented. The combination of several measures could result in synergies between projects or, on the contrary, reveal the existence of undesirable effects.

Due to these reasons, it is necessary to define and appraise scenarios for Malta's internal transport, each one comprising the implementation of several measures (packages of measures). The National Transport Strategy 2050 sets out to achieve sustainable mobility in Malta, primarily through the deployment of travel demand 'push and pull' measures in combination with infrastructure supply measures for motorised and non-motorised modes. It is, therefore, important to clearly understand the likely impacts of the different grouped policy measures identified in the Transport Master Plan, and the extent to which they need to be implemented in order to achieve the desired strategic results. This will serve to guide decision makers as to the general policy approach which needs to be adopted.

04.2
DEFINITION OF THE SCENARIOS

This evaluation has been carried out using different scenarios of development. Besides the Do-Nothing – zero changes – and Do-Minimum – minimum expected changes and those committed developments – scenarios[28], the following scenarios have been assessed according to the interventions or package of interventions that include measures related to two different policies:

- **Do-Something 1**: Moderate restraint in the use of private cars and increased support of public transport and alternative modes;
- **Do-Something 2**: Strong restraint in the use of private cars and strong support to public transport and alternative modes

The purpose of these scenarios is to assess the combined effect of several measures on Malta's transport system.

It has not been possible to incorporate all of the Master Plan measures likely to have an impact on travel demand into the scenario testing process. The Transport modelling used for the appraisal of policy scenarios requires quite specific information about each particular measure or project, including precise location on the network and any fees for users. In many cases, the measure contained in the Master Plan is a study to better define the operational parameters. However, a good cross section of measures have been more clearly defined and have been carefully grouped together to help guide decision makers.

[28] *Transport Malta (2015), National Transport Strategy – Forecasting Report*

This chapter provides the main modelling assumptions and outputs at country level obtained from the simulation of the two aforementioned policy scenarios by using the National Transport Model (NTM) in the horizon year 2025. Both scenarios have been compared with the reference scenario (Do-Minimum) in the same year.

The results of this modelling exercise are the outputs that guide policy makers in the definition of the Transport Master Plan 2025 and its contribution towards the medium to long term targets established in the National Transport Strategy, 2050 The outputs that have been obtained are different performance indicators such as travelled distance or average speeds, cost of congestion and accidents or other environmental externalities such as GHG or air pollutants emission.

The analysis of these outputs in the different scenarios allows a complete test of the proposed measures and projects that provide guidance as to which measures and projects should be finally implemented and with which level of prioritisation.

For more information about the National Transport Model (NTM), see the Forecasting Report and Base Year Model Report.

04.3
"DO-SOMETHING 1" SCENARIO

The Do-Something 1 Scenario corresponds to a transport policy approach that is aimed at moderate restricting in the use of private cars, high provision of new or improved road infrastructure and moderate levels of support to public transport and alternative modes. From the modelling point of view, it has been implemented based on the Do-Minimum Scenario and comprises the following package of measures:

a) High level of road infrastructure provision;
b) Measures to increase average speed of public transport;
c) Measures to improve ferry services;
d) Implementation of a cycling corridor;
e) Low emission zone in the Hub;
f) Promotion of multiple occupancy.

The following paragraphs include the description and the main modelling assumptions adopted for each of the aforementioned packages of measures within the Do-Something 1 scenario package.

4.3.1
HIGH LEVEL OF ROAD INFRASTRUCTURE PROVISION

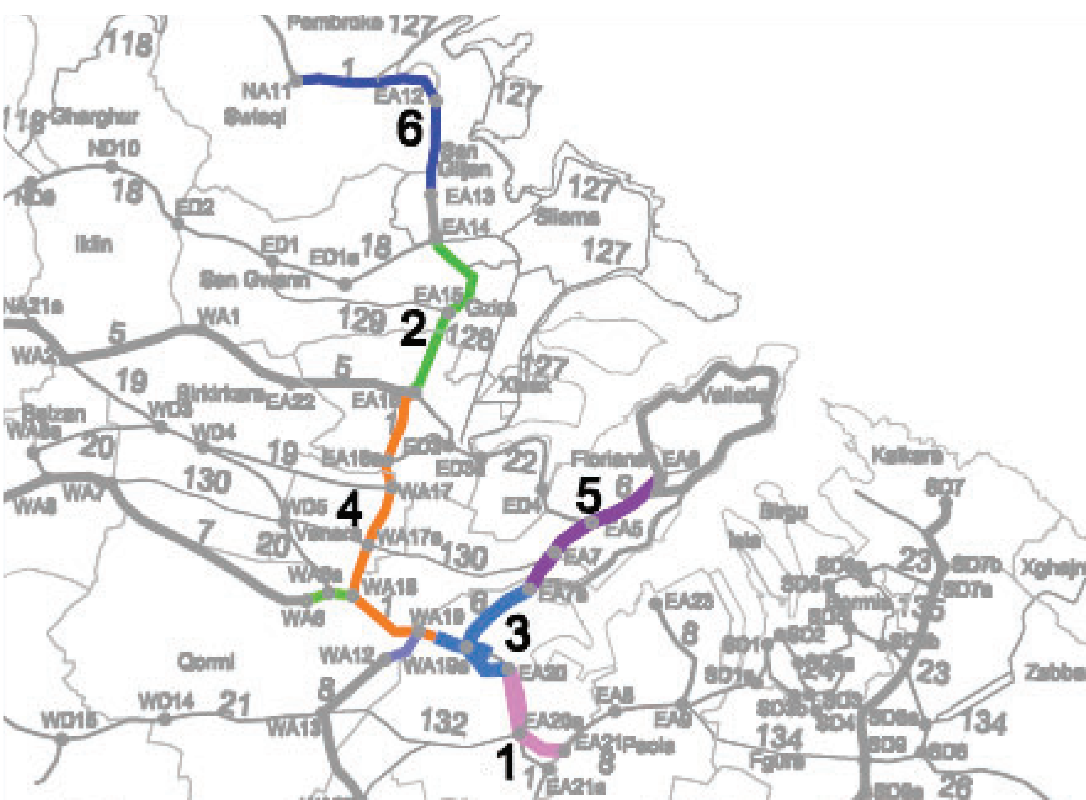
This package of undertakings corresponds to the *Measure 2.2.7.1 TEN - T Core and Comprehensive Network*, from which the six priority road projects identified in Chapter 3 have been included in the model as part of the Do-Something 1 Scenario (Figure 132):

- RD1: Remove traffic bottleneck at [nodes EA20a-EA21a] - Addolorata junction, Marsa

- RD2: Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara

- RD3: Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa
- RD4: Removal of bottlenecks, improving road infrastructure quality and reducing severance (where possible) on Regional road [Nodes EA16-WA19], Msida
- RD5: Make more efficient use of road space and reduce severance on Route 6 [Node EA7a-EA6] from Blata l-Bajda to Valletta
- RD6: Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's

Figure 132.
Location of the six Do-Something 1 TEN-T Road Projects



4.3.2
MEASURES TO INCREASE THE AVERAGE SPEED OF PUBLIC TRANSPORT

This package corresponds to the *Measure 2.3.1.1 Implement Public Transit Quality Corridors* for:

- PT1.1: Sliema – Msida – Valletta
- PT1.2: Tarxien – Fgura – Marsa – Valletta

These two corridors shown in Figure 133 were selected on the basis of having high passenger loadings and largest number of sections with poor bus speed ratios compared to traffic flow speeds. The implementation of Public Transport corridors is the key action to increase the average speed of public transport. Physical Measures along the corridors include bus lanes and other bus priority measures at pinch points (such as bus activated traffic signals) to assist buses during peak hours.

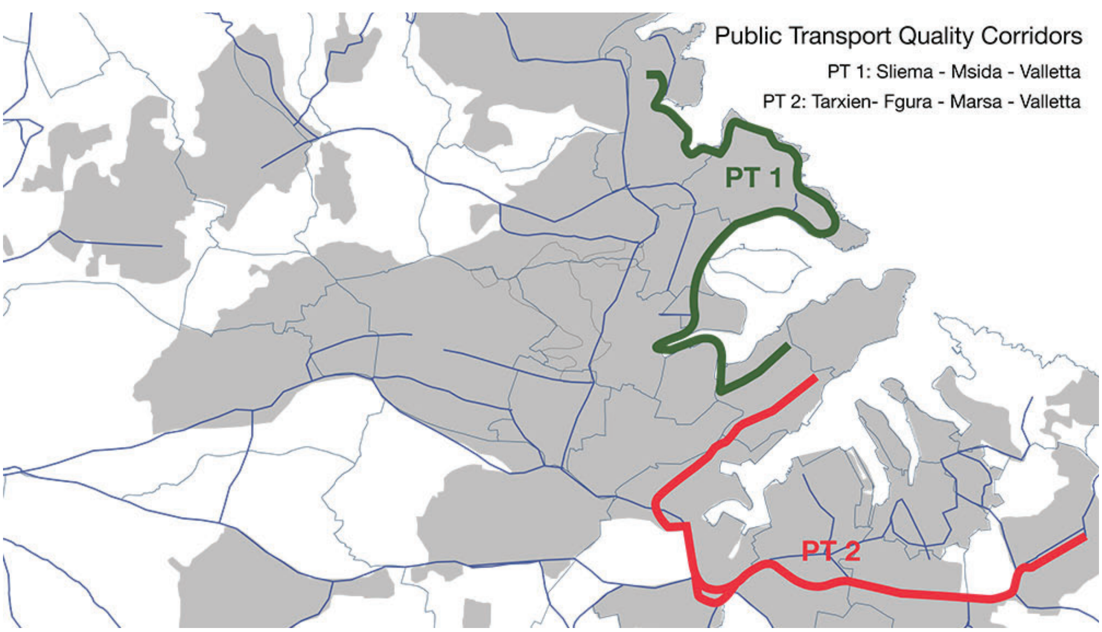


Figure 133.
Public Transport Corridors PT 1 and PT2

Additionally, a number of measures have been proposed in order to increase bus patronage. The aim of these measures is to improve reliability and reduce perceived waiting time and therefore increase bus patronage and public transport modal share.

The identification and description of these complementary measures are given below:

Journey planners

Journey planners provide information about available public transport journeys according to the origin and destination and real time conditions of the services. Journey planners use a journey planning engine to find the best route between the origin and destination of the available public transport services.   Journey planners take into consideration real time traffic conditions or other operational particularities such as breakdowns or accidents that may modify the characteristics of the specific journey. Journey planners are a tool that provides the travellers the best public transport route, reducing then the real and perceived waiting time.

Real time vehicle tracking and management systems

The real time vehicle tracking and management systems are a hardware and software solutions that allow public transport operators to keep track of vehicles' movements within the network.
The system which is currently being deployed enables public transport operators to schedule services in accordance with planned and current traffic conditions, considering current passenger journey behaviour and optimising operational efficiency.

Also, these systems help to ensure that the services run according to schedule and facilitate the operator's task of monitoring services and dealing with problems, such as delays due to traffic congestion and breakdowns.

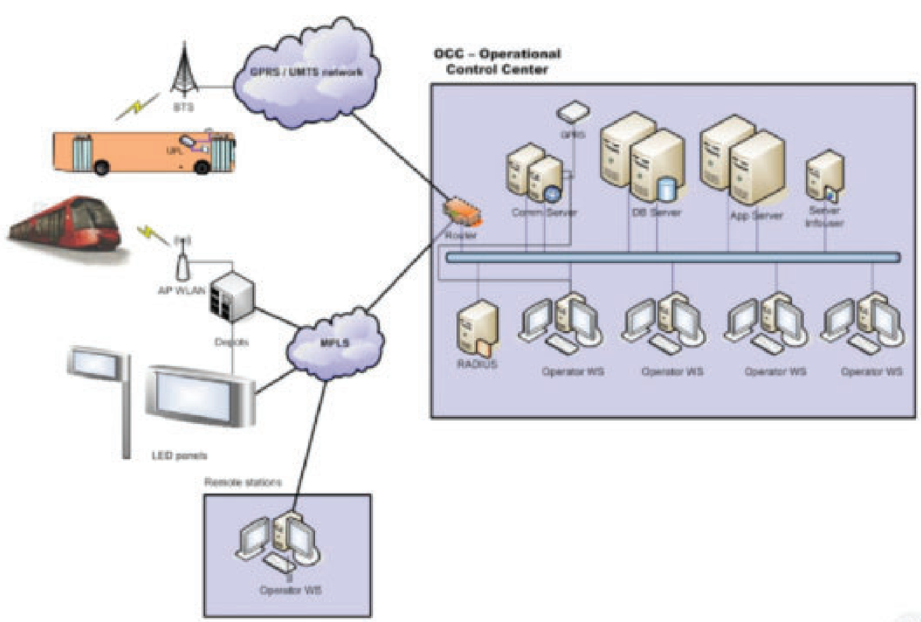


Figure 134.
Schematic of system of real time vehicle tracking and management

Improving interchange facilities

Interchange stations are a key element of the public transport network and improving the interchange facilities enhance the experience of travelling in public transport, increasing then public transport patronage.

A number of upgrades can be implemented in order to improve interchange facilities, such as:

- Improve passenger waiting areas.
- Improve the pedestrian and public transport access to interchange stations in order to reduce access and egress times.
- Improve interchange configuration to optimize transport operation and use of space.
- Implementation of new technologies to manage, operate and provide information for passengers.

All these improvements increase the average efficiency of Public Transport. For modelling purposes, we have considered that the correction factor applied to the Public Transport time with respect to private traffic time is reduced to from 45% to 20%.

4.3.3
MEASURES TO IMPROVE FERRY SERVICES

This undertaking corresponds to the *Measure 2.4.2.1. Improvement of the existing ferry landing places*.

Currently, two passengers ferry services operate in the surroundings of Valletta:

- **The Valletta (Lascaris) – Three cities** service is a ferry passenger route that links Valletta with the Three cities. The location of the boarding places in Valletta is Lascaris and in Three Cities is Bormla.

- **The Valletta – Sliema** ferry service links Marsamxett (in Valletta) to the city of Sliema.

Figure 135.
Location of ferry services

The main features of these ferry services are summarized in the following table:

Valletta (Lascaris) – Three cities (Bormla)

Concept	Brief description
Type of ferry	Around 160 passengers.
Frequency	One service (each way) every 30 minutes. According to current ferry schedule: • 26 services each way per day leave from Lascaris[29] (or Cospicua) in winter (04/10 – 31/05). • 30 services each way per day leave from Lascaris[30] (or Cospicua) in summer (01/06 – 03/10).

Valletta – Sliema

Concept	Brief description
Type of ferry	Around 160 passengers.
Frequency	One service (each way) every 30 minutes. According to current ferry schedule: • 25 services per way and day leave from Marsamxett[31] (or Sliema) in winter (04/10 – 31/05). • 31 services per way and day leave from Marsamxett[32] (or Sliema) in summer (01/06 – 03/10).

Table 53.
Ferry services features

Therefore, in order to improve the capacity of these ferry lines, this measure consists in improving the service given by the Valletta – Sliema and Valletta – Bormla passengers' ferries:

- The frequency has been improved from 1 service every 30 minutes to 1 service every 20 minutes

[29] On Sundays and Public Holidays only 19 services each way per day.
[30] On Sundays and Public Holidays only 26 services each way per day.
[31] On Sundays and Public Holidays only 19 services each way per day.
[32] On Sundays and Public Holidays only 27 services each way per day.

4.3.4
IMPLEMENTATION OF A CYCLING CORRIDOR

This undertaking corresponds to the *Measure 2.2.2.5 Develop pilot cycle corridors between Valletta and: i) St. Julian's, Sliema; ii) Three Cities and Fgura, and iii) between villages*.

Under this scenario one cycle corridor would be provided between St. Julian's, Sliema and Valletta, where the latent demand for using safe bicycle infrastructure is the highest. The cycle lane would be on the footpath or by the side of the road and, therefore, would not reduce the road capacity in the modelled road network.

FIgure 136.
Schematic of an improved allocation of the limited Road Space to create cycling corridors

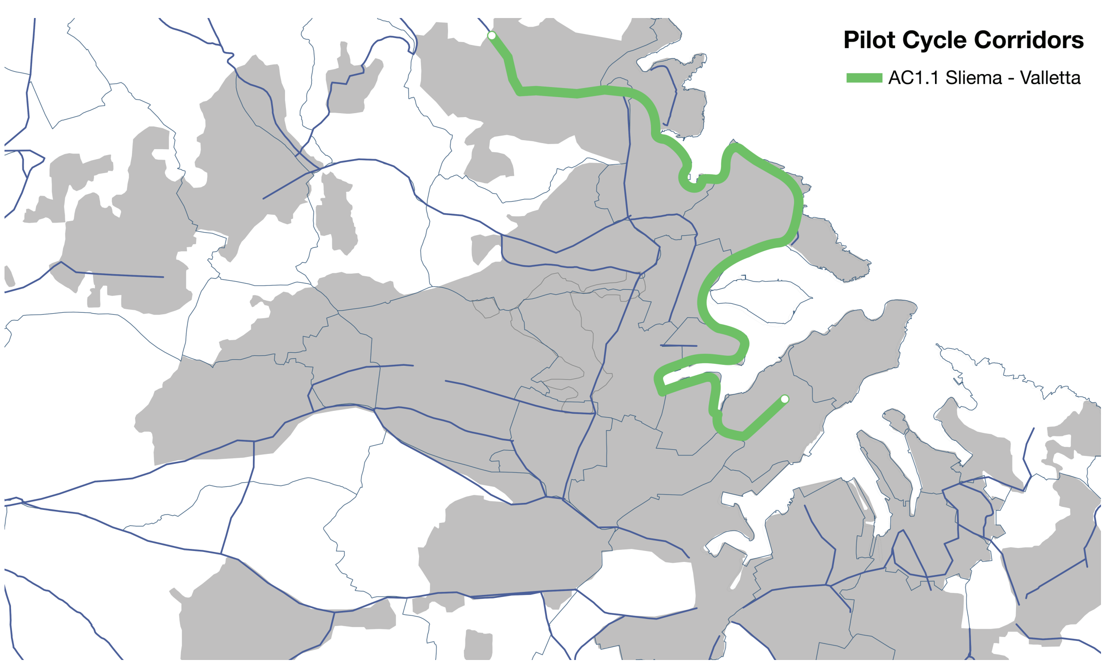


Figure 137.
Cycle Corridor 1

Cycling is not a common mode of transport in Malta (modal share of 0.3% according to 2010 NHTS). However, the comparison with other European countries shows a wide growth potential. According to the Cycling Barometer (European Cyclist Federation, 2013), cycling is the main mode of transport for 30% of the Netherlands' population; countries such as Denmark, Sweden, Germany and Finland also stand out, with more than 10% of their inhabitants using the bicycle as main mode of transport. No figure is included for Malta in the afore-mentioned study.

The study "Cycling in the Netherlands" (Ministerie van Verkeer en Waterstaat, 2009) provides bicycle shares in several European countries/cities.

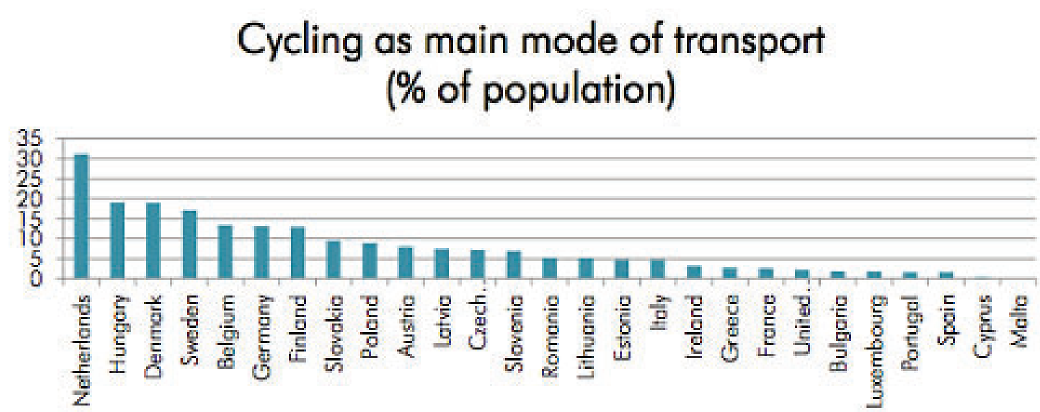


Figure 138.
% of population using the bicycle as main mode of transport. 2013

The afore-mentioned study supports the connection between bicycle use in a municipality and the quality of the cycling infrastructure. It refers to a previous study revealing that about one-third of the explanatory power of a model taking into account 44 factors possibly influencing bicycle use, lays in the group of factors denoting traffic policy; and almost 73% of the variance in bicycle use among municipalities is explained by the same group of factors. Therefore, the provision of an appropriate physical infrastructure is very likely to increase the use of this soft mode of transport in Malta. A comparison between the modal share of transport by bicycle and the density of cycle lanes per inhabitant in different European cities allows for forecasting the future share of transport by bicycle in Malta. The indicator density of cycle lanes per inhabitant was chosen because it incorporates not only the kilometres of cycle lanes, but also the city's population.

	National figures Approx (recent years)	Picture at the municipal level
The Netherlands	26%	The top municipalities score between 35% and 40%; cities with the lowest bicycle use rate between 15% and 20%
Denmark	19%	The differences among the larger cities are relatively small: in general at the level of 20% of all trips
Germany	10%	The western federal states have a higher average bicycle use, especially Nordrhein-Westfalen. Several cities with bicycle shares between 20% and 30%
Austria	9%	Top: Graz (14%) and Salzburg (19%)
Switzerland	9%	Several cities at a higher level, like Bern (15%), Basel (17%) and especially Winterthur (approx. 20%)
Belgium	8%	Many cities in Flanders approach 15%. Top: Bruges - almost 20%
Sweden	7%	Cities: 10%. Extremes: Lund and Malmö 20%. The small city of Västerås: 33%
Italy	5%	A few striking exceptions, especially in the Po Plains, with places like Parma (over 15%) and Ferrara (around 30%). Another top city: Florence (over 20%)
France	5%	Top: Strasbourg 12% and Avignon 10%
Ireland	3%	Virtually no upward extremes (Dublin 5% at most)
Czech Republic	3%	A few cities with some degree of bicycle use (Ostrava, Olomouc and Ceské Budejovice, between 5% and 10%) and some with an even higher bicycle use (Prostejov 20%)
Great Britain	2%	Some isolated cities with a much higher degree of bicycle use (York and Hull 11%, Oxford and especially Cambridge nearing 20%)

Figure 139.
Bicycle modal share in several European countries/cities. 2009

Currently there are about 25 km of cycle lanes in Malta. With the implementation of the Sliema-Valletta cycle corridor, Malta would reach around 35 km of cycle lanes, which would result in a ratio of 78 km/million inhabitants. According to the above-mentioned comparison between the share of transport by bicycle and density of cycle lanes per inhabitant, the ratio of 78 km/million inhabitants would result in a share of transport by bicycle of 2% in Malta.

4.3.5
LOW EMISSION ZONE IN THE HUB

This package corresponds to the *Measure 2.2.4.1 – Study the potential to introduce Low Emission Zones in dense and polluted urban areas.*

For demonstration purposes, this scenario examined the effect of introducing a fee to enter the most critically congested zone in Malta which would apply to all vehicles manufactured twenty years or more ago. Licensed vehicles more than 20 years old were manufactured either to Euro I emission standards or to no stated European emission standard, and therefore represent the most polluting category of vehicles in the national vehicle parc.

For modelling purposes, it has been assumed that all the private vehicles entering the Low Emission Zone pay 19% of the entry fee and all the heavy vehicles entering the Low Emission Zone pay 39% of the entry fee during the peak hours

The entry fee was set to €1.00 for modelling purposes.

Total number of vehicles in Malta (2014)

Vehicle Type	Number of vehicles
LV	265,950
HGV	45,504

Table 54.
Total number of vehicles in Malta

Number of Vehicles over 20 years old (2014)

Vehicle Type	Euro Classification	Number of vehicles	% of the total
LV	M1	49,125	19%
	M2	136	
HGV	N1	12,484	39%
	N2	3,577	
	N3	1,846	

Table 55.
Number of vehicles per age group – over 20 years old

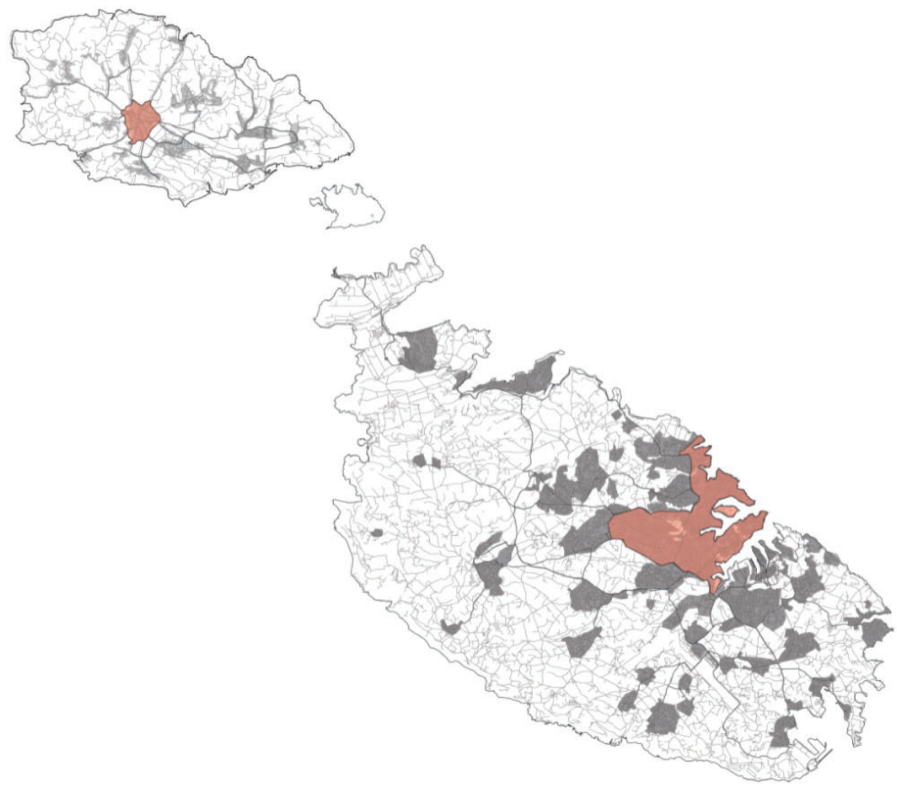


Figure 140.
Low Emission Zone

4.3.6
PROMOTION OF MULTIPLE OCCUPANCY

This package corresponds to the *Measure 2.2.2.2 Develop and incentivise schemes to promote multiple occupancy, smaller vehicles and reduce the need to travel in peak hours.*

The growth of traffic leads to higher levels of congestion, for which the construction of new transport infrastructure is often not a solution, because of financial and technical constraints and also because it tends to induce demand that generates more traffic, increasing the levels of congestion.

Among the number of measures to effectively reduce congestion is the better use of the existing infrastructure by optimizing the use of the existing infrastructure.

This can be achieved by filling the unused space or seats in vehicles. A common characteristic during peak period commuter traffic is average car occupancy rates of 1.2 passengers per vehicle, as was assumed during the development of the Base year and Do-Minimum scenarios.

Therefore, the promotion of multiple occupancy vehicles is required in order to reduce the levels of congestion. A general assumption in the model is that car occupancy increases from 1.207 (Base year and Do-Minimum scenarios) to 1.30 pax/veh.

A number of policies can be implemented in order to promote the increase in car occupancy being the two most relevant carpooling and high-occupancy vehicle (HOV) lane for which is a description is given below:

Carpooling

Carpooling is the sharing by different people of car journeys so that more than one person travels in a car, increasing car occupancy.

Drivers and passengers need to find a match to travel together and after finding this match they contact each other to arrange any details for the journey. Contacting and matching of drivers and passengers is a critical phase of the system and can be made through different systems, such as public or private websites, specific carpooling software, carpooling agencies, pick-up points or different applications available on smart phones and social networks.

In order to guarantee the success of carpooling schemes, the following issues should be addressed when implementing these policies:

- Public funding may be required to implement a matching tool that connects drivers and passengers.
- Appropriate incentives should be given to carpooling users such as HOV, subsidies, free parking, etc.
- Marketing campaigns to inform potential users about convenience, cost savings and create the largest as possible pool of users.
- The system should be flexible to accommodate different driver and passengers' travel patterns.
- It should be reliable mode of transport.
- It should be secure and safe, since potential users usually show great concerns over security.

Carpooling has the following benefits:

- Carpooling reduces each person's travel costs such as fuel costs, tolls, and the stress of driving.
- Carpooling is more environmentally friendly and sustainable way to travel since it reduces carbon emissions, traffic congestion, and the need for parking spaces.

High-occupancy vehicle (HOV) lanes

High-occupancy vehicle lane is a restricted traffic lane reserved at specific periods of time for the exclusive use of vehicles with a driver and one or more passengers, including other public transport vehicles.

HOV lanes are intended to optimize the use of infrastructure with more persons per car and per lane and save time for users by enabling them to bypass the areas of heaviest traffic congestion. Since car occupancy is usually low, especially during peak hours, the HOV lane is seldom congested. Giving HOV users a reliable and congestion-free ride during peak hour serves as a strong incentive for ridesharing HOV lanes also provide commuters a needed alternative to congestion.

HOV lanes show the following benefits:

- To ease congestion in heavily used roads by allowing vehicles with multiple occupants to use the HOV lane.
- To defer road expansion projects and the optimized use of road infrastructure.
- To reduce the extent of exhaust emissions and contribute to cleaner air.

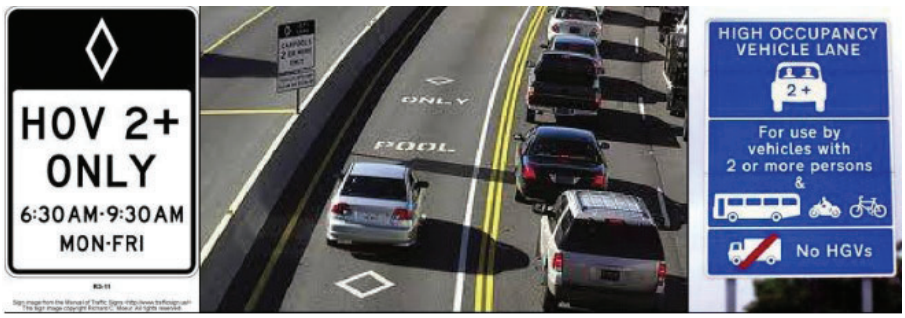


Figure 141.
High Occupancy Vehicle Lanes and signage

04.4
"DO-SOMETHING 2" SCENARIO

The Do-Something 2 Scenario corresponds to the transport policy approach that is aimed at a strong restriction in the use of private cars, moderate levels of road infrastructure provision and strong support of public transport and alternative modes. From the modelling point of view, it has been implemented based on the Do-Minimum scenario and comprises the following groups of measures and their sub measures:

a) Moderate level of road infrastructure provision;
b) Measures to increase average speed of public transport;
c) Measures to improve ferry services;
d) Implementation of two cycling corridors;
e) Low emission zone in the Hub;
f) Promotion of multiple occupancy;
g) Fast ferry between Malta and Gozo;
h) Freight ferry daily service between Malta and Gozo.

The following paragraphs include the description and the main modelling assumptions adopted for each of the aforementioned package of measures within the Do-Something 2 Scenario.

4.4.1
MODERATE LEVEL OF ROAD INFRASTRUCTURE PROVISION

This group of measures corresponds to the *Measure 2.2.7.1 TEN - T Core and Comprehensive Network*, from which only the four priority road projects have been included in the model as part of the Do-Something 2 Scenario:

- RD1: Remove traffic bottleneck at [nodes EA20a-EA21a] - Addolorata junction, Marsa
- RD2: Removal of bottleneck and upgrade of regional road between EA14 and EA16 (Kappara junction), Kappara
- RD3: Remove traffic bottleneck and reduce severance between urban communities [Nodes EA20a-EA7a] -December 13th Road, Marsa
- RD6: Removing bottleneck and reduce severance between communities at Regional Road (Nodes NA11-EA13] - White Rocks Complex to Manuel Dimech Bridge, St Andrew's

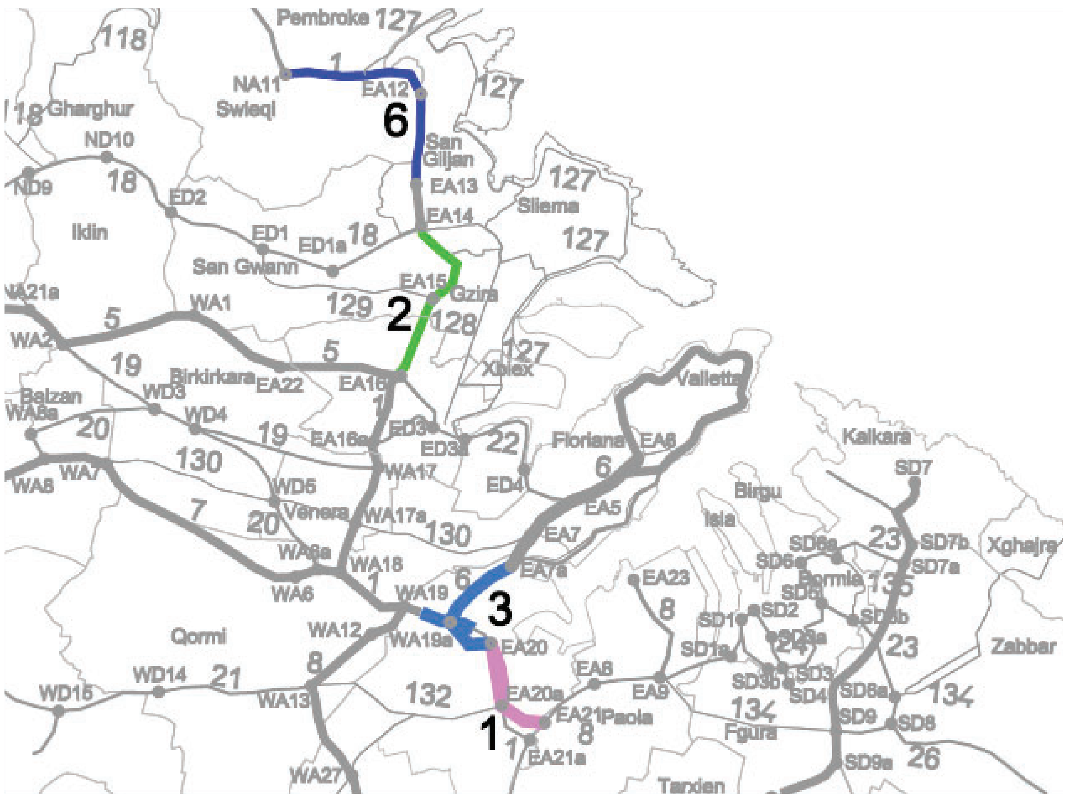


Figure 142.
Location of the four Do-Something 2 TEN-T Road Projects

Road projects RD3, RD4 and RD6 all perform well from an economic point of view, with RD4 exhibiting a more significant rate of return. However, for this scenario RD3 and RD6 were specifically selected from the six shortlisted TEN-T roads projects on the basis of their relatively strong performance in the Multi-Criteria Analysis where the highest scores were awarded to these projects in relation improvement to bus service reliability and efficiency, as well environmental and social criteria.

These two projects are both located on busy bus corridors and the modelled assessment has demonstrated significant potential for reducing the congestion which would give rise to increased bus travel speeds and improved bus service reliability. Unlike road project RD4, RD3 and RD6 are located within busy urban areas and have been specifically designed to address permeability for cycling and walking. These are difficult to model, but nonetheless would lead to increased usage of these alternative modes.

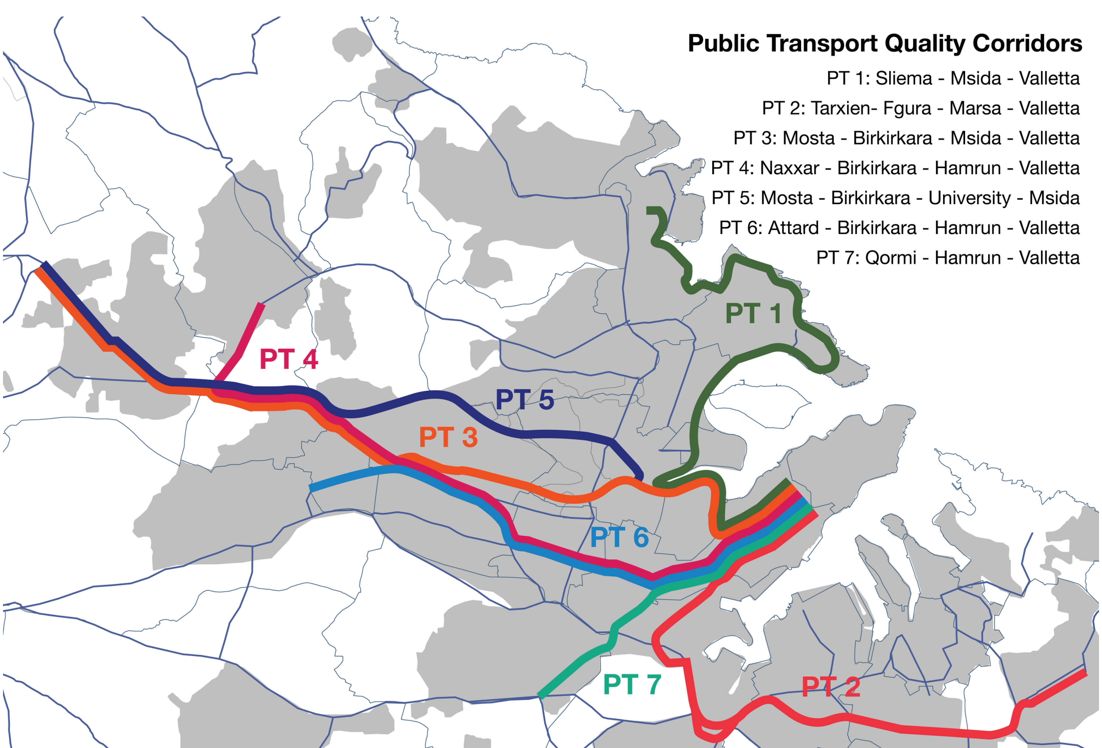
4.4.2
MEASURES TO INCREASE THE AVERAGE SPEED OF PUBLIC TRANSPORT

This group of measures corresponds to the *Measure 2.3.1.1 Implement Public Transit Quality Corridors* for:

- PT1.1: Sliema – Msida – Valletta
- PT1.2: Tarxien – Fgura – Marsa – Valletta
- PT1.3: Mosta – Birkirkara – Hamrun – Valletta
- PT1.4: Naxxar – Birkirkara – Hamrun – Valletta
- PT1.5: Mosta - Birkirkara –University – Msida
- PT1.6: Attard – Birkirkara – Hamrun – Valletta
- PT1.7: Qormi – Hamrun – Valletta

Five additional bus corridors have been added to the two corridors identified in the Do-Something 1 scenario in order to provide a stronger level of support towards promoting public transport. For modelling purposes, the correction factor applied to the Public Transport time with respect to private traffic time is reduced to from 45% to 10% in bus lanes and 30% in the rest of the network.

Figure 143.
Public Transport corridors PT 1 to PT7



4.4.3
MEASURES TO IMPROVE FERRY SERVICES

This undertaking corresponds to the *Measure 2.4.2.1. Improvement of the existing ferry landing places*.

Currently, two passengers ferry services operate in the surroundings of Valletta:

- **The Valletta (Lascaris) – Three cities** service is a ferry passenger route that links Valletta with the Three cities. The location of the boarding places in Valletta is Lascaris and in Three Cities is Bormla.

- **The Valletta – Sliema** ferry service links Marsamxett (in Valletta) to the city of Sliema.

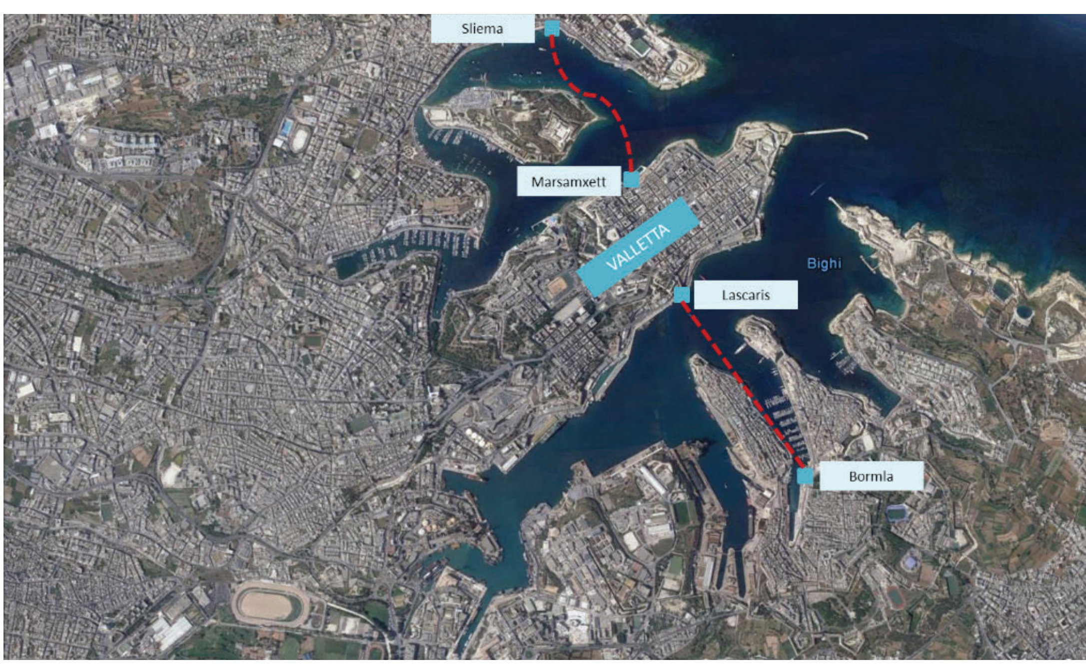


Figure 144.
Location of ferry services

The main features of these ferry services are summarized in the following table:

Valletta (Lascaris) – Three cities (Bormla)

Concept	Brief description
Type of ferry	Around 160 passengers.
Frequency	One service (each way) every 30 minutes. According to current ferry schedule: • 26 services each way per day leave from Lascaris[33] (or Cospicua) in winter (04/10 – 31/05). • 30 services each way per day leave from Lascaris[34] (or Cospicua) in summer (01/06 – 03/10).

Valletta – Sliema

Concept	Brief description
Type of ferry	Around 160 passengers.
Frequency	One service (each way) every 30 minutes. According to current ferry schedule: • 25 services per way and day leave from Marsamxett[35] (or Sliema) in winter (04/10 – 31/05). • 31 services per way and day leave from Marsamxett[36] (or Sliema) in summer (01/06 – 03/10).

Table 56.
Ferry services features

Therefore, in order to improve the capacity of these ferry lines, this measure consists in improving the service given by the Valletta – Sliema and Valletta – Bormla passengers' ferries

- The frequency has been improved from 1 service every 30 minutes to 1 service every 15 minutes

[33] *On Sundays and Public Holidays only 19 services each way per day.*
[34] *On Sundays and Public Holidays only 26 services each way per day.*
[35] *On Sundays and Public Holidays only 19 services each way per day*
[36] *On Sundays and Public Holidays only 27 services each way per day.*

4.4.4
IMPLEMENTATION OF A CYCLING CORRIDOR

This undertaking corresponds to the *Measure 2.2.2.5 Develop pilot cycle corridors between Valletta and: i) St. Julian's, Sliema; ii) Three Cities and Fgura, and iii) between villages*.

Under the Do-Something 2 Scenario, two cycle corridors would be introduced (St. Julian's-Sliema-Valletta and the Three Cities-Fgura- Valletta) to reflect the stronger level of support for alternative modes when compared with the Do-Something 1 Scenario. The cycle lanes would be located either on the footpaths or by the side of the road and therefore would not reduce road capacity in the modelled road network.

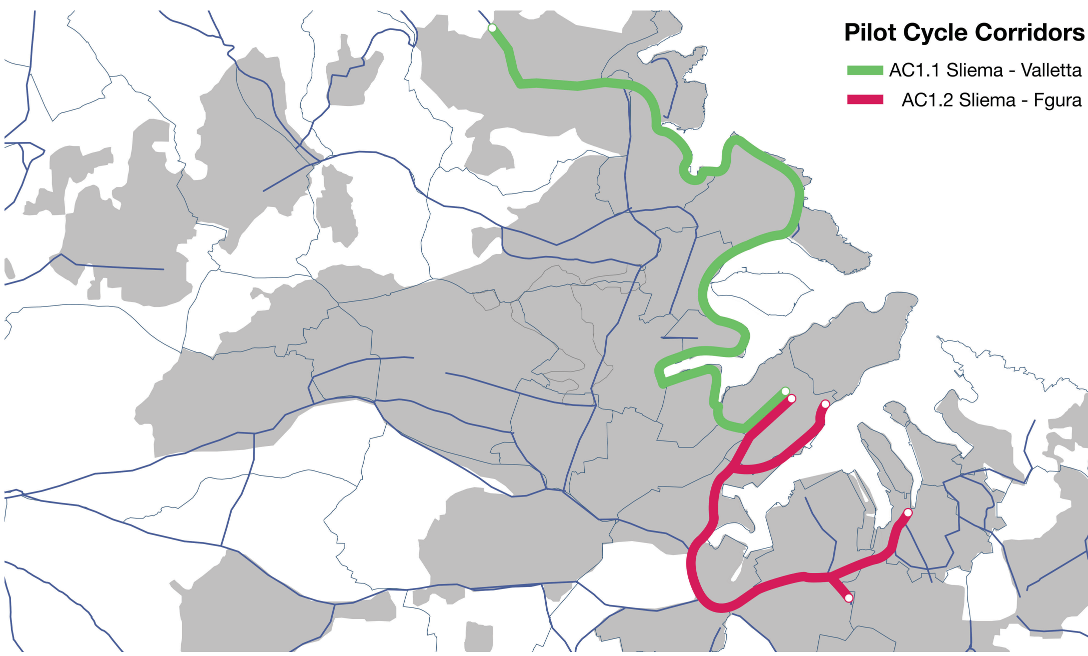


Figure 145.
Cycle Corridors 1 & 2

Currently there are about 25 km of cycle lanes in Malta. With the implementation of the Sliema-Valletta and Fgura-Valletta cycle corridors, Malta would reach around 42 km of cycle lanes, which would result in a ratio of 93 km/million inhabitants. According to the above-mentioned comparison between the share of transport by bicycle and density of cycle lanes per inhabitant (Figure 139), the ratio of 93 km/million inhabitants would result in a share of transport by bicycle of 3% in Malta.

4.4.5
LOW EMISSION ZONE IN THE HUB

This package corresponds to the *Measure 2.2.4.1 – Study the potential to introduce low emission zones in dense and polluted urban areas*.

For demonstration purposes, the Do-Something 2 scenario examined the effect of introducing a fee to enter the most critically congested zone in Malta which would apply to all vehicles manufactured fifteen years or more ago. Licensed vehicles more than 15 years old were manufactured to Euro I, Euro 2 emission standards or to no European emission standard. Vehicles manufactured fifteen years or more ago would have to pay a €1.00 fee to enter this zone during the critical peak hours.

For modelling purposes, it has been assumed that all the private vehicles entering the Low emission zone would pay 40% of the access fee and all the heavy vehicles entering the Low emission zone would pay 64% of the access fee.

Total number of vehicles in Malta (2014)

Vehicle Type	Number of vehicles
LV	265,950
HGV	45,504

Table 57.
Total number of vehicles in Malta

 # Vehicles over 15 years old

Vehicle Type	Euro Classification	Number of vehicles	% of the total
LV	M1	105,737	40%
	M2	349	
HGV	N1	20,352	60%
	N2	6,358	
	N3	2,341	

Table 58.
Number of vehicles per age group – over 20 years old

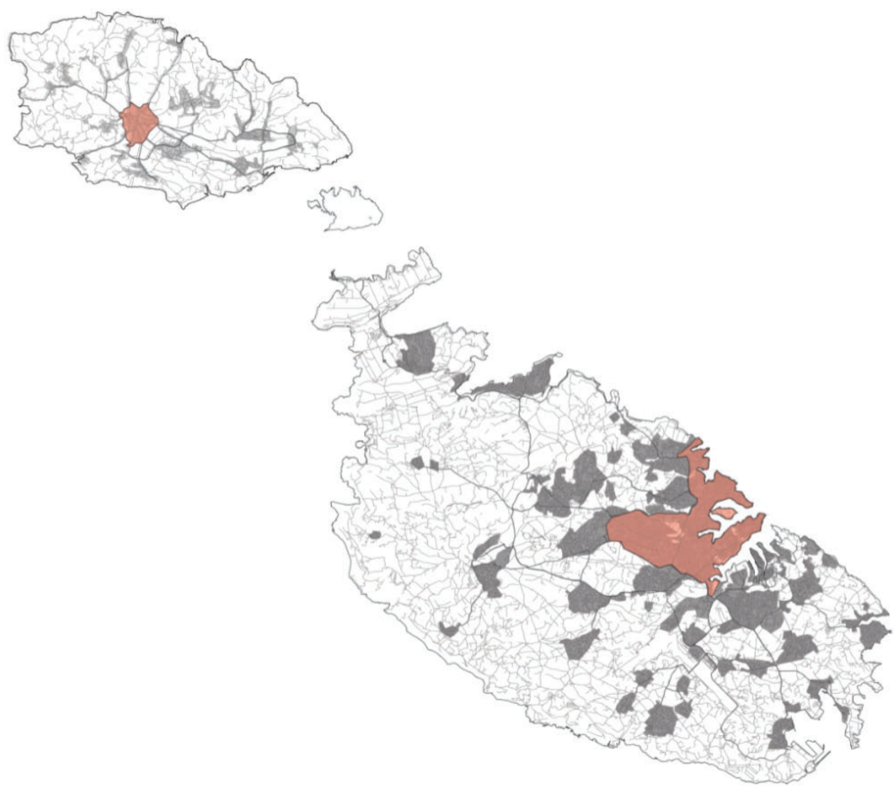


Figure 146.
Low Emission Zone

4.4.6
PROMOTION OF MULTIPLE OCCUPANCY

This package corresponds to the *Measure 2.2.2.2 Develop and incentivise schemes to promote multiple occupancy, smaller vehicles and reduce the need to travel in peak hours.*

The growth of traffic leads to higher levels of congestion, for which the construction of new transport infrastructure is often not a solution, because of financial and technical constraints and because it induces demand that generates more traffic and increases then the levels of congestion.

Among the number of measures to effectively reduce congestion is the better use of the existing infrastructure by optimizing the use of the existing infrastructure.

This can be achieved by filling the unused space or seats in vehicles. A common characteristic during peak period commuter traffic is average car occupancy rates of 1.2 passengers per vehicle, as was assumed during the development of the Base year and Do-Minimum scenarios.

Therefore, the promotion of multiple occupancy is required in order to reduce the levels of congestion. A general assumption in the model is that car occupancy increases from 1.207 (Base year and Do-Minimum Scenarios) to 1.40 pax/veh which would result from a stronger level of support for alternative travel during peak hours when compared with Do-Something 2 scenario.

4.4.7
INTRODUCE ELECTRIC BUSES IN GOZO

The introduction of e-Buses in Gozo to replace 12 of the public transport fleet of 33 buses corresponds to the *Measure 2.2.5.3 Introduction of electric Buses in Gozo.*

The introduction of electric buses in Gozo would eliminate all the pollutants emissions and carbon emissions due to Public transport in Gozo.

In order to estimate the emissions spared, we have calculated the distance travelled by all the buses in Gozo, and then calculated the changes in air pollution and climate change due to the introduction of electric buses.

The following tables summarise the consequences of replacing the current Gozo bus fleet, by an electric bus fleet:

Pollutants emissions [tons] and CO_2 emissions [tons] spared

Scenario	CO [tons/year]	PM [tons/year]	NOx [tons/year]	NMVOC [tons/year]	CO_2 [tons/year]
DS2 with electric buses in Gozo	1.1	0.1	5.1	0.3	475.8

Table 59.
Pollutants emissions and CO_2 emissions spared by the introduction of electric buses in Gozo

Savings in air pollution and climate change (€)

Scenario	PM [€/year]	NOx [€/year]	CO_2 [€/year]	Total [€/year]
DS2 with electric buses in Gozo	4,017	48,747	14,275	67,039

Table 60.
Savings in air pollution and climate change due to the introduction of electric buses in Gozo

Pollutants emissions [tons] and CO_2 emissions [tons] spared

Scenario	CO [tons/year]	PM [tons/year]	NOx [tons/year]	NMVOC [tons/year]	CO_2 [tons/year]
DS2 without electric buses	6,648	55	1,056	1,139	284,736
DS2 with electric buses	6,647	55	1,051	1,139	284,260
% of emissions reduction	0.02%	0.26%	0.48%	0.03%	0.17%

Table 61.
Comparison of the emissions between the scenarios with and without electric buses

Cost of air pollution and climate change (€)

Scenario	PM [€/year]	NOx [€/year]	CO_2 [€/year]	Total [€/year]
DS2 without electric buses	1.55	10.18	8.54	20.28
DS2 with electric buses	1.55	10.13	8.53	20.21
% of cost reduction	0.26%	0.48%	0.17%	0.33%

Table 62.
Comparison of the costs due to climate change and air pollution between the scenarios with and without electric buses

4.4.8
FAST FERRY BETWEEN MALTA AND GOZO

This package corresponds to the *Measures 2.5.4.4 Determine the location of the landing place for the ferry service (including freight high speed ferry) to/from Gozo* and *2.5.4.5 Re-introduction of an express passenger ferry link between Malta and Gozo*.

The objective of re-introducing a fast passenger ferry link between Malta and Gozo would be to provide a new connection between the two islands. Therefore, the **potential demand**[37] of this ferry is **all the passengers currently travelling between Gozo and Malta.**

Since this link does not currently exist currently, there is no demand having an origin (or destination) in Gozo and a destination (or origin) in Malta.

Therefore, with the implementation of this new link, there would be an induced demand effect. With these hypotheses, the potential demand is 300 passengers in the AM peak-hour. A specific demand model based on Stated Preference Surveys and Revealed Preference Surveys should be carried out in order to estimate the share of the fast ferry link in this potential demand.

On the other hand, introducing a **Freight ferry link** between Gozo and Valletta could have a positive impact on the congestion and the environment. The vessel that would operate the link has a capacity for 36 Medium/Heavy Goods Vehicles and would travel once a day (per direction). Annually, this would take approximately 23,000 HGV out of the roads, which would be translated into the following spared emissions:

[37] *The potential demand is the scope of the traffic that could be captured by the new facility In-scope traffic is the traffic that might be attracted to the project. [...] For public transport links, it represents an initial judgement on the traffic that could be captured both from other competing public transport services and potentially attracted from other modes under the most favourable circumstances. Modelling transport, Juan de Dios Ortúzar, Luis G. Willumsen.*

Pollutants emissions [kg] and CO_2 emissions saved [kg]

CO [kg/year]	PM [kg/year]	NOx [kg/year]	NMVOC [kg/year]	CO_2 [kg/year]
3.1	34.0	4.2	6,681.6	3.8

Table 63.
Pollutants emissions and CO_2 emissions spared by a Freight ferry link between Malta and Gozo

Cost of air pollution and climate change (€)

PM [€/year]	NOx [€/year]	CO_2 [€/year]	Total [€/year]
959,716	40,018	113	999,846

Table 64.
Savings in air pollution and climate change due to the introduction of a daily Freight ferry link between Malta and Gozo

04.5 OUTPUTS AND RESULTS OF MODELLING POLICY SCENARIOS

The following paragraphs summarise the main performance indicators and external impacts of traffic (cost of congestion, cost of accidents and environmental externalities) across the whole network, obtained from the simulation of the two Do-Something scenarios, in comparison with the reference scenario (Do-Minimum).

4.5.1 PERFORMANCE INDICATORS

The next table contains the travelled distance as an indicator of private traffic performance, which represents the total distance travelled by all the vehicles across the whole network. It is calculated as the product of the number of vehicles driving on each link and the length of the link (the indicator unit is vkm).

Considering the peak hour factors derived from the NHTS 2010[38] (11.1% for the AM peak hour and 7.6% for the PM one), it was possible to calculate the daily network indicators. From the Automatic Traffic Counts information, it was possible calculate the average weekly indicators on the basis of the daily profiles. The average yearly information was calculated by using monthly traffic profiles.

The following table shows the Measure of Effectiveness for the general point of view and also divided by vehicle category passenger vehicles (as represented by the abbreviation LV) or Freight Carrying Vehicles (as represented by the abbreviation HV). It should be noted that, when considering the whole network from a general perspective, the impact of the HVs is considered as three times the one of a LV, in order to homogenize the parameter and provide a basis for objective comparison.

[38] *National Household Travel Survey, 2010 (Transport Malta, Ministry for Infrastructure, Transport and Communications)*

	Peak-hour travelled distance [vkm]						Yearly travelled distance [million vkm]		
Mode[39]	**AM**			**PM**			**Yearly**		
	Do min	**DS 1**	**DS 2**	**Do min**	**DS 1**	**DS 2**	**Do min**	**DS 1**	**DS 2**
LV	391,090	347,693	310,159	397,996	362,986	322,803	1,425	1,286	1,145
HV	47,231	47,118	46,844	24,851	25,458	24,702	124	125	123
LV+HV	**532,782**	**489,048**	**450,692**	**472,547**	**439,360**	**396,911**	**1,796**	**1,660**	**1,513**

Table 65.
Measures of effectiveness: peak-hour and yearly travelled distance by all vehicles, 2025 (NTM; Elaboration)

The next figures show the **Traffic flow maps** for each scenario in the AM peak period. Please note that the unit is the Passenger Car Unit (PCU), which is a combination of LVs and HVs (the latest multiplied by a factor of 3). The general levels of adequacy and effectiveness of the road network during most congested time segments of the day are shown by the following **Volume/ Capacity maps**.

The traffic across the dense Maltese road network is mainly concentred along the central section of the TEN-T Network (mainly arterial with some distributor corridors), which gravitates around the harbour region (Peninsula, Inner Harbour and Outer Harbour) with its border defined by the following localities: Fgura, Malta International Airport, Qormi, Mosta, Birkirkara, Valletta and St Julian's. From the outputs of the National Transport Model, it can be concluded that:

- The higher traffic levels are registered in the TEN-T Core and Comprehensive Network.
- The maps below show the decrease in traffic Volumes in the main TEN-T Comprehensive Network (the transverse corridor) between the Do-Something 1 and the Do-Something 2 scenarios. This is very likely to be related to the improvement of the Public Transport efficiency and the consequent modal shift.
- Similarly, a reduction of the traffic volumes in the radial corridors: 1) Triq Dun Karm, Triq il-Mosta and Triq Valletta (Birkirkara) and 2) Triq L-iMdina (Attard), Mriehel Bypass and Marsa Hamrun Bypass can be seen in the Do-Something-2 scenario with respect to the Do-Something 1 scenario. This is due to the introduction of the Public transport corridors number 3, 4, 5 and 6 that has enhanced the modal shift in those corridors.

[39] *Light vehicles (Private Car), Heavy vehicles (Freight)*

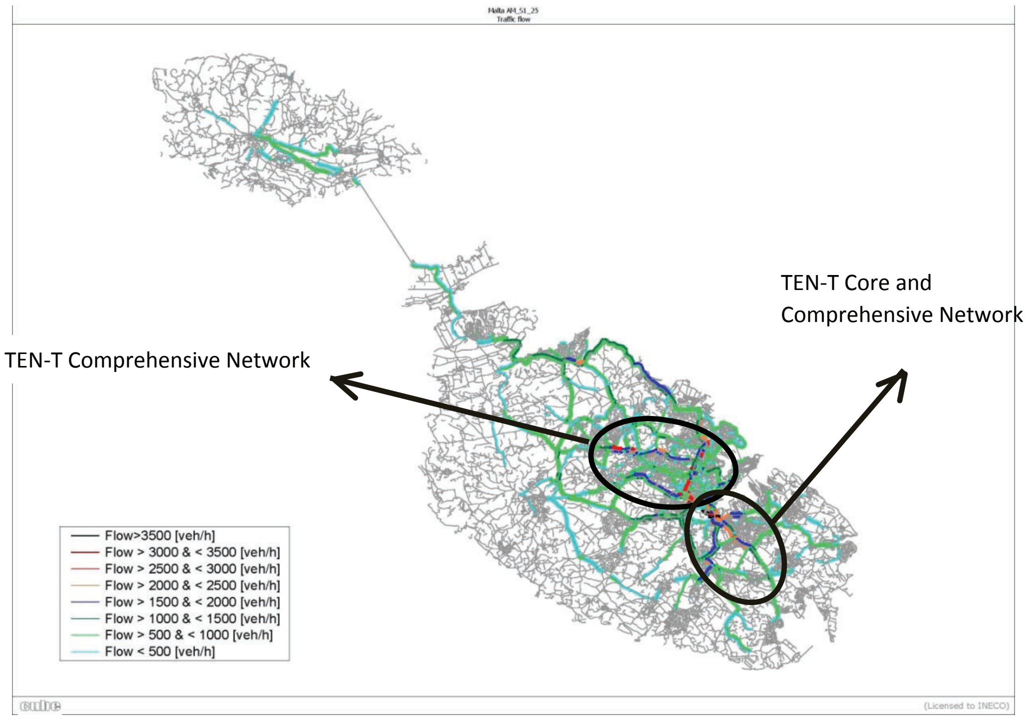


Figure 147.
AM Road traffic volumes (PCU/h) of the entire network, Do-Something 1, 2025 (NTM)

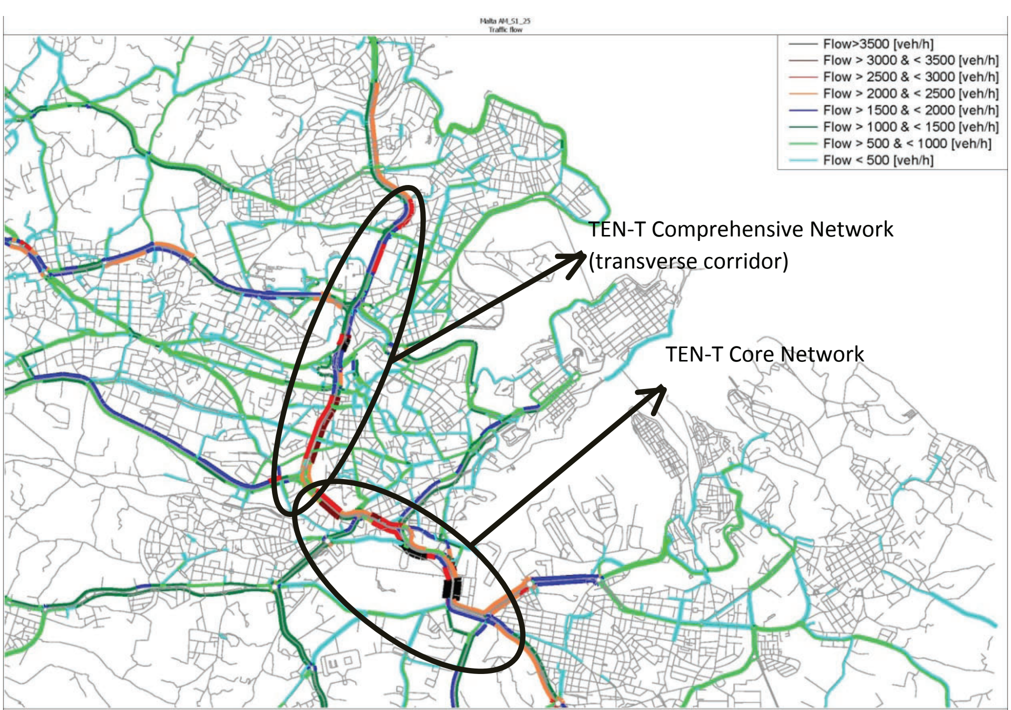


Figure 148.
AM Road traffic volumes (PCU/h) within the Inner-Harbour Region, Do-Something 1, 2025 (NTM))

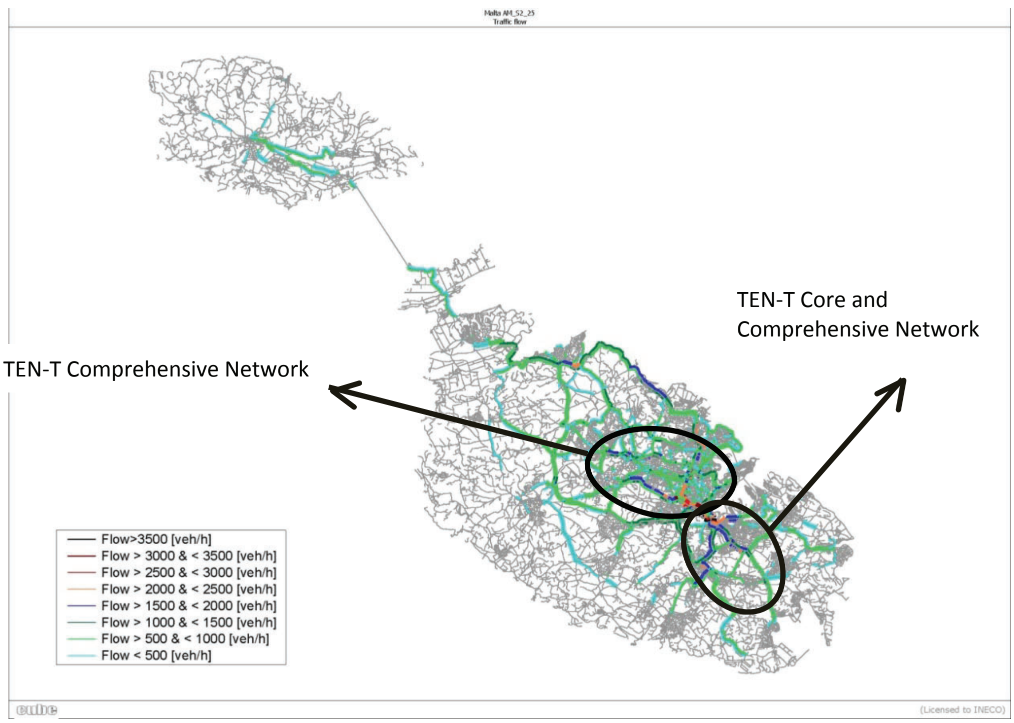


Figure 149.
AM Road traffic volumes (PCU/h) of the entire network, Do-Something 2, 2025 (NTM)

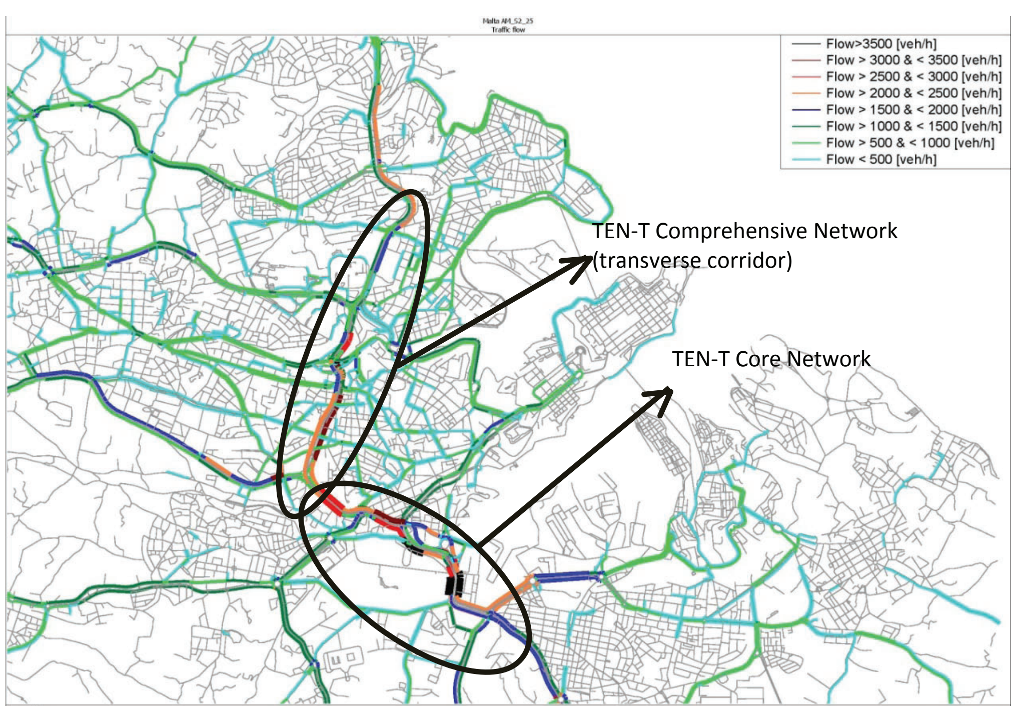


Figure 150.
AM Road traffic volumes (PCU/h) within the Inner-Harbour Region, Do-Something 2, 2025 (NTM)

The critical sections, characterised by higher degree of congestion and low level of service have a V/C > 0.8. As depicted in the V/C maps below, the congestion in the main corridors of Malta has noticeably decreased in comparison to the Do-Minimum scenario. The congestion was expected to spread to all the metropolitan area of the Outer Harbour Region in 2025, however with the introduction of the road measures of the Do-Something 1 and the Do-Something 2 scenarios, the congestion is avoided in the following sections:

- Most of the 5 **radial roads** connecting Valletta to the rest of the island, namely 1) Triq Bellavista and Triq Tal-Balal (San Gwann), 2) Triq Dun Karm, Triq il-Mosta and Triq Valletta (Birkirkara), 3) Triq Il-Wied ta' l-iMsida, Triq Mannarino, Triq Il-Ferrovija, Triq Salvu Psaila, Triq in-Naxxar (Birkirkara), 4) Triq l-iMdina (Attard), Mriehel By-pass and Marsa Hamrun Bypass 5) Triq l-iMdina have a V/C under 0.6.

- Almost the entire Comprehensive TEN-T corridor, the **transverse corridor**, between Triq Paul Boffa, Triq Aldo Moro, Triq Dicembru 13 (Marsa), Triq Regionali and Triq Mikiel Anton Vassalli (St Julian's).

In both scenarios, in 2025, congestion spreads over the entire length of the Sliema sea front, from **Triq ix-Xatt** to Triq it-Torri. This private transport congestion is in part due to the introduction of a bus lane in one of the two lanes of Triq ix-Xatt what leaves only one lane for private car. Similarly, the congestion in the distributor linkage between the airport and the urban centre of Qormi, Triq Hal Qormi and Triq Hal Luqa, worsens in the two scenarios analysed in comparison to the base year situation.

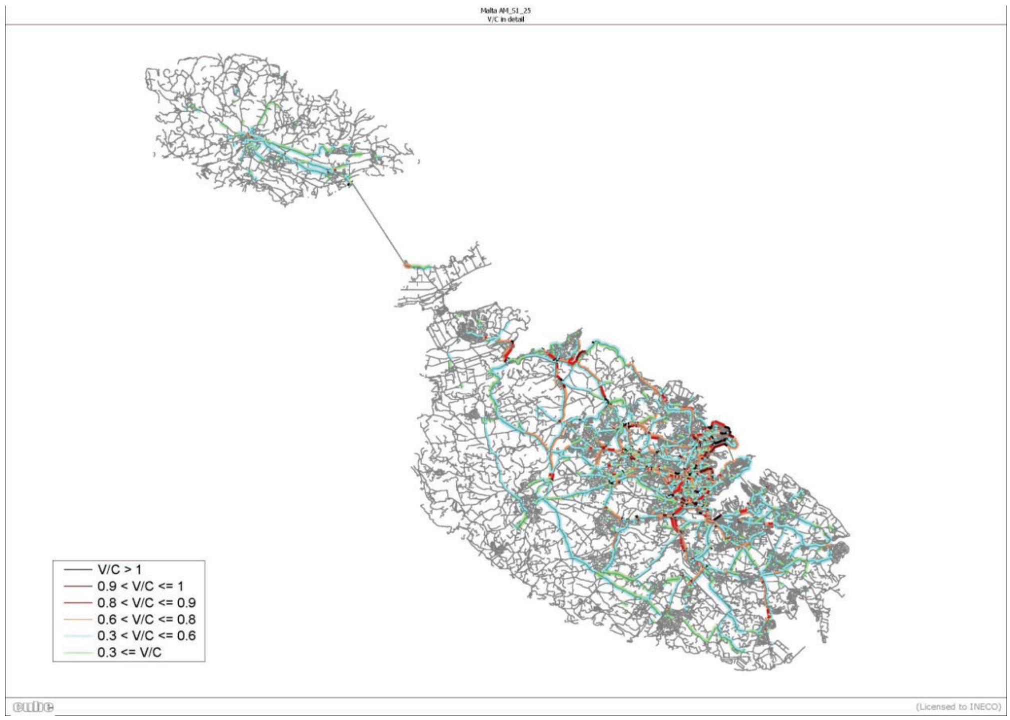


Figure 151.
AM Volume/Capacity of the entire network,
Do-Something 1, 2025 (NTM)

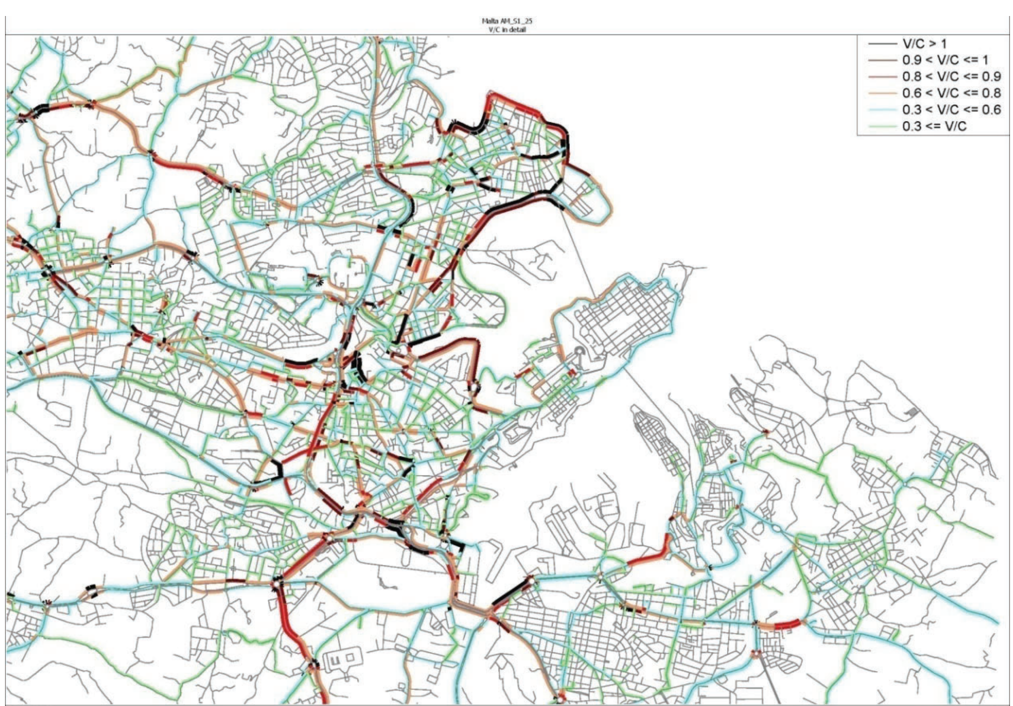


Figure 152.
AM Volume/Capacity within the Inner-Harbour Region,
Do-Something 1, 2025 (NTM)

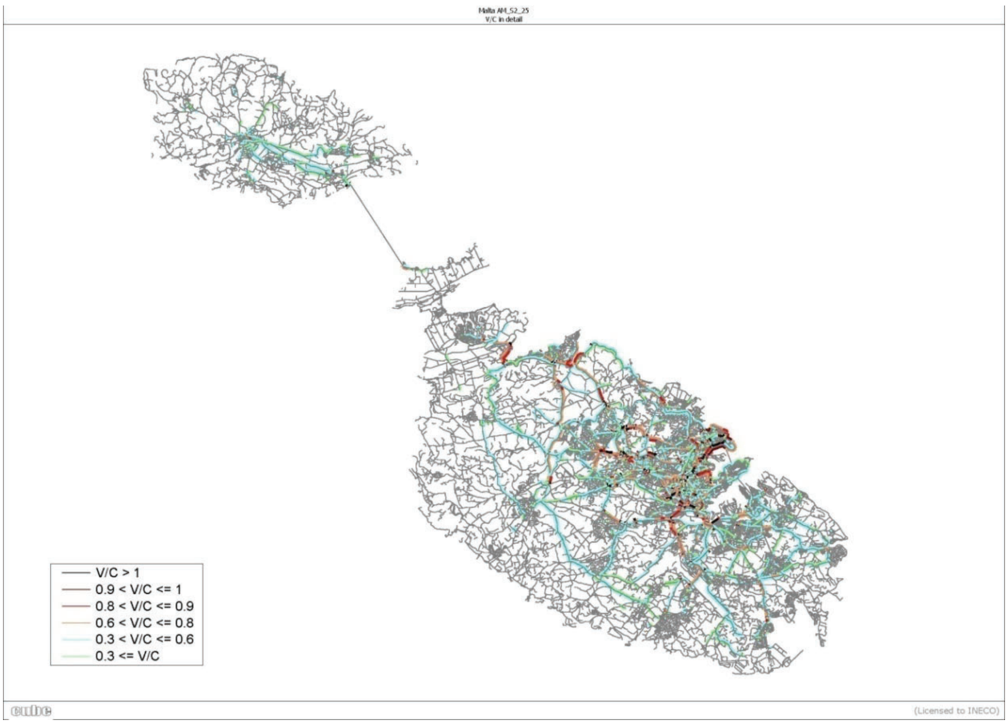


Figure 153.
AM Volume/Capacity of the entire network, Do-Something 2, 2025 (NTM)

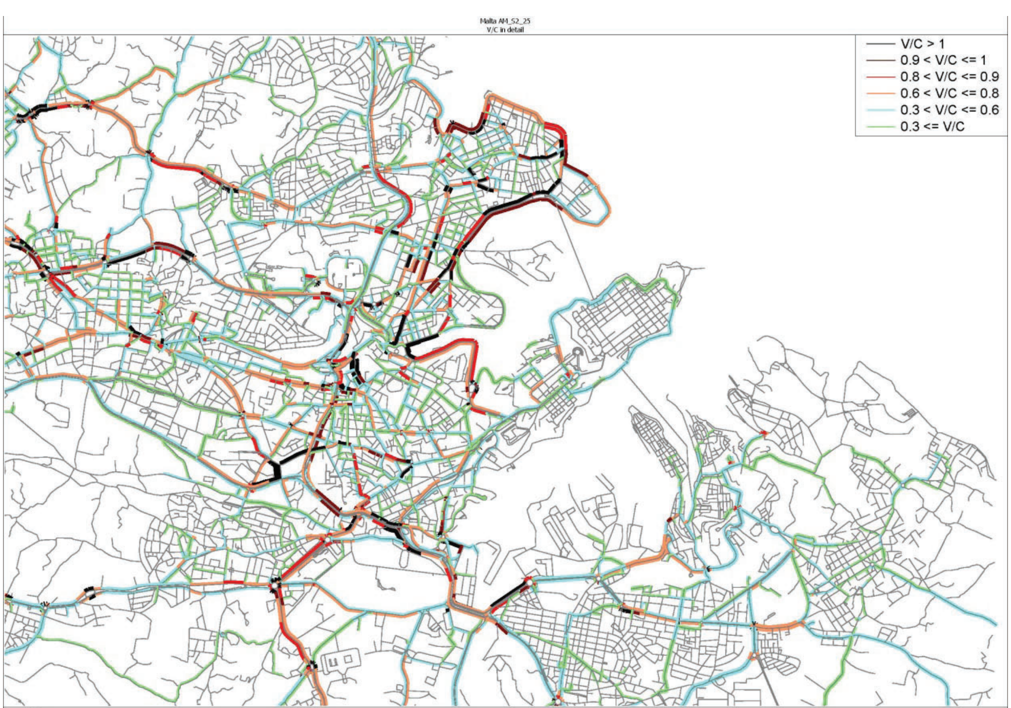


Figure 154.
AM Volume/Capacity within the Inner-Harbour Region, Do-Something 2, 2025 (NTM)

Modal split across the whole network, or modal share, is the percentage of travellers using a particular type of transportation. Modal split changes noticeably between the Do-Minimum, Do-Something 1 and Do-Something 2 scenarios.

In the Do-Something 1 scenario, the introduction of the 2 Public Transport corridors and the improvement of the Valletta Ferry frequencies results in an improvement of the Public Transport share of 2.0%. Besides, the Do-Something-2 scenario, which focuses on Public Transport measures, includes 7 Public Transport corridors and the improvement of the Valletta Ferry frequencies together with the reduction of buses average dwelling times. Under this scenario, the Modal shift from Private vehicles to Public Transport is of 4.4% with respect to the Do-Minimum scenario.

Modal split

Mode	AM			PM			Yearly		
	Do Min	DS 1	DS 2	Do Min	DS 1	DS 2	Do Min	DS 1	DS 2
Private Car	72.3%	70.3%	67.9%	79.0%	76.7%	74.8%	75.7%	73.5%	71.4%
Public Transport	16.7%	18.8%	21.2%	15.2%	17.4%	19.4%	16.0%	18.1%	20.3%
Other Modes	11.0%	10.9%	10.9%	5.8%	5.9%	5.8%	8.4%	8.4%	8.3%

Figure 66.
Key mobility Statistics: peak-hour and yearly Modal Split 2025 (NTM; Elaboration)

	Peak-hour travelled distance [pkm]						Yearly travelled distance [million pkm]		
Mode	**AM**			**PM**			**Yearly**		
	Do Min	**DS 1**	**DS 2**	**Do Min**	**DS 1**	**DS 2**	**Do Min**	**DS 1**	**DS 2**
Private Car	472,046	452,001	434,223	480,381	471,882	451,924	1,720	1,672	1,603
Public Transport	111,538	141,801	169,639	90,321	113,147	133,216	358	452	536
Total	**583,584**	**593,802**	**603,862**	**570,702**	**585,029**	**585,140**	**2,078**	**2,123**	**2,139**

Figure 67.
Measures of effectiveness: peak-hour and yearly travelled distance by all passengers 2025 (NTM; Elaboration)

The next table contains the **travelled distance** as an indicator of public and private traffic performance, which represents the total distance travelled on board by all the passengers across the whole network.

It is calculated as the sum, extended to all the links of the network, of the products of the number of passengers on board on each link and the length of the link (the indicator unit is pkm).

The **average speed** of the entire network for each mode, an indicator of public and private traffic performance, it is calculated as the ratio between the travelled distance and the time spent by the all vehicles in the network and shown in Table 68.

As a reference, Table 69 below shows the observed commercial speed of public transport in several European cities

Peak-hour LV and PT average speed [km/h]

Mode[40]	AM			PM		
	Do Min	DS 1	DS 2	Do Min	DS 1	DS 2
Private Car	20.7	23.8	24.8	23.1	23.6	26.3
Public Transport	13.6	15.5	17.5	15.5	17.0	18.7

Figure 68.
Measures of effectiveness: peak-hour LV and PT average speed 2025 (NTM; Elaboration)

[40] *Light Vehicles (LV), Public Transport (PT)*

Commercial speed

The commercial speed of public transport is one of the main quality issues that city planners have to deal with in urban areas. The average speed for the urban bus and the tram is about 20 km/h and for the suburban buses the average rises up to 30 km/h. The same happens with the metro and the commuter train. The metro runs at 35 km/h in average and the commuter train rises up to 30 km/h.

Table 69.
Comparison of commercial speeds for urban bus networks across different cities in 2013 (EMTA[41], Elaboration)

The next figures show the **Public Transport Speed analysis maps** for each scenario in the AM peak period. The **PT Speed Ratio** represents the ratio between the expected or congested speed of PT and the design speed of PT at each section. The speed analysis is a tool to identify the improvement of the bottlenecks and critical sections identified in the Do-Minimum scenario.

The PT speed analysis in the two scenarios shows that the introduction of the bus lanes has improved significantly the speed of the public transport network. The maps below show that the Public Transport corridors 3, 4, 5 and 6 have an average speed very close to the free-flow speed in the scenario Do-Something 2. However, there are still a few small sections where the speed is less than 30% of target speed: in Triq tal Balal, in the San Gwann zone, in Triq Regionali and in Marsa Hamrun bypass.

[41] *European Metropolitan Transport Authorities Barometer, 2013 data.*

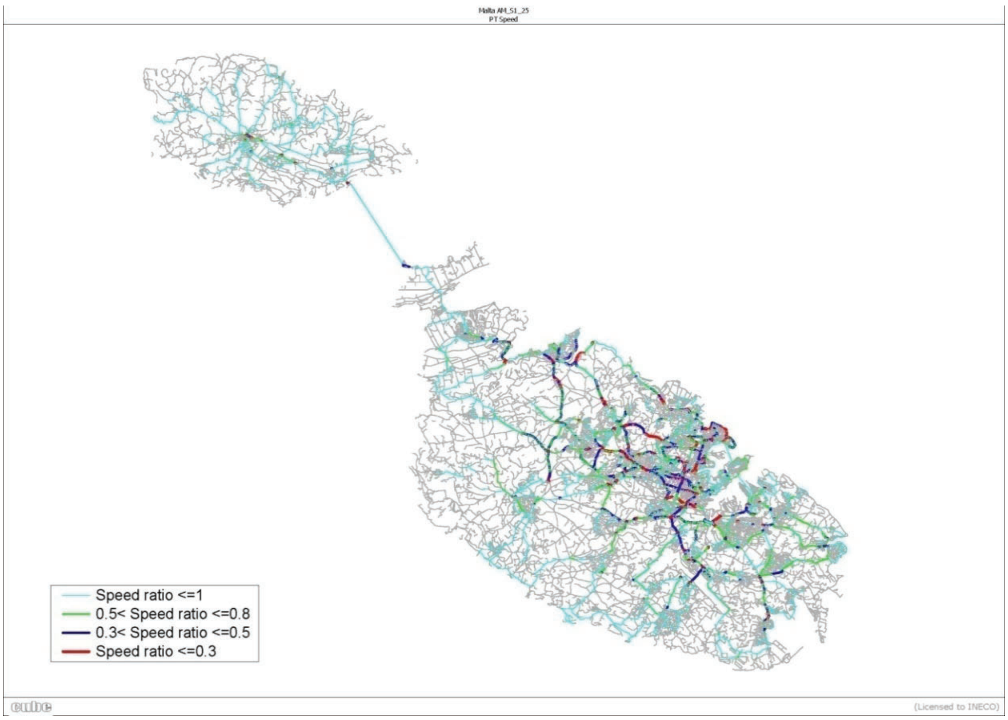


Figure 155.
AM Public Transport speed analysis of the entire network, Do-Something 1, 2025 (NTM)

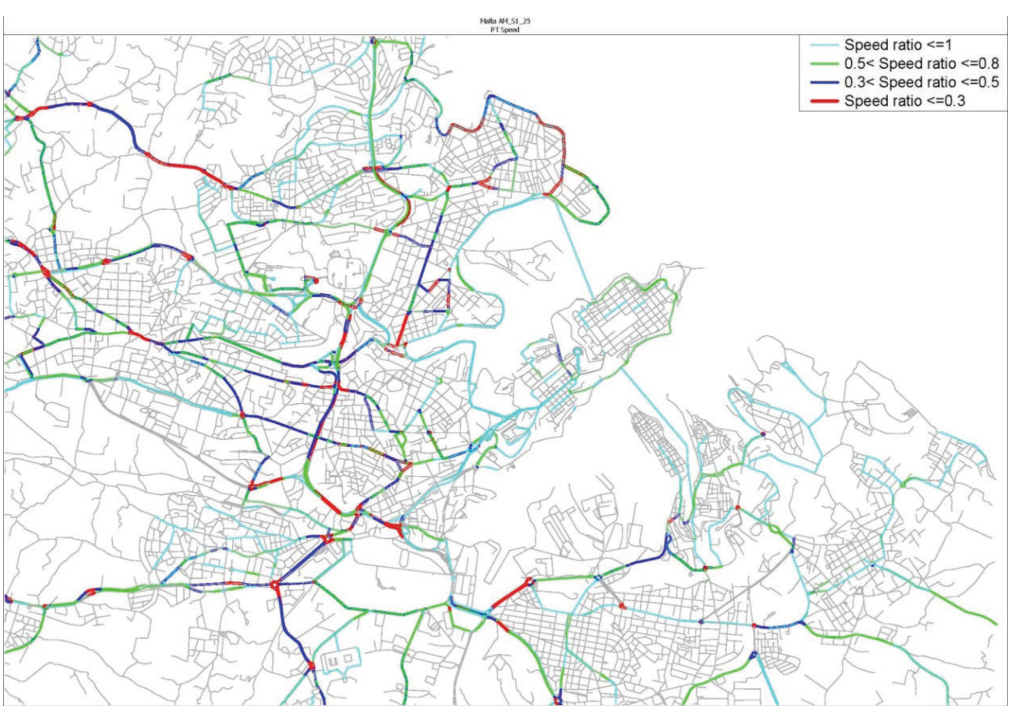


Figure 156.
AM Public Transport speed analysis within the Inner-Harbour Region, Do-Something 1, 2025 (NTM)

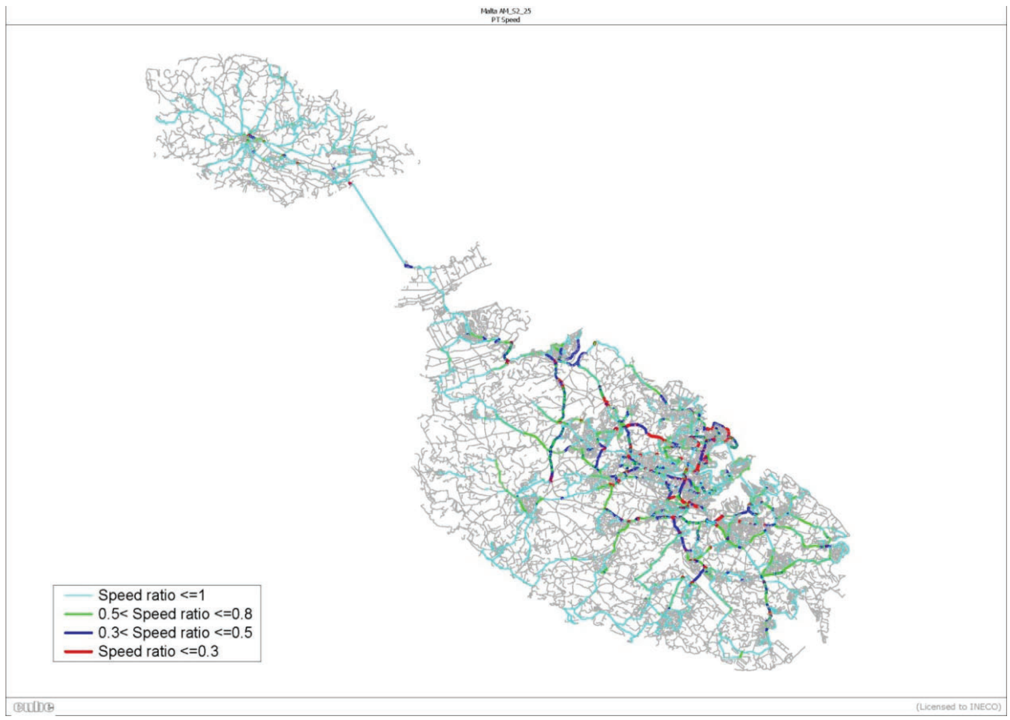


Figure 157.
AM Public Transport speed analysis of the entire network, Do-Something 2, 2025 (NTM)

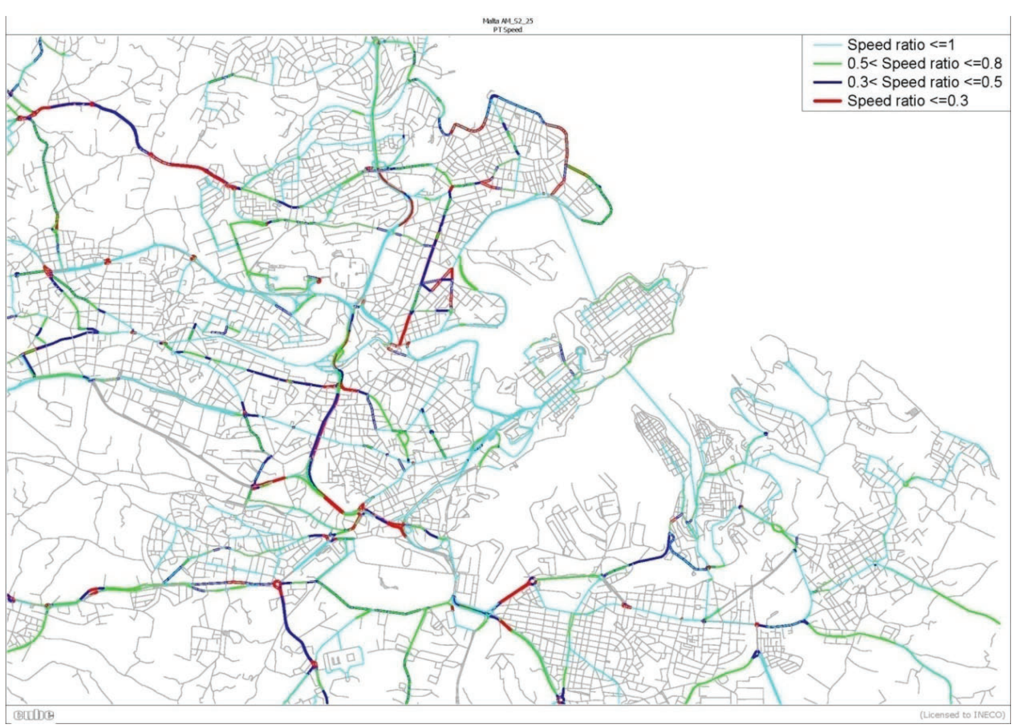


Figure 158.
AM Public Transport speed analysis within the Inner-Harbour Region, Do-Something 2, 2025 (NTM)

4.5.2
COST OF CONGESTION

The analysis of the external impact of traffic and congestion in Malta seeks to quantify all the significant impacts of transport on Malta's environment, public health, economy and employment.

The **cost of congestion** is based on the evaluation of the lost time spent across the whole road network due to congestion as the difference between the actual total time spent travelling within the network and the total travelled time at ideal "free flow condition".

The final cost of congestion related to the overall time lost travelling within the network is based on two main components:

- the first one, more significant, is the value of time: VoT applied to the total number of hours lost travelling within the network, and
- the second one, related to the VoC, is the total idle fuel consumption: fuel consumption associated to idle/stop conditions applied to the total number of hours lost travelling.

Annual cost of congestion

Mode	Lost time per passenger [h/year]			Cost of lost time [€m/year]			Cost of Consumption at idle [€m/year]		
	Do Min	DS 1	DS 2	Do Min	DS 1	DS 2	Do Min	DS 1	DS 2
Private Car	29.1	27.3	25.0	397.1	360.3	321.1	20.3	17.1	14.2
Freight	18.9	16.2	13.5	51.1	43.8	36.6	6.3	5.4	4.5
Public Transport	36.6	32.7	26.7	105.6	106.9	98.0	0.0	0.0	0.0
Total	**29.6**	**27.4**	**24.5**	**553.8**	**511.0**	**455.7**	**26.6**	**22.5**	**18.6**

Table 70.
Estimation of yearly cost of congestion, 2025 (NTM; Elaboration)

4.5.3
COST OF ACCIDENTS

The methodology followed to estimate the number of accidents in each scenario was as follows:

1. The total number of accidents in Malta for the period 2010-2014 was taken from the various Transport Statistics reports[42] published by the National Statistics Office of Malta.

[42] *https://nso.gov.mt/en/publicatons/Publications_by_Unit/Documents/B3_Environment_Energy_Transport_Agriculture_Statistics/Transport_Statistics_2015.pdf*

2. This number of accidents only represent the total number of reported accidents in the country, therefore, the European Commission recommends using correction factors to account for unreported accidents as well.

3. With the average number of accidents by type of vehicle for the period 2010-2014 and the yearly number of vehicle-kilometres, the total number of accidents by vehicle-kilometre could be obtained. Light vehicles were not differentiated between cars and motorbikes; however, given the difference in accident ratios for both modes of transport it is necessary to differentiate them. In order to do so the stock of licensed vehicles was used assuming that the percentage coincides with the percentage of vehicle-kilometres (93.53% cars 6.47% motorbikes)

4. Once the total number of accidents per vehicle-kilometre was estimated, using the forecast of vehicles-kilometre for each scenario the total number of expected accidents was calculated.

5. Finally, given the intervention the total number of accidents is expected to fall given the improvements in each scenario. With those reductions of accidents, the final expected number of accidents was calculated and its associated costs were calculated by using the value of statistical life proposed by the Guidance Manual for Cost Benefit Analysis (CBAs). Appraisal in Malta[43]. These values are reported in table 71. The final results under each scenario are presented in table 72.

Value of statistical life (€2012 prices)

Fatality	Severe injury	Slight injury
1,205,573	153,918	11,442

Table 71.
Value of statistical life (Manual for CBA. Malta)

Annual cost of accidents

Scenario	Slight accidents [accidents/ year]	Grievous accidents [accidents/ year]	Fatal accidents [accidents/ year]	Cost associated to accidents [€m/year]
Do-Minimum	3,009.4	375.0	15.7	111.1
Do-Something 1	2,758.0	343.9	14.5	102.0
Do-Something 2	2,494.0	311.4	13.3	92.5

Table 72.
Estimation of yearly cost of accidents across the whole network, 2025 (Various sources; Elaboration)

[43] *https://eufunds.gov.mt/en/Operational%20Programmes/Useful%20Links%20and%20Downloads/Documents/Guidance%20 Manual%20for%20CBAs%20Appraisal_May2013.pdf*

4.5.4
ENVIRONMENTAL EXTERNALITIES

One of the external impacts of transport is the climate change due to GHG (CO_2) emissions. Road transport is the transport mode with higher GHG emissions. The following table presents the assumptions taken to calculate the CO_2 emissions as well as the pollutants emissions produced by road transport across the whole network.

Emission factors

Mode	CO_2 [g/kg fuel]	CO [g/kg fuel]	PM [g/kg fuel]	NOx [g/kg fuel]	NMVOC [g/kg fuel]
LV	0.47	87.1	3,169	9.8	14.90
HV	1.44	11.7	3,141	16.0	1.95
PT	0.94	7.6	3,140	33.4	1.92

Table 73.
Main assumptions: Tier 1 emission factors (EMEP-EEA air pollution emissions inventory guidebook[44])

Typical Fuel Consumption

[g/km]	
LV	65.0
HV	90.5
PT	240.0

Table 74.
Main assumptions: average fuel consumption per km

In the analysis, the composition of the vehicle fleet is assumed to remain the same, with no change in vehicle technology taking place. However, it is a fact that as newer vehicles typically have lower fuel use and emissions, this means that the costs of air pollution, climate change, and idling fuel consumption are likely overestimated. However, the costs estimated are very useful to compare the Do-Minimum and the Do-Something 1 and 2 scenarios.

[44] *http://www.eea.europa.eu/publications/emep-eea-guidebook-2013*

For the Do-Minimum scenario, the total predicted costs are estimated at €24.0 million whereas in the Do-Something 1, the predicted costs of air pollution and climate change are estimated at €22.2 million and at €20.3 million in the Do-Something 2. Therefore, the proposed measures help reduce the impact of transport in Malta, by first, enhancing the modal shift towards lower carbon-emission modes (bus and ferry) and second reducing congestion. Both facts contribute to reduce the air pollution and mitigate climate change.

The following tables summarise the yearly estimations of GHG and pollutants emissions, for each scenario and the calculation of the yearly costs of air pollution and climate change.

CO_2 Emission (tons/year)

Do-Minimum	Do-Something 1	Do-Something 2
342,642	314,319	284,736

Table 75.
Climate change: estimation of yearly GHG (CO_2) emissions, 2025 (NTM; Elaboration)

Air pollutants emissions [tons per year]

CO [tons/year]			PM [tons/year]			NOx [tons/year]			NMVOC [tons/year]		
Do Min	**DS 1**	**DS 2**	**Do Min**	**DS 1**	**DS 2**	**Do Min**	**DS 1**	**DS 2**	**Do Min**	**DS 1**	**DS 2**
8,234	7,448	6,648	63.7	60	55	1,236	1,149	1,056	1,410	1,276	1,139

Table 76.
Estimation of yearly production of air pollutants, 2025 (NTM; Elaboration)

Cost of air pollution and climate change (€m/year)

Scenario	PM [€m/year]	NOx [€m/year]	CO_2 [€m/year]	Total [€m/year]
Do-Minimum	1.80	11.91	10.28	**23.99**
Do-Something 1	1.68	11.08	9.43	**22.19**
Do-Something 2	1.55	10.18	8.54	**20.28**

Table 77.
Estimation of yearly cost of air pollution, 2025 (NTM; Elaboration)

As a summary, the Do-Something 1 scenario reduces the costs of the external impacts of transport in €58m per year and the Do-Something 2 scenario reduces the costs of the external impacts of transport in €128m per year.

4.5.5
ECONOMIC INDICATORS

The results from the previous sections, as well as the shadow prices stated in the Guidance Manual for Cost Benefit Analysis (CBAs) Appraisal in Malta (May 2013), were used to estimate the costs and benefits associated with each scenario. A few assumptions were taken into account in order to perform the CBA:

- No inclusion of indirect effects: The guide above-mentioned states that, in general, the use of shadow pricing and the monetisation of externalities are appropriate to account for any indirect effects. In this particular study, where the size of the distortion in secondary markets is considered to be rather small and very difficult to measure, it was decided that shadow pricing was enough to measure these distortions.
- A social discount rate of 5. was used in order to calculate the ENPV and the BCR. This is the discount rate recommended by the EU guidance for CBAs carried out in cohesion countries during the programming period 2014-2020
- Given the estimated investments, some operational and maintenance costs had to be assumed:
    - Small maintenance and operational cost: annual cost of 2% of the total investment from the beginning of the operational period to the end of the thirty-year period of evaluation,
    - Major road rehabilitation cost: 15% of the total investment 20 years after finalising the construction works.
- Linear growth in the costs (lost time, consumption at idle, air pollution and traffic accidents) from 2025 to 2050.
- All projects are completed by 2020.

Three economic indicators were calculated based on the afore-mentioned hypotheses:

- Economic net present value (ENPV);
- Economic internal rate of return (ERR); and
- Benefit-cost ratio (BCR).

The benefit-cost ratio is simply the ratio between the discounted values of economic benefits and discounted economic costs.

$$\frac{B}{C} = \frac{PV(C)}{PV(B)}$$

In the equation above, PV stands for present value and this is calculated by applying the social discount rate.

The ENPV is the sum of the discounted flows of benefits and costs. In the equation below, St represents the difference between benefits and costs in time t. As before, at represents the choice of discount rate (in this case, the social discount rate is chosen).

$$ENPV = \sum_{t=0}^{n} a_t S_t = \frac{S_0}{(1+i)^0} + \frac{S_1}{(1+i)^1} + \dots + \frac{S_n}{(1+i)^n}$$

Finally, the EIRR can be estimated based on the ENPV. The EIRR is simply the rate of return that gives an ENPV with a value of zero.

The results shown in the next table are for the beginning of the year 2020; the Do-Minimum scenario is considered the base case. It has also been considered that all the projects are operating by the year 2020 and that they have a useful life of 30 years leaving no residual value after the year 2050.

Socio-Economic Profitability

	Do-Something 1 (€m)	**Do-Something 2 (€m)**
Socioeconomic benefits	1,626.68	2,814.55
Congestion time savings	1,282.43	2,161.28
Consumption at idle savings	96.69	161.89
Externalities - environmental costs savings	32.31	63.14
Externalities - accidents savings	215.25	428.24
Operation and maintenance costs	**-159.98**	**-150.91**
Investments (including RD1 and RD2)	**-474.64**	**-401.67**
ENPV [€m]	**992.06**	**2,261.97**
EIRR	**12.94%**	**24.53%**
BCR	**2.56**	**5.09**

Table 78.
Economic indicators, DS1 and DS2 scenarios. (Elaboration)

The results show, and if measured individually, that both scenarios are socially profitable and if measured individually should be carried out. However, the analysis shows better results for the Do-Something 2 scenario. It can be seen that the economic net present value of this scenario is more than two times the one of the Do-Something 1 scenario. Furthermore, the internal rate of return and the Benefit to Cost Ratio also show advantages in terms of risk for the Do-Something 2 scenario.

The following figures show the cash flows over the analysed period for each of the projects.

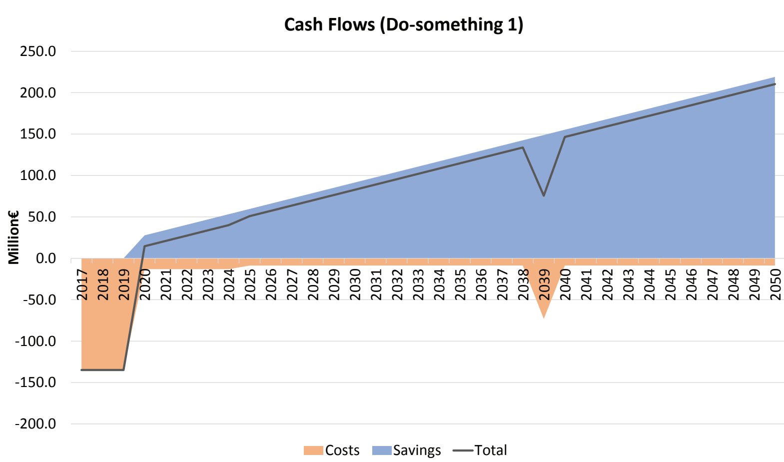


Figure 159.
Estimated Economic Cash Flows (Do-Something 1)

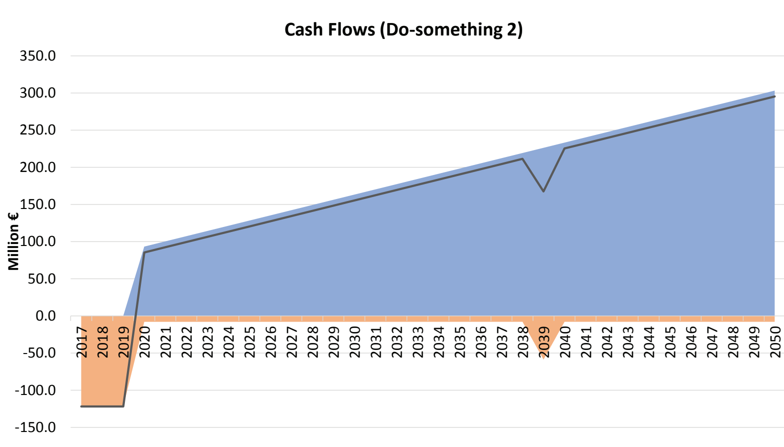


Figure 160.
Estimated Economic Cash Flows (Do-Something 2)

05

ENVIRONMENTAL CONSIDERATIONS

This chapter summarises the Environmental Report[45], which describes the Strategic Environmental Assessment (SEA) in relation on the National Transport Strategy, 2050 (NTS) and the Transport Master Plan, 2025 (TMP).

The assessment was carried out in accordance with the SEA Regulations (Legal Notice 497 of 2010), which transpose the European Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. It also summerises the findings of the Appropriate Assessment that was carried out in accordance with Legal Notice 311 Of 2016.

05.1 NATIONAL TRANSPORT STRATEGY AND MASTER PLAN

The National Transport Strategy provides a vision for the transport sector in Malta. It goes on to describe the strategic goals and direction to achieve these goals as well as identifying indicators to measure progress.

The vision for the NTS is:

> *To provide a sustainable transport system which is efficient, inclusive, safe, integrated and reliable for people and freight, and which supports attractive urban, rural and coastal environments and communities where people want to live and work: now and in the future.*

Six strategic goals have been developed in the context of the vision. The goals were developed based on research, policy review and analysis described within the introductory chapters of the NTS. The table below summarises the strategic goals.

Strategic Goal 1: Transport to Support Economic Development
Reduced congestion and removal of traffic bottlenecks improves travel times thereby supporting competitiveness.
Improved reliability and efficiency can allow for better journey planning.
Strengthening transport links and connectivity, nationally and internationally increases access to markets.
Reduced operational costs and improved seamless interconnectivity increases profitability and can support competitiveness.
Improved experience and ease of access for non-regular users can support the tourism product.

[45] *Transport Malta (2016), National Transport Strategy - Strategic Environmental Assessment Environmental Report*

Strategic Goal 2: Transport to Promote Environmental and Urban Sustainability
Reduce and mitigate greenhouse gas emissions
Ensure efficient and sustainable use and management of resources
Ensure adaptation to climate change
Minimise impact of transport to enhance the landscape and townscape
Preserve the natural habitats and biodiversity
Respect historical and heritage resources

Strategic Goal 3: Transport to Support Social Development and Inclusion
Ensure travel options and journey quality are suitable for all user groups
Ensure affordability for targeted social groups
Increasing societal awareness on the need for sustainable travel choices
Reduce severance and adverse impacts on specific communities
Integration of isolated communities

Strategic Goal 4: Transport to Provide Accessibility and Mobility
Easy access to daily facilities
Convenient and reliable journey times
Ensuring an equitable and sustainable approach to all transport modes
Managing freight and urban logistics

Strategic Goal 5: Transport to be Safe and Secure
Resilient critical infrastructure
Extending the lifetime of high quality infrastructure
Reduction in injuries and loss of life relating to transport accidents
Rapid response to emergencies and accidents
Crime and terrorism

Strategic Goal 6: Transport to Work towards Public Health
A clean and pleasant public realm
Active lifestyles
Reduced pollution (air, noise and light)

Table 79.
Strategic goals of the Transport Strategy

The National Transport Strategy 2050, also defines eight key guiding principles based on European and national policy as well as trends identified in the NTS. The Master Plan then identifies operational objectives that were developed from the guiding principles, providing a more detailed way forward in working towards the strategic goals outlined in Table 79 above.

Chapter 5 of the NTS identifies indicators and targets for achieving each of the strategic goals.

The **Transport Master Plan** aims to achieve the goals set out in the NTS through a number of measures that have been designed to be implemented within the short to medium term (within 10 years).

The TMP first provides a detailed description of the current situation of the transport sector in Malta. A SWOT analysis of all transport subsectors is presented.

Operational objectives and subsequent measures were developed based on identifying those aspects in the transport sector that require addressing in order to ensure effective and efficient management of the sector and reduce externalities. This was done through a number of exercises including analysis of existing national and EU policies and plans, data gathering, computer modelling and forecasting through the application of a four stage transport mathematical model for estimating transportation demand as well as public consultation. The model outputs include aspects such as daily trips, modal share and distance, time and speed, which together allow for the analysis of transport network performance and externalities both of the base year (2014) as well as allowing the planners to forecast how implementation of certain measures might affect these aspects. Feedback obtained during the public consultation process on the TMP will also affect the final list of measures as well as the findings from the SEA and potentially the Appropriate Assessment.

Table 2.2 in the Environment Report lists the Operational Objectives and Measures for implementation and are divided into the various transport sectors or aspects as follows:

Table 2.2 in the Environment Report lists the Operational Objectives and Measures for implementation and are divided into the various transport sectors or aspects as follows:

- Road;
- Public transport;
- Intermodal;
- Internal maritime;
- External maritime; and
- Aviation.

There are also a number of common measures that apply horizontally.

05.2
STRATEGIC ENVIRONMENTAL ASSESSMENT FRAMEWORK

The objective of the SEA Directive is to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development. It is the process of evaluating the environmental impacts of any proposed plan/programme likely to have significant effects on the environment. The SEA process helps to inform the decision making process with the aim of improving the final plan or programme and promoting sustainable development. In addition, the SEA process aims to increase public involvement in decision making at a strategic level, with consultation at various stages in the SEA process being a requirement of the Regulations.

The five main steps required as part of the SEA process are summarised in Table 80 below.

A Scoping Report was prepared and is included in Appendix 1 of the Environment Report. Consultation on the draft Scoping Report was undertaken with a number of identified stakeholders, including the SEA Focal Point, the former Malta Environment and Planning Authority (MEPA), the Malta Resources Authority (MRA), the Ministry for Energy and Health, the Ministry for Sustainable Development, the Environment and Climate Change, the Environmental Health Directorate, and the Agriculture & Fisheries Regulation Department.

Consultation with the general public was undertaken from 27th March 2015, when the Scoping Report was made available through Transport Malta's website.

This Environmental Report is based on the Scoping Report. It outlines the assessment of the impacts of the NTS and TMP on various environmental parameters, as described in Chapter 7 of the Environmental Report.

Stage in SEA Process	Details of Process Required
Screening	Screening is required to determine whether the proposed plan/ programme is likely to have significant environmental effects and whether an SEA is required.
Scoping	Scoping enables the coverage and level of detail of the Environmental Report to be determined in conjunction with the statutory consultee/s.
Environmental Report	The Environmental Report details the anticipated environmental impacts of the programme and any proposed amendments to the plan to mitigate its effects. It must be consulted upon.
Adoption	The Adoption Report details the results of consultation; how comments have been incorporated into the programme; the final programme; and the proposals for monitoring the environmental impacts of the programme.
Monitoring	The Monitoring stage is undertaken during implementation of the programme and serves to identify the level of monitoring required and, should adverse impacts be identified, any remediation proposals.

Table 80.
Key stages in the SEA process

The Scoping Report is reproduced in Appendix 1 of the Environment Report.

An Appropriate Assessment, which considers the impact of the Strategy and Master Plan on the Natura 2000 network in accordance with the Habitats Directive has also been prepared and is reproduced in Appendix 2 of the Environment Report.

5.2.1
ASSESSMENT METHODOLOGY

Although the SEA Directive does not specifically require the use of objectives or indicators in SEA, they are a recognised way through which environmental effects can be described, analysed, and compared. SEA objectives encompass the relevant national and EU environmental priorities that can be inferred from a number of relevant national documents as outlined below (in the absence of a national environmental strategy). The Strategy and Master Plan are assessed in light of the SEA objectives. The performance of the Strategy and the Master Plan was assessed against the SEA objectives. The SEA objectives are separate from the Strategy and Master Plan objectives, although the two influence each other and may overlap. To fulfil the requirements of the SEA Directive and the SEA Regulations, 2010, the SEA objectives must cover biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, landscape, and inter-relationships between them, where these are relevant to the sector being addressed by the plan or programme. The SEA objectives were developed on the basis of the aforementioned topics and their relevance to the OP; these are described in Table 81.

5.2.1.1
SEA objectives & indicators

Table 81 defines the set of objectives relating to environmental issues, in support of which, relevant assessment criteria and possible data sources have also been identified.

The SEA indicators are measurements of trends over time. Changes in the indicators show whether the implementation of the Strategy and Master Plan would be or has been successful in improving the environment. It is to be noted, however, that changes in the indicators could be the result of factors outside the influence of the Strategy / Master Plan.

Issue	SEA Objective	Criteria How this action will...	SEA Indicator	Data source
Biodiversity, Flora & Fauna	• To maintain or improve biodiversity (including terrestrial and marine) • To maintain or improve Natura 2000 sites	• Affect the integrity of designated areas, including Natura 2000 sites? • Affect protected species and habitats? • Affect ecological connectivity? • Contribute to generate ecosystem services? • Affect the achievement of Good Ecological Status of coastal waters and Good Environmental Status of marine waters beyond protected areas (as per Water Framework Directive and Marine Strategy Framework Directive requirements respectively)?	• Number of developments / interventions in protected areas • Number of developments / interventions in Natura 2000 sites • Conservation status of habitats and species • Conservation status of habitats and species in Natura 2000 sites • Number of developments / interventions on greenfield sites / undeveloped land • Number of developments/ interventions resulting in habitat fragmentation • New or enhanced green infrastructure elements in urban areas • Quality of the marine environment in terms of biological and physico-chemical elements	Environmental monitoring through Environmental Impact Assessment (EIA), Appropriate Assessment (AA), or other regulatory requirements as relevant. Environment & Resources Authority (ERA)

Issue	SEA Objective	Criteria How this action will...	SEA Indicator	Data source
Population and Human health	• To reduce noise / vibration and light pollution • To reduce air pollution • To improve road safety • To improve overall levels of health • To enhance well-being[46] • To reduce road traffic and congestion through modal shift to more sustainable options • To improve accessibility and transport links to services, facilities and opportunities	• Affect air pollution generation from traffic? • Affect noise and vibration from traffic? • Affect light pollution from transport associated development? • Affect road safety? • Reduce traffic congestion? • Promote modal shift to more sustainable options? • Improve accessibility and transport links to services, facilities and opportunities? • Promote an active lifestyle?	• Compliance with air quality emission level standards • Noise levels • Number of noise complaints related to transport related activities • Number of road accidents/ injuries • Access to services and facilities by public transport, walking and/ or cycling • Number of improvement schemes for pedestrian and cycle routes • % of bus fleet with facilities for accessibility for the disabled and people with impaired mobility • Modal split • Bus services running on time	Transport Malta, ERA, Ministries responsible for Energy and Health

			• Journey times • Public transport patronage • Satisfaction with local bus service • Number of schemes for improving transport coordination and integration including interchange between cycling / walking and other forms of travel • Life expectancy • Proportion of street lamps with downward beam	

[46] In a consultation meeting held with the Department of Environmental Health (at its request), it was recommended that the environmental assessment should consider also well-being.

Issue	SEA Objective	Criteria How this action will...	SEA Indicator	Data source
Water	• To maintain or improve the quantity and quality of ground and sea water • To maintain of improve rainwater harvesting capacity	• Affect Malta's groundwater, inland surface waters and coastal waters?	• Quality of the marine environment • Bathing water quality • Number of pollution incidents attributable to transport related activities • Quality of the marine environment in terms of biological and physico-chemical elements • Quality of groundwater in the vicinity of any projects related to the transport sector • % of rainwater harvested	PA and ERA, potential permit requirements Sustainable Energy and Water Conservation Unit, Malta Resources Authority, Ministries responsible for Energy and Health
Emissions to air	• To maintain or improve air quality	• Affect air quality?	• Emission trends of key pollutants (such as NO2, PM10) over time	ERA

Climatic factors and climate change	• To ensure resilience to climate change by minimising the risk of flooding and adapting to the predicted changes in weather conditions • To decarbonise transport to reduce transport related CO_2 emissions	• Affect climate change (considering in particular mitigation, adaptation renewable energy and GHGs)? • Affect reduce transport related CO_2 emissions?	• CO_2 emission trends over time • Area of land at risk of flooding • Number of projects in flood risk areas • Number of projects that feature energy efficient design and/or use of renewable energy • Proportion of felt using alternative fuel technology • Modes of transport	ERA, Transport Malta, MRA, Ministries responsible for Energy and Health
Soil	• To maintain the resource of productive soil	• Affect soil quantity and quality?	• Soil conservation in the vicinity of any projects related to the transport sector • Number of pollution incidents attributable to transport related activities • Area affected by new developments • Number of soil permits issued by the Department of Agriculture	Environmental Impact Assessment, Environmental monitoring as part of permit, Department of Agriculture

Issue	SEA Objective	Criteria How this action will...	SEA Indicator	Data source
Material assets	• To maintain and include green infrastructure as relevant • To promote better use of road space • To improve efficiency of transport networks and physical infrastructure standards	• Use green infrastructure? • Affect sustainable transport modes?	• Number of measures/ actions that include green infrastructure • Number of vehicles on the road over time • Number of schemes aiming to modernise and upgrade the transport systems	ERA, Transport Malta
Cultural heritage	• To maintain or improve the conservation status of cultural heritage sites / areas with known cultural / archaeological remains • To maintain or improve the cultural landscape, townscape or quality/ amenity of Urban Conservation Areas as relevant	• Affect cultural heritage including archaeological heritage?	• Number of developments / operations located away from cultural heritage sites / areas or areas with known cultural / archaeological remains as a percentage of the total number of operations • Number of projects targeting the improvement of the cultural landscape, townscape or quality/ amenity of Urban Conservation Areas	PA, Resources Management Unit Heritage Malta Superintendent of Cultural Heritage

Landscape	• To conserve or enhance landscape character and scenic value	• Affect landscape character and scenic value?	• Environmental Impact Assessment results on landscape assessment • Number of transport measures aimed at improving local landscape character	ERA, PA, Transport Malta

Table 81.
Table 3: SEA Environmental Objectives & Indicators for Assessing Impacts

5.2.2 ASSESSING SIGNIFICANCE

Significance is assessed in accordance with the criteria listed in Schedule 2 of the SEA Regulations, 2010. It is already well established in Environmental Impact Assessment (EIA) literature whereby significance is a function of impact magnitude and the sensitivity of receptors. Significance may be determined in a number of ways, including expert judgement, the use of thresholds, reference to legislation, and consultation with stakeholders. Although this SEA draws on each of these methods, expert judgement and consultation predominate.

The assessment of significance is based on the probability of the impact occurring, on the scale of the impact, its duration, reversibility, whether it has transboundary effects, and the certainty of impact prediction.

5.2.3 ASSESSMENT OF ALTERNATIVES

The SEA Directive requires the assessment to identify the likely significant effects on the environment of implementing the plan or programme, as well as considering reasonable alternatives, taking into account the objectives and the geographical scope of the plan or programme. Chapter 6 of the Environment Report provides an assessment of alternatives considered when developing the Master Plan.

The Transport Master Plan has considered a number of scenarios in developing the measures. The following scenarios have been considered:

- Scenario 1: Do nothing;
- Scenario 2: Do minimum;
- Scenario 3: Do-something 1; and
- Scenario 4: Do something 2.

Based on the above, the following alternatives have been assessed:

- **Scenario 1: Do nothing**: no changes to the network or implementation of any transport related actions;

- **Scenario 2: Do minimum**: minimum expected changes and those committed developments. It includes all the recently implemented and committed developments from the base-year (2014) to 2020;

- **Scenario 3: Do-something 1**: Moderate restraint in the use of private cars and increased support of public transport; and

- **Scenario 4: Do-something 2**: Stronger restraint in the use of private cars and strong support to public transport.

To summarise the assessment, the Do Nothing and the Do Minimum Option provide the least opportunity for positive environmental impacts because all the measures contained in the Strategy and the Master Plan will not be implemented. This is particularly relevant for those SEA objectives related to air quality, climate change, and population and human health. The Do Nothing and Do Minimum options are likely to result in increased congestion and little regulation in the sector which are likely to lead to increased GHG emissions, air pollution, more accidents and degradation of infrastructure. The implementation of the Do Nothing Scenario was not taken forward in the Master Plan. Instead Scenario 2 (Do Minimum) was used as the comparative for the other two scenarios.

The modelling of the three scenarios (2,3, and 4) undertaken as part of the development of the Master Plan showed that Scenario 4 is the best option, environmentally.

Scenario 4 is therefore the option that is assessed in detail in Chapter 7 of the Environment Report.

5.2.4
IMPACT ASSESSMENT

In summary, the assessment of the various operational objectives and their implementing measures has shown that positive impacts are expected in terms of the important SEA objectives related to emissions to air and climate change. The provision of facilities and infrastructure and additional soft measures to support modal shift are viewed positively and are likely to contribute to improving air quality and reducing GHG emissions from the transport sector.

The provision of facilities for cyclists, pedestrians and public transport is also considered positive in terms of supporting modal shift as well as improving transport infrastructure.

Negative impacts are expected from the implementation of infrastructure at a local level and where proposals seek to increase traffic especially in the maritime and aviation sectors. In particular, those projects located in sensitive areas such as Mgarr and Cirkewwa could have an effect on the marine Special Areas of Conservation and Special Protection Areas as relevant. Development in the ports could have potential negative impacts on nearby close sensitive receptors. Interventions in Valletta and the Grand Harbour could result in potential impacts on cultural heritage and landscape.

The assessment also concludes that no transboundary effects are anticipated form the implementation of the various operational objectives and measures because the latter are targeted towards localised infrastructure and interventions that are unlikely to yield impacts of a transboundary nature.

5.2.5
CUMULATIVE & SYNERGISTIC IMPACTS

Cumulative effects are those effects that result from incremental changes caused by other past, present, or reasonably foreseeable, actions together with the proposal. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Synergistic effects interact to produce a total effect that is greater than the sum of the individual effects.

Table 82 provides a general overview of the key issues identified for each environmental topic considered within the assessment process.

SEA Theme	Potential cumulative significant effects
Biodiversity, Flora and Fauna	Impacts on biodiversity, flora and fauna, as discussed could be potentially negative when new infrastructure is envisaged both on land and in the marine environment as for all infrastructures in general. The SEA makes specific recommendations for interventions in sensitive areas such as the marine environment at Mgarr (Gozo), Cirkewwa and Comino where protected habitats and species are found. While one of the Strategy objectives is to preserve the natural habitats and biodiversity this objective does not directly translate into any measures in the Master Plan.
Human health	The TMP is beneficial in terms of human health through measures that seek to reduce emissions through promotion of modal shift. Where noise mitigation is proposed in, for example, the aviation sector, these are also considered to contribute to human health. Negative noise impacts from proposed infrastructure such as interventions in the ports are anticipated. Improvements to road safety to reduce the number of accidents / injuries will also be accrued through the road transport operational objectives. Increased cycling and pedestrian facilities are also envisaged in the Master Plan road transport operational objectives. Public transport measures are also expected to improve public transport patronage and potentially reduce use of the private car with a consequent potential reduction in emissions.
Emissions	Emissions are targeted through several operational objectives that encourage modal shift and seek to provide infrastructure to support modal shift. The provision of pedestrian, cycling and public transport infrastructure through various measures will also positively affect emissions especially if this is coupled with a decline in car usage. The replacement of conventionally fuelled buses to electric buses will also reduce emissions. Increased air traffic (as a result of aviation measures) would be detrimental in terms of emissions, however there is potential to reduce emissions through reduced waiting times from improvements to the taxiways.
Climate change	Although there are no specific climate change mitigation or adaptation measures that specifically address a reduction in GHG emissions or proposed interventions for climate change adaptation, there are several operational objectives that target increase public transport patronage, improved facilities for cyclists and pedestrians in order to encourage modal shift. Other measures include reduction in the average age of vehicles, increase in car sharing and conversion of some conventionally fuelled buses. All are expected to contribute to reducing GHG emissions from the transport sector.

SEA Theme	Potential cumulative significant effects
Water	Fresh water is only indirectly affected by the Master Plan. While there is only one measure targeting storm water infrastructure, the SEA recommends that rainwater harvesting and storm water management infrastructure are considered at a strategic level when implementing projects on the TEN-T network. With regards to the marine environment, a number of physical interventions are envisaged both on the coast and potentially in the sea. Since the Master Plan focuses on the TEN-T network especially for ports, any projects that address intermodal objectives or internal and external maritime should be viewed holistically so that any studies required target all the infrastructure projects envisaged by the Master Plan.
Soil	The impact on soils is neutral to negative as the objectives do not directly affect soils. However, whenever infrastructure on land is proposed, the SEA recommends that soils are considered.
Material Assets	The impact on material assets is generally considered positive throughout the assessment primarily through the improvement of road space through the provision of facilities for pedestrians, cyclists and public transport. The SEA considers the sharing of road space an important component to attract modal shift away from the private car.
Cultural heritage	Cultural heritage impacts are only accrued when infrastructure projects are proposed especially in sensitive areas such as Valletta. The impacts are uncertain as artefacts may be unearthed when dredging in the marine environment or excavating on land. The planning of projects in and around the Grand Harbour and Valletta should be assessed holistically also in the context of the cultural landscape. The potential reduction in emissions especially in congested areas could have indirect positive impacts on cultural heritage buildings and monuments.
Landscape	Landscape impacts are mainly expected when infrastructure projects are proposed especially in sensitive areas. Projects that are within close proximity to designated areas should be assessed holistically for their landscape impacts.

Table 82.
Summary of cumulative environmental effects of the Transport Master Plan

5.2.6 MITIGATION & RECOMMENDATIONS

Potential mitigation measures for each of the operational objectives and the measures are described in Chapter 7 of the Environment Report. During the finalisation of the Master Plan and the Strategy, following the issuance of the Environmental Report and the public consultation, these measures should be considered. These mitigation measures are discussed below.

5.2.6.1

Meeting targets to address national and international obligations

One of the key recommendations emerging from the SEA is the need to ensure that the operational objectives and corresponding measures work towards the implementation of targets in particular with respect to GHG emissions[47]. While the assessment notes that the Master Plan has the potential to yield positive environmental effects, the assessment is based on the implementation of all the proposed measures as described in the Master Plan which favours the Do-Something 2 Scenario. The targets described in Chapter 7 of the Master plan would need to be carefully monitored over the life time of the Master plan to ensure they are being met.

5.2.6.2

Siting of new infrastructure

Certain interventions in the Master Plan will require the construction of new facilities / infrastructure. Many of the proposed mitigation measures for those measures that require upgrading of existing infrastructure or provision of new infrastructure (both marine and on land) require the consideration of biodiversity, soil, cultural heritage and landscape issues. In particular, developments within Valletta and the Grand Harbour need to assess impacts of proposed projects cumulatively across operational objectives addressing different transport modes; for example, roads and internal and external maritime objectives, especially in the formulation of Master Plans for these areas. The need for the assessment of alternatives is also highlighted in the SEA as well as the importance of including environmental considerations in feasibility studies. Other sensitive areas such as the marine environment at Mgarr and Cirkewwa should be carefully considered in view of the presence of protected habitats and species. Early consultation with competent authorities such as the Environment and Resources Authority and the Superintendence of Cultural Heritage has also been recommended for the implementation of infrastructure projects.

[47] By 2030, the goal for transport will be to reduce GHG emissions to around 20% below their 2008 level.

5.2.6.3
Specific recommendations

The Master Plan includes some measures that require the formulation of studies, master plans and action plans. While a Strategic Environmental Assessment has been carried out on the Transport Master Plan, this does not preclude other master plans to also be subject to SEA. Indeed, it is a recommendation of the SEA that other studies are subject to the relevant assessments.

All the measures that target reduction in the use of the private car and use of public transport, cycling and walking should be prioritised for implementation. Setting national targets for climate change should also be prioritised.

The SEA recommends that the implementation start date of the operational objective that aims to reduce the use of the private car is brought forward from 2030. It is further recommending that this operational objective is closely linked to addressing illegal parking and other incentives to discourage car use. Other tangible measures should be included under this objective to effectively reduce the role of the car in the urban hub.

In the measures related to development in the ports it is recommended that measures that address noise and light impacts from the current operations are considered in detail. Any expansion of facilities should address noise and other impacts that arise from port operation.

Throughout the assessment of the operational objectives, in particular in relation to provision of transport infrastructure, the SEA recommends that green infrastructure is horizontally integrated throughout the Master Plan in order to also help in achieving targets, mitigating effects and maximising use of ecosystem services. Development of new infrastructure, in particular, new roads, should ensure that during the design phase issues related to the urban heat island effect, storm water management from hard services and an improved environment for pedestrians and cyclists are considered.

5.2.7
MONITORING

Table 83 summarises the proposed monitoring plan of potential negative impacts identified in the assessment.

SEA Theme	Relevant Indicators (adapted from Table 5.1)
Biodiversity, Flora and Fauna	• Number of developments / interventions in protected areas • Number of developments / interventions in Natura 2000 sites • Number of developments / interventions on greenfield sites / undeveloped land • Number of developments/interventions resulting in habitat fragmentation • New or enhanced green infrastructure elements in urban areas • Quality of the marine environment in terms of biological and physico-chemical elements
Human health	• Emissionsfrom the transport sector • % reduction in transport derived noise levels in UCA's and tourism areas • Number of road accidents/injuries • Access to services and facilities by public transport, walking and/ or cycling • Number of improvement schemes for pedestrian and cycle routes • Modal split • Bus services running on time • Journey times • Public transport patronage • Satisfaction with local bus service • Number of schemes for improving transport coordination and integration including interchange between cycling / walking and other forms of travel

SEA Theme	Relevant Indicators (adapted from Table 5.1)
Emissions	• Litres of fuel used in transport per pkm and per inhabitant • Tonnes of PM_{10} produced by transport per time period and per inhabitant • Tonnes of NOx derived from transport • % reduction air pollutants from road transport
Climate change	• CO_2 emissions from transport per time period • Number of projects that feature energy efficient design and/or use of renewable energy • Proportion of fleet using alternative fuel technology • Modal split
Water	• Quality of the marine environment in terms of biological and physico-chemical elements • Number of pollution incidents attributable to transport related activities • Quality of groundwater in the vicinity of any projects related to the transport sector • % of rainwater falling on transport infrastructures that is harvested
Soil	• Soil conservation interventions in the vicinity of any projects related to the transport sector • Number of soil pollution incidents attributable to transport related activities • Area affected by new transport infrastructure • Number of soil permits issued by the Department of Agriculture for Transport projects

SEA Theme	Relevant Indicators (adapted from Table 5.1)
Material Assets	• Number of measures/actions that include green infrastructure • Number of vehicles on the road • Number of schemes aiming to modernise and upgrade the transport systems
Cultural heritage	• Number of developments / operations located in the immediate vicinity of cultural heritage sites / areas or areas with known cultural / archaeological remains as a percentage of the total number of operations • Number of projects targeting the improvement of the cultural landscape, townscape or quality/amenity of Urban Conservation Areas
Landscape	• Environmental Impact Assessment results on landscape assessment • Number of transport measures aimed at improving local landscape character

Table 83.
Environmental Monitoring Plan

05.3
APPROPRIATE ASSESSMENT FINDINGS

5.3.1
POTENTIAL IMPACTS IN THE LIFETIME OF THE MASTER PLAN

In terms of the impact of the Strategy and Master Plan on the Natura 2000 network, the Appropriate Assessment considers that the main sites that could potentially be affected are:

- Il-Bahar fil-Grigal ta' Malta (SAC);
- Il-Bahar tal-Lbic (SPA);
- Rdumijiet ta' Malta: Ir-Ramla tac-Cirkewwa sa il-Ponta ta' Benghisa (SAC/SPA); and
- Wied Harq Hamiem (national SAC).

Figure 6 of the AA summarises the location of potential interventions that are expected to be implemented through the Master Plan (2025) that may have an impact on Natura 2000 sites and SACs of national importance as relevant, as described below.

There are various other proposals within the Master Plan which by their nature or land requirements may result in significant impacts on SACs/SPAs, depending on their siting, location and mitigation of operational impacts. These proposals include off-street parking areas, the proposed LNG and CNG refuelling stations, reclassification of streets, etc. Project level screening and assessment will be required as the exact location of these facilities was not identified in the Master Plan, therefore an assessment at this stage was not possible.

5.3.1.1
Il-Bahar fil-Grigal ta' Malta

The Master Plan calls for studies to identify the extent of required works at Cirkewwa and Mgarr harbours, including interventions to the breakwater systems, improvement of quays and expansion of the port of Mgarr. Engineering works would then likely be required that could result in direct interventions to the seabed, spillover effects during construction, impacts to water quality during construction, underwater noise, and hydrographical effects if changes are made to the port configuration that could result in indirect impacts on habitats and species.

5.3.1.1.1
Loss of benthic habitat & associated species

Figure 3 of the AA illustrates the distribution of Posidonia within this SAC and demonstrates that this priority habitat is found around Mgarr harbour and in and around Cirkewwa. Any interventions that affect the integrity of the meadows through either direct obliteration of the habitat or through the halo effect whereby the meadows in the vicinity of interventions such as construction works suffer in terms of health and can even die off within a certain distance of the disturbance, would be considered to be a major negative impact. The benthic environment within the Mgarr port is largely coarse sediment according to MEPA's 2003 Posidonia survey. If interventions are largely contained within the port, impacts on habitats of interest would be minimised. However, interventions carried out outside the port have a greater likelihood in resulting in significant effects given that the Posidonia beds lie just outside the harbour. However, benthic surveys would be required to verify that the data gathered in 2003 remains relevant and also to identify the presence of any species of conservation interest.

5.3.1.1.2
Damage or disturbance to benthic habitats and species of conservation interest

Other impacts from engineering works could affect the seagrasses and other benthic habitats and species in the SAC. These potentially include increased turbidity and changes in water quality. The significance of effects would depend on the extent of works, their location, and duration.

5.3.1.2
Il-Bahar tal-Lbic ta' Malta

The proposals envisaged through the Master Plan suggest increased activity at the port of Marsaxlokk and include proposals to upgrade the breakwater system, square off Terminal 2, dredging, development of a service fuel station, upgrading of the access road, development of an oil terminal quay and site expansion.

5.3.1.2.1
Disturbance to seabird ecology

Already a relatively noisy operation, increased activity at the port of Marsaxlokk could have an impact on the breeding sea birds' ecology if noise levels and light pollution also increase. In order to identify the extent of such an effect, baseline levels and predicted impacts need to be compared and the impact on the seabirds considered, in particular their ecology at the site throughout the year. Careful monitoring of the seabird populations and of noise and light emissions, as well as potentially the identification of critical levels, should be aimed for to avoid potential long-term negative effects.

5.3.1.3
Rdumijiet ta' Malta: Ir-Ramla tac-Cirkewwa sa il-Ponta ta' Benghisa

The TMP proposes to replace the primary radar at Dingli.

5.3.1.3.1
Disturbance to Annex I habitats

The radar is located in the vicinity of three Annex I habitats – 5330, 5430 and 9320 (refer to the Management Plan for Rdumijiet ta' Malta: Mir-Ramla ta' Ghajn Tuffieha sa' Xaqqa). Interventions at this site could result in overspill effects that impact these habitats if appropriate mitigation is not implemented. The impacts are likely to be localised, however, and would potentially be minor to not significant in the context of the integrity of the entire SAC.

A survey for Annex II species in the area would ensure that works would be able to be planned for and scheduled in such a way as to minimise any potentially significant negative effects on species populations in the area.

5.3.1.3.2
Disturbance to seabird colonies

Considering the conservation objectives listed above, construction impacts may also result in some negative, although temporary effects on birds in particular. Appropriate mitigation measures including timing of interventions must be put in place at project stage.

5.3.1.4
Wied Harq Hamiem

The proposed road interventions in this area will occur in the vicinity of this SAC (refer to Figure 10 of the AA). However, similar to the project at Kappara Junction, TM indicates that the interventions will be confined to the existing carriageway.

5.3.1.4.1
Damage or disturbance to habitats and species of conservation interest

At this stage in the assessment, there is limited baseline data. Project level assessment including surveying would be necessary to ensure a more robust assessment. However, in general, potential impacts that may result in damage or disturbance to habitats and species populations could be accrued as a result of some or all of the following:

- Overspill during construction onto the valley;
- Noise and vibration during construction;
- Run-off during construction and operation;
- Changes to lighting during operation(considering that a road already exists);
- Changes to noise during operation (considering that road already exists); and
- Escape of species used in landscaping.

5.3.1.4.2
Damage to Harq Hamiem cave

In the absence of any detailed plans, the AA identifies the potential for damage to the cave as a result of construction activity. Damage to this unique feature would potentially be significant. Project details and further information about the cave structure would be required to reduce uncertainty. Project level assessment would be required to carefully assess localized impacts.

5.3.2
POTENTIAL IMPACTS BEYOND THE MASTER PLAN

The Master Plan identifies a list of projects to be undertaken as part of the upgrades necessary to the TEN-T network and as identified in Chapter 2 of the AA. Many of these identified projects will be implemented in future Master Plans as only four have been identified for implementation in this Master Plan. Potential impacts arising from future Master Plans will also require Strategic Environmental Assessment and Appropriate Assessment at strategic level as relevant. However, given that the list of projects was included in this Master Plan, this Appropriate Assessment identifies potential significant negative effects to be studied further at the appropriate time whereby it is also assumed that more detail will also be available.

5.3.2.1
Ghadira, Is-Simar, Il-Mizieb

The consideration of a bypass to avoid Xemxija suggests that the Natura 2000 sites of Ghadira, Is-Simar and Il-Mizieb may be affected (Figure 8 of the AA) illustrates the locations of these sites). Although not part of this 2025 Master Plan, when these interventions become higher on the agenda, it is important to note that the impacts from the construction of new roads that may pass through or adjacent to these sites are likely to result in the most significant impacts identified from the implementation of the Strategy and Master Plan, potentially resulting in a number of impacts including direct loss of habitat and species, habitat fragmentation, and disturbance to species from traffic noise and light pollution during operation. The need to consider alternatives to the proposals as summarised in the TMP must be stressed and should be considered during the Strategic Environmental Assessment of the next TMP as well as being important at project level.

5.3.2.2
Comino & Il-Bahar ta' Madwar Ghawdex

With respect to implementation of interventions along the TEN-T network, although not directly within the lifetime of this Master Plan, the reference to a Malta-Gozo fixed link is nonetheless included as an envisaged project within the transport planning framework. No further detail of what form this link will take is provided. Given the sensitivity of Comino and its location between Malta and Gozo, this assessment identifies the potential for this SAC and SPA to be significantly negatively affected.

The SPA Il-Bahar ta' Madwar Ghawdex is also noted for its importance for breeding seabirds, Calonectris diomedea and Puffinus yelkouan. Any disturbance to the ecology of these species could potentially significantly negatively affect breeding populations. The importance of these breeding colonies for these species throughout the Mediterranean region means that potential impacts could negatively affect the integrity of the populations both locally and potentially at a regional level.

Figure 8 presents the marine Natura 2000 sites in this area.

In order to allow for a more detailed assessment, further details on the proposal, including alternatives are required.

5.3.3
POTENTIAL CUMULATIVE IMPACTS OF THE MASTER PLAN

5.3.3.1
Potential cumulative impacts of the Master Plan on the marine component of the Natura 2000 network

5.3.3.1.1
Il-Bahar fil-Grigal ta' Malta

The assessment highlights the potential for cumulative impacts from implementation of a number of Master Plan measures to affect in particular the Malta-Comino-Gozo channel within this SAC. Potential impact sources within this channel identified from the Master Plan include the following measures:

- Sub-measure 2.5.4.1: Improve Mgarr and Cirkewwa Breakwater Systems;
- Sub-measures 2.5.4.2: Improve Cirkewwa South Quay;
- Sub-measure: 2.5.4.3: Improve quays and consider expansion of the Port of Mgarr.

In addition to the above measures, beyond the 2025 Master Plan, a Malta-Gozo fixed link is envisaged under the list of TEN-T projects, which may also result in impacts on the SAC. However, cumulative impacts during the lifetime of this Master Plan consider potential impacts on the benthic environment including habitats and species of conservation interest, in particular, the priority habitat – Posidonia meadows.
In addition to the proposals listed here, the Planning Authority is consulting on a Master Plan for Paceville.

Impacts from implementation of the Paceville Master Plan may affect the benthos in the area. Cumulative impacts from the proposed developments in the Malta-Comino-Gozo channel would be considered to be significant if they were to result in extensive breaches to the marine habitat network, in particular the Posidonia meadows priority habitat, which currently extends throughout much of the site exhibiting relatively high continuity. Project-level assessment will allow for more detailed qualification of the extent of potential impacts through detailed site-specific studies, which can also be assessed in terms of cumulative impacts.

As identified, the Malta-Comino-Gozo channel is important also with respect to bird species listed under the Birds Directive. Impacts on the SPAs and bird species that breed as well as species for which the channel is an important migratory route may be negatively affected as a result of these interventions. Cumulative effects would largely be expected if projects at each of the ports are timed to be carried out at the same time resulting in cumulative noise, dust and other issues. During operation, cumulative light pollution impacts would need to be assessed at project design stage in order to minimise disturbance to seabirds at night time.

5.3.3.1.2
Il-Bahar tal-Lbic ta' Malta

The following TMP sub-measures envisage development at the Freeport:

- Sub-measure 2.6.4.1: Upgrade of the breakwater system
- Sub-measure 2.6.4.2: Terminal 2 squaring off at North West side
- Sub-measure 2.6.4.7: Service fuel station
- Sub-measure 2.6.4.9: Oil terminal quay development
- Sub-measure 2.6.4.11: Assessment of MFT Master Plan – site expansion

Increased development throughout the Freeport can result in cumulative impacts both during construction if projects are implemented simultaneously, however, also key impacts in terms of the seabirds will be operational impacts. Identification of overall changes to noise and light will need to be considered also at project level to allow for the identification of potential disturbance including identifying critical capacity with respect to noise, light, etc at which point disturbance is considered to be significant.

5.3.3.2
Potential cumulative impacts on the terrestrial component of the SAC ecological network

Wied Harq Hamiem may be sensitive also to potential impacts that may arise from the implementation of the Paceville Master Plan. Impacts arising from the construction phase of various projects, including those earmarked at Villa Rosa, Corinthia, and the Institute of Tourism Studies in particular, together with road construction works may result in cumulative impacts from dust, noise and vibration and run-off as identified above.

5.3.4 MITIGATION

Mitigation measures identified for the NTS and TMP include:

- Reference should be made in the NTS and TMP text SACS and SPAs to demonstrate that their presence has been taken into account. Recognition of the requirement to avoid or where necessary reduce negative effects through appropriate mitigation measures should also be included.

- Consideration of strategic alternatives in particular where potentially significant interventions are under consideration.

This could include identification of alternative routes when considering new roads or consideration of alternative forms of transport to that where major impacts on SACs and SPAs are considered to be likely;

- Implementation of a monitoring plan; and
- Additional assessment at planning and project level assessment as more details become available. All plans or projects emerging from the implementation of this Strategy and Master Plan that lie within or in the vicinity of a SAC or SPA should be screened to determine whether an Appropriate Assessment is required.

5.3.5
RESIDUAL IMPACTS

The residual impacts resulting from implementation of the Strategy and Master Plan will depend on the implementation of the mitigation measures identified above. If major projects that cumulatively will affect marine benthic habitats are all pursued, and at the same time in particular all the projects earmarked in the Strategy, assessment of project level mitigation would be required. However, without project level details, it is considered that all residual impacts remain uncertain.


DIESEL

06

PREFERRED OPTION

This chapter is aimed at identifying a single policy scenario of measures, as a preferred way forward based on traffic, socioeconomic and environmental considerations. The performance of each scenario in the afore-mentioned three aspects is detailed in Chapter 4.

Four scenarios were analysed: Do-Nothing, Do-Minimum, Do-Something 1 and Do-Something 2. However, the Do-Minimum scenario was regarded as the reference scenario for the Do-Something scenarios and is clearly not a preferred option. The Do-Something 1 scenario comprises measures of moderate restraint in the use of private cars and increased support of public transport and alternatives modes, whereas the Do-Something 2 proposes a strong restraint in the use of private cars and strong support to public transport and alternative modes.

The transport model allows for assessing how the traffic would react to different changes in the transport network and services. In particular, the model illustrates how congestion, modal split, and external impacts of traffic would change between scenarios.

The congestion in the main corridors of Malta decreases in the Do-Something scenarios in comparison with the Do-Minimum scenario. In particular, congestion is avoided in most sections of the five radial roads connecting Valletta with the rest of the island, as well as in almost the entire Comprehensive TEN-T corridor. Nevertheless, in both Do-Something scenarios there are still some congested sections; in general, the road network in the Do-Something 2 scenario presents lower congestion levels than in the Do-Something 1 scenario (see the following two figures), which can be appreciated in the following sections:

- Sliema sea front, from Triq ix-Xatt to Triq it-Torri
- Triq Marina
- Triq Dicembru 13, from Marsa-Hamrun by pass to Triq-Nazzjonali
- Triq Regjonali, between Mriehel bypass and Triq Il-Ferrovija
- Triq Il-Wied ta' l-iMsida, in the proximity of its connection with Triq Regjonali
- Triq Mikiel Anton Vassalli, between Triq tas-Sliema and Triq Birkirkara
- Proximity of the connection between Triq Dun Karm, Triq in-Naxxar and Triq il-Kbira
- Triq Ghajn Dwieli, from Triq il-Bacir to Triq San Gwann Ghuxa
- Triq Il Mina ta' Hompesch, from Triq Il-Foss to Triq Villabate

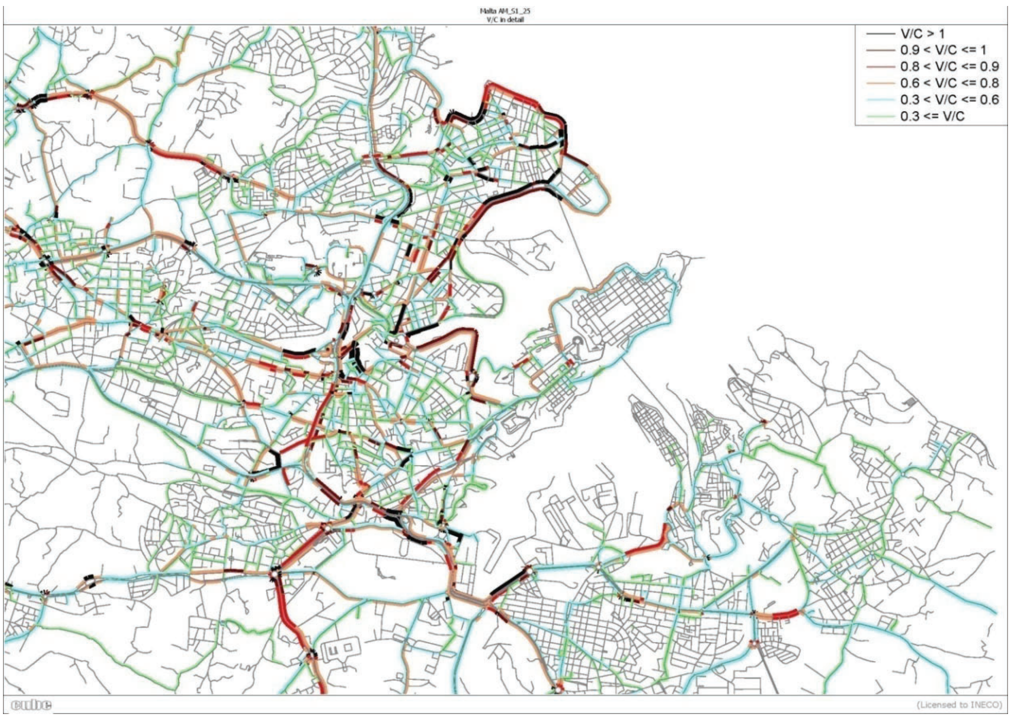


Figure 161.
AM Volume/Capacity within the Inner-Harbour Region, Do-Something 1, 2025 (NTM)

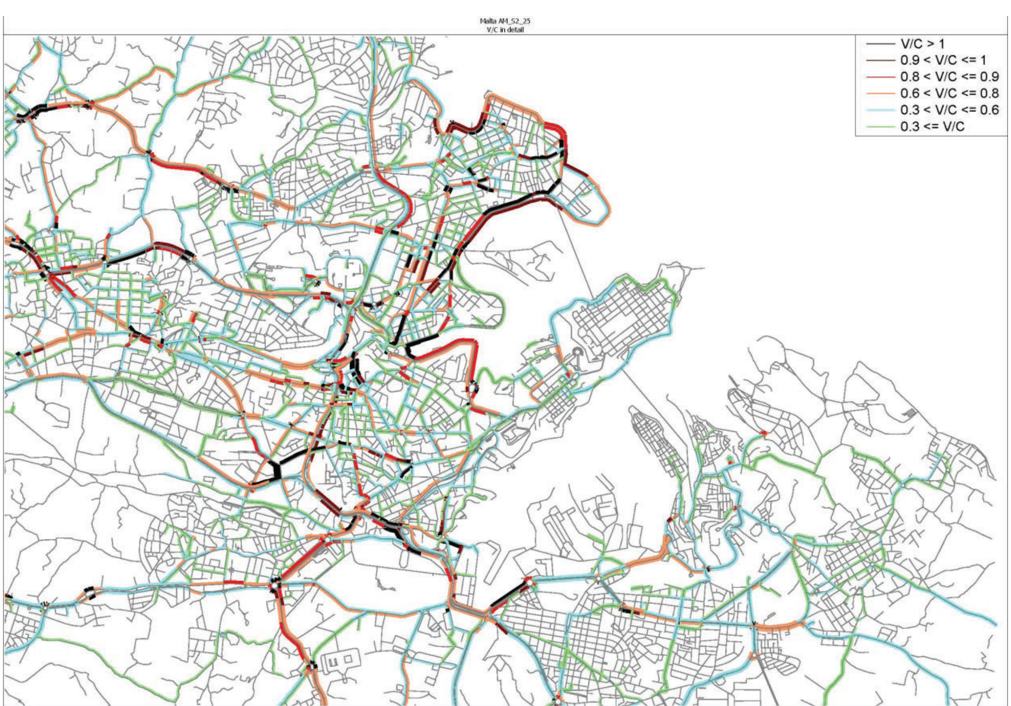


Figure 162.
AM Volume/Capacity within the Inner-Harbour Region, Do-Something 2, 2025 (NTM)

With respect to modal split, the public transport participation increases from 16% - Do-Minimum scenario - to 18.1% in the Do-Something 1 scenario, and to 20.3% in the Do-Something 2 scenario. It has to be noted that these figures are not completely comparable to the public transport share in other European cities, since the scope of analysis here is beyond a metropolitan area. The increase in the public transport share correlates to a decrease in private car usage, since the share of Other modes is very similar in the three scenarios.

The change in the modal split turns into an increase in the distance travelled by public transport users of 26% and 50% in the Do-Something scenario 1 and the Do-Something 2 scenario, respectively, and a decrease in the distance travelled by private car users of -3% and -7%.

The modelling of the Do-Minimum and Do-Something scenarios depicts that the Do-Something 2 scenario is the best option, environmentally. It is noted, however, that the differences in the mix of measures between Do-Something 1 and 2 is relatively small and this is reflected in relatively small differences in environmental performance of the two scenarios:

- The Do-Something 2 scenario represents a saving of -18% in congestion cost in comparison with the Do-Minimum scenario, whereas the Do-Something 1 scenario represents a -8% saving. Therefore, the congestion cost decreases from €580 million in the Do-Minimum scenario to €474 million in the Do-Something 2 scenario.

  The lost time per passenger and annum decreases from 29.6 h/year in the Do-Minimum scenario to 27.4 h/year in the Do-Something 1 scenario, with it reaching the lowest value in the Do-Something 2 scenario – 24.5 h/year.

- The decrease in the modal share of private cars leads to a reduction in the number of vehicle-kilometres, which is usually associated with lower number of accidents. According to the estimate carried out in this Master Plan, the Do-Something 2 scenario would involve a saving of -17% in the costs of accidents against a -8% obtained with the Do-Something 1 scenario. The Do-Minimum scenario would have a cost of accidents of €111 million.

- The monetisation of the CO_2, PM and NO_x emissions produced by road transport shows a cost of €24 million in the Do-Minimum scenario. The Do-Something 1 scenario would allow for a €1.8 million saving, whereas the Do-Something 2 scenario would save €3.7 million. The following table depicts the emissions produced in each scenario, as well as the emission savings of the Do-Something scenarios in comparison with the Do-Minimum scenario.

Air pollutants emissions

Scenario	CO [tons/year]	PM [tons/year]	NOx [tons/year]	NMVOC [tons/year]
Do-Minimum	8,234	63.7	1,236	1,410
Do-Something 1	7,448 (-9.5%)	60 (-5.8%)	1,149 (-7.0%)	1,276 (-9.5%)
Do-Something 2	6,648 (-19.3%)	55 (-13.7%)	1,056 (-14.6%)	1,139 (-19.2%)

Figure 84.
Estimation of yearly production of air pollutants, 2025 (NTM; Elaboration)

The Cost Benefit Analyses (CBA) of both Do-Something scenarios show that the benefits of both packages of measures are higher than their costs over a thirty-year period. Two main indicators were determined: the Economic Internal Rate of Return (EIRR) and the Benefit to Cost Ratio (BCR). Both scenarios present EIRR higher than the social discount rate established by the EU guidance for CBAs carried out in cohesion countries during the programming period 2014-2020 – 5.% - and BCR higher than one. Nonetheless, the Do-Something 2 scenario shows more positive results from a social welfare point of view: BCR of 4.8 and EIRR of 24.5%. The table below includes the results of both scenarios.

Considering the above-mentioned results, the Do-Something 2 scenario is being put forward in the transport master plan as the preferred policy scenario option. This scenario would not only see a stronger shift to public transport modes of travel, but also show higher economic benefits and much better environmental performance than Do-Something 1.

CBA

Scenario	ENPV [€m]	EIRR	BCR
Do-Something 1	992.1	12.9%	2.6
Do-Something 2	2,262.0	24.5%	5.1

Figure 85.
Economic indicators, DS1 and DS2 scenarios. (Elaboration)

07

TARGETS, DELIVERY & TIMELINES

This chapter sets out the details of delivery of this Transport Master Plan indicating the costs summarised by mode, and financial periods 2016-2020 and 2021-2025 (the two periods considered in this master plan).

All costs indicated below are indicative and subject to project approval and funding provision by the Ministry for Finance. Figures for EU / National Funds are those measures which may include project that we expect would be eligible for EU funding (CEF, ESIF and other centralised or decentralised funding streams).

Figures indicated under "Private Sector" are those funds that are expected to be expended by the Private Sector, including government owned companies such as Malta Air Traffic Services Ltd. A number of these funds could be eligible for support under the European Funds for Strategic Investments and/or the various Financial Instruments available under the EU financial programmes.

Appropriate applications for funding by project would need to be prepared in all cases.

07.1 TRANSPORT MASTER PLAN 2025 TARGETS AS RELATED TO THE NATIONAL TRANSPORT STRATEGY 2050

The targets defined in the National Transport Strategy have been further cascaded to the Transport Master Plan as shown in Table 86 to Table 91 below.

Figure 86.
Transport Master Plan Targets relating to the Economic Development Strategic Goal

Transport Master Plan 2025 Targets

			Master Plan Target	**Strategy Target**
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Economic Development	TEN-T Core Network (20.8km) – length completed	14.4km	19km	20.8km
	TEN-T Comprehensive Network (92.4km) – length completed	29.8km	46.0km	60.9km
	Bus Average Speed at AM Peak	14.8km/h	17.5km/h	20km/h

Transport Master Plan 2025 Targets

			Master Plan Target	Strategy Target
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Environmental & Urban Sustainability	Conventionally fuelled cars	99.9%	80%	50%
	Zero emission urban logistics	<1%	50%	95%
	Average Age of Passenger Cars [to 2014 EU average]	13.6yr	11.5yr	8.5yr
	Non-ETS Greenhouse House Gas emissions from Transport*	532 ktCO_2 equiv.	527 ktCO_2 equiv.	525 ktCO_2 equiv.

** subject to change due to ongoing analysis of CO_2 emissions from transport*

Figure 87.
Transport Master Plan Targets relating to the Environmental & Urban Sustainability Strategic Goal

Transport Master Plan 2025 Targets

			Master Plan Target	Strategy Target
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Accessibility and Mobility	Modal Share (car drivers) [back to 1990 level]	57%	47%	41%
	Public Transport Boarding's	43.7m	47.0m	50.2m

Figure 88.
Transport Master Plan Targets relating to the Accessibility and Mobility Strategic Goal

Transport Master Plan 2025 Targets

			Master Plan Target	Strategy Target
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Social Development and Inclusion	Percentage of population that are >15min on foot from nearest bus stop	4%	3.4%	3%

Figure 89.
Transport Master Plan Targets relating to the Social Development and Inclusion Strategic Goal

Transport Master Plan 2025 Targets

			Master Plan Target	Strategy Target
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Safe and Secure	Road Accident Grievous Injuries	292 (2014)	235	204
	Road Accident Fatalities	17	9	8

Figure 90.
Transport Master Plan Targets relating to the Safe and Secure Strategic Goal

Transport Master Plan 2025 Targets

			Master Plan Target	Strategy Target
Strategic Goal	**Indicators**	**2015**	**2025**	**2030**
Improved Public Health	Modal Share of non-motorised trips (journeys more than 5min at AM peak)	8%	11%	15%

Figure 91.
Transport Master Plan Targets relating to the Improved Public Health Strategic Goal

07.2
COSTS FOR DELIVERY OF THIS MASTER PLAN

7.2.1
COSTS BY MODE

At the highest level of analysis, Table 92 summarises the possible costs of the implementation requirements of this Transport Master Plan.

Cost of delivery of this Transport Master Plan by Mode 2016-2025 (€'000)

Source of Funds	National		EU /National Funds*		Private Sector		Total	
Scenario	**DS1**	**DS2**	**DS1**	**DS2**	**DS1**	**DS2**	**DS1**	**DS2**
Road	21,910	22,610	442,520	356,870	250	250	464,680	379,730
Public Transport	6,340	11,440	-	-	600	600	6,940	11,940
Intermodal Transport	1,110	1,110	7,300	7,300	10	10	8,420	8,420
Internal Maritime	2,070	2,070	20,700	27,000	1,100	1,100	23,870	30,170
External Maritime	59,900	59,900	13,500	13,500	83,000	84,700	156,400	158,100
Aviation	6,785	6,785	-	-	31,280	31,300	38,065	38,085
Common to All Modes	2,000	2,000	-	-	-	-	2,000	2,000

** These represent total eligible and non-eligible costs for measures that could be eligible for EU funding*

Figure 92.
Summary of Costs of delivery of Transport Master Plan by mode (2016-2025)

7.2.2
COSTS BY 5-YEAR PERIOD

Table 93 summarises the total possible costs of the implementation requirements of this Transport Master Plan over two budgetary cycles – that of 2016 to 2020, and also for 2021 to 2025.

Cost of delivery of this Transport Master Plan by Period (€'000)

Source of Funds	National		EU /National Funds*		Private Sector		Total	
Period	**DS1**	**DS2**	**DS1**	**DS2**	**DS1**	**DS2**	**DS1**	**DS2**
2016-2020	32,595	33,395	95,220	101,670	94,740	96,440	222,555	231,505
2021-2025	67,520	72,420	388,800	303,000	21,500	21,520	477,820	396,940

** These represent total eligible and non-eligible costs for measures that could be eligible for EU funding*

Figure 93.
Summary of Costs of delivery of Transport Master Plan by Period (2016-2025)

07.3
TIMELINES, ENVIRONMENTAL IMPACT AND STATE AID ASSESSMENT FOR EACH MEASURE

The master plan measures have been analysed and summarised in Table 94 to show the expected timelines. The table also includes a high level analysis of possible environmental and state aid issues. Detailed consideration of the environmental aspects has been detailed in Chapter 5. These have been marked as No, Yes or possible positive (Poss. +) or possible negative (Poss. -) impacts. The list below is the final list of measures to be considered under this Master Plan for the period up to 2025.

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding

Road

2.2.1	**IMPROVE INTEGRATED AND LONG TERM STRATEGIC TRANSPORT PLANNING AND DESIGN**														
	2.2.1.1	Implement and monitor the long term integrated national transport strategy and short and medium term transport master plan											No	No	National
	2.2.1.2	Develop a framework with the spatial planning process to integrate land use and transport planning policies and move towards transit oriented development											No	No	National
	2.2.1.3	Master Plan for Mriehel Area											No	No	National
	2.2.1.4	Master Plan for Paceville, St Julian's											No	No	National / Private
	2.2.1.5	Master Plan for Sliema											No -	No	National / Private
	2.2.1.6	Develop a framework to ensure that transport projects are developed by interdisciplinary teams to maximize opportunities for sustainable development											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
	2.2.1.7	Improve co-ordination and planning with service utility infrastructure authorities											No	No	National / Private
	2.2.1.8	Carry out a national household travel survey by 2020											No	No	National
	2.2.1.9	Develop a framework for collating mobility data focusing on further analysis of multipurpose trips and efficient mobility											No	No	National
2.2.2	**PROVIDE ALTERNATIVES TO PRIVATE VEHICLES TO ENCOURAGE SUSTAINABLE TRAVEL PATTERNS AND REDUCE PRIVATE VEHICULAR DEMAND IN THE CONGESTED "HUB" AREA**														
	2.2.2.1	Develop awareness campaigns to improve the understanding of transportation aspects											No	No	National
	2.2.2.2	Develop and incentivise schemes to promote multiple occupancy and alternative modes as well as to reduce the need to travel in peak hours											Yes	No	National

	2.2.2.3	Set up a multi-organisational team to develop a pedestrian infrastructure plan focussing on the “hub”											No	No	National
	2.2.2.4	Develop a cycling strategy focussing on the “hub”											Poss. +	No	National
	2.2.2.5	Develop pilot cycle corridors between Valletta and: i) St. Julian’s, Sliema; ii) Three Cities and Fgura, and iii) between villages											Poss. +	No	National
	2.2.2.6	Develop a national bicycle / e-bicycle sharing scheme											Poss. +	No	National / Private
	2.2.2.7	Develop a framework for the introduction and implementation of Sustainable Urban Mobility Plans (SUMPS) in Malta and Gozo											No	No	National

2.2.3	**REDUCING THE ROLE OF THE CAR IN THE BUSY CONGESTED URBAN ‘HUB’**														
	2.2.3.1	Develop a comprehensive parking management system to create a better balance between off-street and on-street parking											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.2.4	**REDUCE THE IMPACT OF HIGH POLLUTING VEHICLES IN INNER CONGESTED URBAN AREAS AND ON THE TEN-T NETWORK**														
	2.2.4.1	Study the potential to Introduce low emission zones in dense and polluted urban areas											Poss.+	No	EU / National
	2.2.4.2	Study the potential to introduce further financial differential incentives to reduce the average age of vehicles											Poss.+	No	National
	2.2.4.3	Introduce further fiscal measures and incentives to favour the purchase and use of clean fuel vehicles											Poss. +	No	National
	2.2.4.4	Continue implementing the electro-mobility action plan											Poss. +	Poss.	EU / National
	2.2.4.5	If feasible, implement LNG refuelling stations for land transport by 2025 along the TEN-T core network											Poss. +	Poss.	EU / National
	2.2.4.6	Implement CNG refuelling stations for land transport by 2025 along the TEN-T Core network											Poss. +	Poss.	National

2.2.5	**REDUCE THE IMPACT (SOCIAL, ENVIRONMENTAL AND ECONOMIC) OF VEHICLES IN URBAN AREAS**														
	2.2.5.1	Develop a policy framework and design guidelines to create a balanced approach to different modes in urban streets and public space											No	No	National
	2.2.5.2	Develop mitigation measures so as to reduce the impact of noise levels in urban areas UCA's and tourism areas											Poss. +	No	EU / National
	2.2.5.3	Introduction of electric Buses in Gozo											Poss.	Yes	EU / National
	2.2.5.4	Develop design guidelines for the development of Shared Space and Home Zones											No	No	National
	2.2.5.5	Set up a Sustainable Mobility Unit within Transport Malta to work with Local Councils in the redesign of local streets											No	No	National
	2.2.5.6	Develop a Funding Programme for the redesign/refurbishment of Local Street according to the Design Guidelines for Urban Streets and Home Zones											No	No	EU / National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.2.6	**REDUCE THE IMPACT OF HGVs ON URBAN AREAS AND THE ROAD NETWORK**														
	2.2.6.1	Review and update the policy framework for the regulation, monitoring and enforcement of HGV's											No	No	National
	2.2.6.2	Introduce provision of safe off-street overnight parking areas for heavy vehicles											No	No	EU / National
	2.2.6.3	Develop an action plan for the management and regulation of freight transport and 'last mile' urban logistics											No	No	EU / National
2.2.7	**ENSURE A HIGH LEVEL OF SERVICE ON THE TEN-T CORE AND COMPREHENSIVE NETWORK**														
	2.2.7.1-1	TEN-T Core and Comprehensive network – Marsa (RD1)											Poss. -	No	EU / National
	2.2.7.1-2	TEN-T Core and Comprehensive network –Kappara (RD2)											Poss. -	No	EU / National
	2.2.7.1-3	TEN-T Core and Comprehensive network – Marsa-Qormi (RD3)											Poss. -	No	EU / National

	2.2.7.1-6	TEN-T Core and Comprehensive network – Paceville (RD6)											Poss. -	No	EU / National
	2.2.7.1-10	TEN-T Comprehensive Network - Malta-Gozo Fixed Link Studies											Poss. -	Poss.	EU / National

2.2.8	**IMPROVE THE FUNCTIONALITY OF STRATEGIC ROADS PROVIDING SECONDARY CONNECTIVITY AND IMPROVING THE QUALITY OF URBAN AREAS**														
	2.2.8.1	Review and clarify the road network classification											No	No	National
	2.2.8.2	Classify route 120 (from Tal-Balal to Birguma) according to its design and build as a distributor road											No	No	National
	2.2.8.3	Improve provision for pedestrians, cycling and public transport and change functionality of ND9 (Naxxar/Gharghur) to ED1 (San Gwann)											Poss. +	No	National
	2.2.8.4	Improve provision for pedestrians, cycling and public transport and change functionality of route 127 (St. Julian's to Ta' Xbiex)											Poss. +	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
	2.2.8.5	Improve provision for pedestrians, cycling and public transport and change functionality of EA16 (University Skate park) – ED3 – ED3a (Msida) – ED4 – EA5 (Portes de Bombes)											Poss. +	No	National
	2.2.8.6	Improve provision for pedestrians, cycling and public transport and address conflicting traffic flows and urban activity at WD11 (Zebbug) – WA13 (Qormi)											Poss. +	No	National
	2.2.8.7	Review the strategic functionality of route 132 (Marsa Race Course Road) between the Core TEN-T network and the Park & Ride to improve accessibility for active and public transport modes											Poss. +	No	National
	2.2.8.8	Improve provision for pedestrians, cycling and public transport to encourage modal shift on the road section WD18 to WA24 (tunnel under runway)											Poss. +	No	National

2.2.9	**ENSURE EFFECTIVE AND EFFICIENT MANAGEMENT OF ROADS AND RELATED EQUIPMENT ENSURING QUALITY AND SUSTAINABILITY OF INVESTMENT THROUGH REGULAR MAINTENANCE**														
	2.2.9.1	Set up an asset management system and asset management plan for the road network											No	No	National
	2.2.9.2	Increase the implementation of service culverts and storm water management in local roads											Poss. +	No	National
	2.2.9.3	Develop an action plan to improve the quality of street furniture and information											No	No	National
	2.2.9.4	Review and update road specifications and standards											No	No	National

2.2.10	**IMPROVE ROAD SAFETY THROUGH BETTER RESEARCH, ENGINEERING, EDUCATION AND ENFORCEMENT**														
	2.2.10.1	Implement the Road Safety Strategy											No	No	National
	2.2.10.2	Improve the overall EuroNCap rating of the Maltese vehicle fleet											No	No	National
	2.2.10.3	Develop design guidelines for safety measures with respect to designing for e-bicycles, bicycles and motorcycles											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
	2.2.10.4	Develop bridge and tunnel management system			■	■	■	■	■				No	No	National
2.2.11	ENSURE SAFE AND EFFICIENT TRAFFIC MANAGEMENT TO OPTIMISE THE USE OF EXISTING INFRASTRUCTURE														
	2.2.11.1	Increase use of Intelligent Transport Systems in traffic management (ITS3)		■	■	■	■	■	■	■			Poss. +	No	EU / National
	2.2.11.2	Pilot and analyse the potential for introducing tidal lanes	■	■	■	■	■						Poss. +	No	National
	2.2.11.3	Develop a framework for the national co-ordination and management of road works, road closures, road side maintenance and cleaning	■	■	■	■	■	■	■	■	■	■	No	No	National
	2.2.11.4	Introduce transport modelling and GIS in planning diversion routes for road works (ITS2)	■	■	■	■	■						No	No	EU / National
	2.2.11.5	Review and update traffic management guidelines to improve traffic management and safety during road works	■	■	■	■	■						No	No	National

	2.2.11.6	Improve event management planning to improve coordination and traffic management for events											Poss. +	No	National
	2.2.11.7	Develop incident management plans											Poss. +	No	National
2.2.12	**IMPROVE THE EFFECTIVENESS OF ENFORCEMENT OF ROAD TRANSPORT REGULATIONS**														
	2.2.12.1	Increase presence and effectiveness of traffic police											No	No	National
	2.2.12.2	Review of Speed Camera System											No	Poss.	National
	2.2.12.3	Introduce technology to reduce labour intensive enforcement (red light and bus lane cameras)											No	No	National
	2.2.12.4	Increase roadside checks and roadworthiness testing											No	No	National
	2.2.12.5	Review enforcement fine levels											No	No	National
	2.2.12.6	Review regulatory system to give enforcement officers more authority											No	No	National
	2.2.12.7	Introduce weighbridges at maritime terminals											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding

Public Transport

2.3.1	**IMPROVE SERVICE QUALITY AND MODAL SHARE ALONG STRATEGIC ROUTES BY INTRODUCING PUBLIC TRANSPORT QUALITY CORRIDORS**														
	2.3.1.1-1	Implement Public Transit Quality Corridors (PTQC) (Sliema-Msida-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.1-2	Implement Public Transit Quality Corridors (PTQC) (Tarxien-Fgura-Marsa-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.1-3	Implement Public Transit Quality Corridors (PTQC) (Mosta-Birkirkara-Msida-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.1-4	Implement Public Transit Quality Corridors (PTQC) (Naxxar-Birkirkara-Hamrun-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.1-5	Implement Public Transit Quality Corridors (PTQC) (Mosta-Birkirkara-University-Msida)											Poss. +	No	EU / National

	2.3.1.1-6	Implement Public Transit Quality Corridors (PTQC) (Attard-Birkirkara-Hamrun-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.1-7	Implement Public Transit Quality Corridors (PTQC) (Qormi-Hamrun-Valletta)											Poss. +	Poss.	EU / National
	2.3.1.2	Develop a programme to upgrade main boarding bus stops											No	No	National
	2.3.1.3	Make better use of electronic data collected by the bus operator to quickly adapt bus routes timetables and combined frequencies to temporal and seasonal demand changes and identify additional PTQC											Poss. +	No	National
	2.3.1.4	Improve enforcement of PTQC through greater deployment of technology											Poss. +	No	National / Private
	2.3.1.5	Develop and publish comprehensive route information											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.3.2	**IMPROVE PUBLIC TRANSPORT SERVICE QUALITY TO AND BETWEEN STRATEGIC EMPLOYMENT NODES, SERVICES OUTSIDE THE INNER HARBOUR REGIONS AND PERIPHERAL RESIDENTIAL AREAS**														
	2.3.2.1	Optimise use of existing Park and Ride facilities and develop new sites at strategic locations to encourage modal interchange											Poss. +	No	National
2.3.3	**EXPLORE OPPORTUNITIES TO MOVE TOWARDS TRANSIT ORIENTED DEVELOPMENT**														
	2.3.3.1	Analyse accessibility (PT) index for all transport zones and improve transit provision in relation to current development patterns											No	No	National
2.3.4	**IMPROVE PHYSICAL ACCESSIBILITY OF PUBLIC TRANSPORT SERVICE**														
	2.3.4.1	Provide more accessible bus infrastructure in residential areas and commercial centres											No	No	National
	2.3.4.2	Increase enforcement of illegal parking and ensure proper use of bus bays											No	No	National

2.3.5	**IMPROVE THE QUALITY OF THE ENVIRONMENT AT PRIMARY AND SECONDARY PUBLIC TRANSPORT HUBS**														
	2.3.5.1	Carry out a quality audit of existing public transport hubs											No	No	National
	2.3.5.2	Improve the environment and accessibility at Valletta public transport hub											No	No	EU / National
	2.3.5.3	Explore alternative forms for financing of public transport infrastructure											No	No	National
2.3.6	**IMPROVE AVAILABILITY AND QUALITY OF UNSCHEDULED PUBLIC TRANSPORT FOR SCHOOLS**														
	2.3.6.1	Review school transport services to identify issues and strategic interventions											No	No	National
2.3.7	**REDUCE THE IMPACT OF CLUSTERING OF UNSCHEDULED PUBLIC TRANSPORT PARTICULARLY IN TOURISM HOT-SPOTS AND COMMERCIAL AREAS**														
	2.3.7.1	Review and improve policies for traffic management, demand management and operations of unscheduled public transport											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.3.8	**IMPROVE SUPPLY OF ALTERNATIVE FORMS OF SCHEDULED PUBLIC TRANSPORT**														
	2.3.8.1	Continue the planning and development of a Mass Rapid Transit system with a view to establishing a detailed proposal for public consultation											No	No	National
	2.3.8.2	Create a framework for introducing demand responsive transport											No	No	National

Intermodal

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.4.1	**IMPROVE INTERMODAL SEAMLESS MOBILITY (TRAVEL INFORMATION, JOURNEY PLANNING SERVICES AND MULTI-MODAL TICKETING)**														
	2.4.1.1	Encourage operators of public transport to integrate and coordinate their operations of ticketing information and journey planning											No	No	EU / National
	2.4.1.2	Facilitate the development of a real time multi-modal journey planner											No	No	EU / National

2.4.2	**DEVELOP TRANSPORT HUBS TO ENCOURAGE INTERMODALITY**														
	2.4.2.1	Improvement of the existing ferry landing places											No	No	EU / National
	2.4.2.2	Study options available to improve wave climate in the Port of Marsamxett											No	No	EU / National
	2.4.2.3	Assess potential and implement new ferry landing places											No	No	EU / National
	2.4.2.4	Improve the vertical and pedestrian connectivity between the Sliema-Valletta ferry service in Valletta and the city centre											No	No	National
	2.4.2.5	Provide and regulate space for use of bicycles											No	No	National

2.4.3	**IMPROVE LOGISTICS AND URBAN DISTRIBUTION OF GOODS IN THE MULTI-MODAL CHAIN BETWEEN PORTS, AIRPORT AND HINTERLAND**														
	2.4.3.1	Improve the management and regulation of freight transport and urban logistics											No	No	National
	2.4.3.2	Set up a national freight forum to improve urban logistics											No	No	National / Private
	2.4.3.3	Establish freight routes from ports that utilise appropriate roads for their weight and dimensions											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding

Internal Maritime

2.5.1	**ENSURE DEVELOPMENTS IN PORTS ARE BACKED UP BY LONG-TERM PLANNING TO SUPPORT LONG TERM MOBILITY PATTERNS, SAFETY AND SECURITY**														
	2.5.1.1	Review the financial sustainability of the Malta-Gozo link, including operations, maintenance and asset replacement to develop a business model that minimises the need of government financial support											No	No	National
	2.5.1.2	Improve the framework for collation, analysis and dissemination of meteorological and hydrographic data to support planning, design and operations of internal maritime transport											No	No	National
	2.5.1.3	Introduce maritime weather stations in ports to record trends which are necessary for planning and design											No	No	National

	2.5.1.4	Assess the potential for underutilised port areas to be used for internal transport / Master Plan for Secondary Ports											No	No	National
2.5.2	**IMPROVE OPERATIONS AND ENFORCEMENT SO THAT INTERNAL MARITIME TRANSPORT IS PROPERLY REGULATED AND MONITORED**														
	2.5.2.1	Introduce AIS on commercial vessels operating in internal ports											No	No	National / Private
	2.5.2.3	Improve visual information about vessel movement and location for traffic management											No	No	EU / National
2.5.3	**ENSURE USERS COMPLY WITH CONDITIONS ESTABLISHED FOR PUBLIC ACCESSIBLE MARITIME FACILITIES AS SPECIFIED IN CONTRACTS FOR USE OF THESE INFRASTRUCTURES**														
	2.5.3.1	Establish clear guidelines with the port infrastructure users for operators to be aware of and use infrastructure within design limits											No	No	National
	2.5.3.2	Monitor and carry out enforcement on operators who make incorrect use of the infrastructure											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.5.4	**REMOVAL OF BOTTLENECKS AT TEN-T COMPREHENSIVE PORTS**														
	2.5.4.1	Improve Mgarr and Cirkewwa breakwater systems											Yes -	No	EU / National
	2.5.4.2	Improve Cirkewwa South Quay											No	No	EU / National
	2.5.4.4	Development of the landing places for the ferry service (including freight and high speed ferry) to/from Gozo											Poss. -	No	EU / National
	2.5.4.5	Re-introduction of an express ferry link between Malta and Gozo											No	No	National / Private
	2.5.4.6	Consider measures to improve wave climate in the Port of Marsamxett											No	No	National

External Maritime

2.6.1	**ENSURE CONTRACTED PARTIES COMPLY WITH CONDITIONS ESTABLISHED FOR THE OPERATION IF MARITIME FACILITIES AND AS SPECIFIED IN CONTRACTS FOR USE OF THESE INFRASTRUCTURES**														
	2.6.1.1	Develop contract management system to ensure Government obtains value for money											No	No	National

	2.6.1.2	Develop infrastructure asset management data base systems (including the milestones of contract and inspections to check whether or not they are met)											No	No	National
2.6.2	**ENSURE DEVELOPMENT OF PORTS AND CONTIGUOUS AREAS ARE BACKED UP BY LONG-TERM PLANNING TO SUPPORT SUSTAINABLE GROWTH IN LONG TERM MOBILITY PATTERNS, RESILIENCE, SAFETY AND SECURITY**														
	2.6.2.1	Develop 10-year port master plan designating future land uses – TEN-T Core port of Valletta											No	No	National
	2.6.2.2	Develop 10-year port master plan designating future land uses – TEN-T Core port of Marsaxlokk											No	No	National
2.6.3	**REMOVAL OF BOTTLENECKS IN THE TEN-T CORE PORT OF VALLETTA**														
	2.6.3.1	Deep Water Quay Phase II											Poss. -	Poss.	National
	2.6.3.2	Improvement of harbour wave climate											Poss.	No	EU / National
	2.6.3.3	New cargo infrastructure in the Port of Valletta											Poss.	Poss.	EU / National
2.6.4	**REMOVAL OF BOTTLENECKS IN THE TEN-T CORE PORT OF MARSAXLOKK**														
	2.6.4.1	Upgrade of the breakwater system											Yes -	No	National
	2.6.4.2	Terminal 2 squaring off of north-west side (9)											Poss. -	No	Private

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.6.4	2.6.4.3	Procurement of 2 super post panamax cranes (10)											Yes -	No	Private
	2.6.4.4	Dredging of all mainline berths to 20m											Yes -	No	Private
	2.6.4.5	Investment in IT systems											No	No	Private
	2.6.4.6	Development of engineering facilities (6)											No	No	Private
	2.6.4.7	Service fuel station											No	No	Private
	2.6.4.8	Upgrade of south road access to Freeport											No	Poss.	EU / National
	2.6.4.9	Oil terminal quay development											Poss. -	No	Private
	2.6.4.10	Petroleum product discharge point replacement											Poss. +	Poss.	National
	2.6.4.11	Assessment of MFT master plan - site expansion											No	No	National
2.6.5	**ENSURE EQUIPMENT, TOOLS AND HUMAN RESOURCES FOR THE USE, MONITORING AND ENFORCEMENT OF MARITIME AREAS ARE UPDATED AND TO IMPROVE SAFETY AND SECURITY**														
	2.6.5.1	Research new sources of funding to deal with monitoring requirements											No	No	National

2.6.5	2.6.5.2	Ensure equipment and tools for the monitoring and enforcement of maritime areas are updated and enable the required regulatory control to ensure safety and security											No	No	National
	2.6.5.3	Upgrade VTMIS to monitor and enforce maritime areas to ensure safety and security											No	No	EU / National
	2.6.5.4	Upgrade ICT tools to interchange information with port stakeholders and operators to ensure safety and security of maritime areas											No	No	National

2.6.6	**REDUCE THE ENVIRONMENTAL IMPACT OF PORTS ON THE NEARBY URBAN AREA**														
	2.6.6.1	Check that port infrastructures and operations comply with the conditions established in the environmental impact assessment											No	No	National
	2.6.6.2	Implement new pollution mitigation measures											Yes +	No	National
	2.6.6.3	Support the use of less polluting equipment											Yes +	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.6.7	**PROVIDE ALTERNATIVE FUEL INFRASTRUCTURE TO PROMOTE EFFICIENCY AND COMPETITIVENESS**														
	2.6.7.1	Develop an LNG deployment action plan for the TEN-T Core ports											No	No	National
	2.6.7.2	Develop a shore supply action plan for the TEN-T ports.											Yes +	Poss.	National
	2.6.7.3	Replace obsolete bunker discharge infrastructure											Yes +	Poss.	National

Aviation

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.7.1	**SAFEGUARDING SPACE WITHIN THE AIRPORT AND ITS CONTIGUOUS AREA TO ENSURE DEVELOPMENTS SUPPORT LONG TERM SUSTAINABLE GROWTH IN THE AVIATION SECTOR**														
	2.7.1.1	Develop an airport master plan that prioritises developments and improvements airside to support long term air travel growth expected and improves the safety and security of this travel mode											No	No	National
	2.7.1.2	Ensure that the airport and its surrounding areas are safeguarded for aeronautical developments											No	No	National

2.7.2	**REMOVE BOTTLENECKS AT THE TEN-T CORE AIRPORT**														
	2.7.2.1	Carry out feasibility studies for the development of the parallel taxiway to Runway 31/13 to ensure continued sustainability of the main runway and appropriate safety access to the distant points of the airport											Poss. -	No	National
	2.7.2.2	Improve the manoeuvring areas for the runways where excessive runway occupancy causes bottlenecks in airside traffic and aircraft conflicts											No	No	National / Private
	2.7.2.3	Maintain the shorter Runway 23/05 in full operational standard to ensure airport resilience and ability to maintain the primary runways											No	No	National / Private
	2.7.2.4	Upgrade of the aeronautical infrastructure and technology to enable Runway 23/05 up to instrument landing system standard (ILS) and RNAV capability											No	No	National / Private
	2.7.2.5	Enhancing the air navigation services facilities											No	No	Private

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
2.7.3	**IMPROVE THE MANAGEMENT OF OPERATIONS, INFRASTRUCTURES AND EQUIPMENT BY TAKING ADVANTAGE OF NEW TECHNOLOGIES**														
	2.7.3.1	Develop asset management systems and databases to allow effective inspection and management of infrastructures (airfield)											No	Poss.	National / Private
	2.7.3.2	Develop asset management systems and databases to allow effective management of services and infrastructures (terminal & services)											No	No	Private
2.7.4	**MAINTAIN HIGH LEVELS OF SAFETY AND SECURITY OF AIRCRAFT IN THE MALTA AIRSPACE AND THE AIRPORT**														
	2.7.4.1	Keep the safety programme updated											No	No	National
	2.7.4.2	Improve wildlife control systems in the airport											Yes	No	Private
	2.7.4.3	Improve security of the remote aprons and parks on the airfield to a level relevant to their long term use											No	Poss.	National

	2.7.4.4	Improve airfield safety by updating aerodrome ground traffic management											No	Poss.	National / Private
	2.7.4.5	Improve aviation safety by mapping obstacle clearances and maintaining this obstacle clearance mapping to EU and international standards on the approaches of the airport											No	No	National
	2.7.4.6	Update service contracts of aeronautical importance											No	No	Private
	2.7.4.7	Integrate new aviation technologies while safeguarding the safety of aviation services											No	No	Private

2.7.5	**MITIGATE THE IMPACT OF THE AIRPORT ON THE SURROUNDING ENVIRONMENT**														
	2.7.5.1	Ensure that airport infrastructures and operations continue to comply with the conditions established in their planning and operational conditions											No	No	National
	2.7.5.2	Support the use of less polluting/noisy equipment											Poss. +	Yes	National
	2.7.5.3	Implement new mitigation measures											Yes +	Yes	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
	2.7.5.4	Update obsolete refuelling infrastructure											Yes	Yes	National / Private
2.7.6	**IMPROVE AVAILABILITY AND ACCESS TO AVIATION TRANSPORT STATISTICS**														
	2.7.6.1	Introduce contract clauses requiring concessionaires and contractors to provide regular information to the authorities											No	No	National
2.7.7	**IMPROVE AIR CONNECTIVITY FOR COMMERCIAL PASSENGERS, FREIGHT AND BUSINESS TRAVELLERS**														
	2.7.7.1	Establish new bilateral agreements with non-EU countries											No	No	National
	2.7.7.2	Improve the transparency and fairness of the allocation of airport slots											No	No	National / Private
	2.7.7.3	Encourage route development to attract new aviation services											No	No	National
	2.7.7.4	Develop a policy framework that enables the domestic use of helicopters											No	No	National

	2.7.7.5	Reserve dedicated areas (like aircraft parking and terminal buildings) to support general aviation											No	No	Private
	2.7.7.6	Improve airport traffic circulation to support business aviation											No	No	Private
	2.7.7.7	Studies to consider the development of a terminal for business and general aviation											No	No	Private

2.7.8	**IMPROVE THE FREIGHT CONNECTIVITY BETWEEN THE AIRPORT AND PORTS**														
	2.7.8.2	Consider fast routes between the cargo areas in the airport and ports											Poss.	Poss.	National

2.7.9	**PROVIDE ALTERNATIVE FUEL INFRASTRUCTURE TO PROMOTE EFFICIENCY AND COMPETITIVENESS**														
	2.7.9.1	Develop a deployment action plan for the TEN-T Core airport for current and alternative fuels											No	No	National
	2.7.9.2	Develop a ground supply action plan for the TEN-T Core airport											Poss. +	Poss.	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
Common															
2.8.1	**SUSTAINABLE FINANCING**														
	2.8.1.1	Sources of financing that leverage potential revenue from transport infrastructures and operations											No	Poss.	National
	2.8.1.2	Create direct links between revenue generation from transport and transport investment											No	No	National
2.8.2	**CLIMATE ADAPTATION AND MITIGATION**														
	2.8.2.1	Establish the share of Greenhouse Gases from transport that would fairly contribute to climate change targets and monitor progress of this master plan in line with these targets											No	No	National
	2.8.2.2	Assess the impact of climate change and sea level rise on transport infrastructures											No	No	National

	2.8.2.3	Incorporate climate change considerations at the planning and design stage to reduce retro-fitting costs											No	No	National

2.8.3	**RESEARCH AND INNOVATION IN TRANSPORT**														
	2.8.3.1	Improve links between government and transport research establishments to encourage research in areas of policy relevance											No	No	National
	2.8.3.2	Develop a framework that facilitates the testing and piloting of innovative technologies and new materials in the development of transport infrastructures											No	No	National
	2.8.3.3	Use of transport infrastructure for energy generation											No	No	National
	2.8.3.4	Develop research capabilities to exploit new data sources including "big data"											No	No	National
	2.8.3.5	Develop processes that facilitate the procurement of temporary measures and their assessment											No	No	National

Operational Objective.	TMP Ref.	Measure	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Expected Environ. Impact?	Expected State Aid?	Possible Source of Funding
	2.8.3.6	Develop Transport Malta in-house capability for data analytics to better support internal decision making and information available to external stakeholders											No	No	National
2.8.4	**TRANSPORT ACCIDENT SAFETY INVESTIGATIONS**														
	2.8.4.1	Further develop the transport accident investigation body to maintain appropriate resource levels as well as keeping it functionally, financially and legally distinct from the regulatory bodies											No	No	National
	2.8.4.2	Contribute to the action plan for response to national disasters and accidents on strategic infrastructure											No	No	National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08

MONITORING OF THE PLAN

This Chapter outlines the programme of monitoring and evaluation that will be carried out in relation to the implementation of Transport Master Plan, 2025.

Implementation monitoring is an important part of any short-medium term plan, as it allows for the tracking of the progress of both the individual different projects and measures contained within the plan, as well as gauging the overall progress in the execution of the plan as a whole. Periodic monitoring and review is particularly useful for the managing authorities, as it enables corrective and pre-emptive action to be taken in respect of timelines, quality of service, costs and ultimately the benefits pertaining to each project and measure.

08.1 THE MONITORING PROCESS

The monitoring process is an intermediate evaluation carried out within the process of the Transport Master Plan implementation. Whereas the ex-ante evaluation (which takes place at the planning and feasibility assessment stage) is based on estimates, the ex-post evaluation (carried out once the project is implemented) feeds on actual data and information collected during the monitoring process. Therefore, monitoring is a key factor as it helps in the identification of any projects that perform poorly at an early stage, which can lead to the timely adoption of the necessary corrective actions.

Indicators will be tailored to evaluate different elements of the projects and the measures included in the Master Plan. The implementation of the Transport Master Plan will also be evaluated holistically at a plan level.

Focusing on individual measures, the following types of monitoring will be carried out:

- Financial: this will focus on the allocated financial resources and assessment of actual costs i.e. overall project cost, capital cost (infrastructure projects), operational and maintenance costs (infrastructure and operational measures) and unit costs (infrastructure).

- Physical: this relates to the products of a project/measure (a new transport infrastructure, the documents that are part of a transport plan or a feasibility study, etc.).

- Output: this will measure the usage of the infrastructures whose construction or rehabilitation is included in the Transport Master Plan.

- Outcome: this will measure the contribution of each project / measure to the shift towards more efficient modes. This indicator will include the measurement of change using the national transport model as a tool to quantify for example: change in lost time due to congestion (passengers and freight), time savings due to improved flee-flow condition, change in travel distance (vkm and pkm), change in modal choice (passengers and freight), as well as other indicators not only dependent on the situation of the transport sector – GDP, employment. This type of monitoring will not be carried out for measures involving plans or studies.

- Cost-Benefit Analysis / Multi-Criteria Analysis: reviewing these analyses will help identify whether or not the envisaged targets are being achieved. A review of the cost-benefit analysis carried out during the ex-ante evaluation will be undertaken for main transport infrastructure projects. Non-infrastructure measures will be reviewed through the comparison of ex-ante and ex-post multi-criteria analyses.

- Sustainability: this type of monitoring is aimed at highlighting certain outputs of the environmental evaluation at a macro level, more detailed environmental issues are incorporated in the Strategic Environmental Assessment supporting the Transport master Plan. Measurements will be taken within the project's influence area. As mentioned for outcome indicators, this type of indicators will not be carried out for measures involving plans or studies.

08.2 INDICATORS FOR MONITORING

Table 95 through Table 98 below show the monitoring indicators proposed for each category of measure:

Planning and Design

Type of monitoring	Indicators
Financial	Overall cost
Physical	Laws or regulations passed or modified, plans or guidelines passed or updated, studies or reports passed; infrastructure asset management data base systems implemented
Output	Number of projects/measures passed within the scope of the plans passed or updated
Outcome	-
CBA/MCA	MCA
Sustainability	-

Figure 95.
Indicators proposed for Planning and Design measures

Policy, Regulator or Economic

Type of monitoring	Indicators
Financial	Overall cost
Physical	Laws or regulations passed or modified, plans or guidelines passed or updated, studies or reports passed; structured coordination functions established between different authorities; administrative units created to deal with new needs
Output	Number of projects/measures passed within the scope of the plans passed or updated
Outcome	Change in modal choice (passengers); satisfaction of public transport users in residential areas and commercial centres; satisfaction of soft modes users
CBA/MCA	MCA
Sustainability	Litres of fuel used in transport per pkm and inhabitants; tonnes of CO_2 produced by transport for a specified period and inhabitant; tonnes NOx derived from transport; % reduction in noise levels in the airport influence area

Figure 96.
Indicators proposed for Policy, Regulatory or Economic measures

Supporting

Type of monitoring	Indicators
Financial	Overall cost, operational and maintenance cost (applicable to asset management systems)
Physical	Reports resulting from audits, reviews, agreements and forums; records of fines; number of awareness campaigns; tools developed to improve travel information; asset management systems implemented; recommendations accepted and programmed
Output	Number of processes involving the asset management systems and their updating frequency; number of research programmes in transport
Outcome	-
CBA/MCA	MCA
Sustainability	% reduction in road accidents fatalities and seriously injured

Figure 97.
Indicators proposed for Supporting measures

Physical or Technical

Type of monitoring	Indicators
Financial	Overall cost, capital cost, operational and maintenance cost, unit costs
Physical	Cycle corridors implemented; change in the fleet of electric vehicles; road km upgraded; Public Transit Quality Corridors implemented; % bus stops upgraded; % ports with maritime weather stations; area (m2) of quays, number of breakwater systems upgraded; ferry landing places implemented/upgraded; number of intelligent transport systems deployed; runway and taxiway km upgraded
Output	Vehicles/day; aircraft movements/day; ship movements/day; people using the bicycle on a daily basis; applications for maritime weather data/year; passengers/day; passenger-km/day; tonnes/day; tonnes-km/day; volume/capacity ratios
Outcome	Lost time due to congestion (passengers and freight); time savings due to improved flee-flow condition; change in travel distance (vkm, and pkm); change in modal choice (passengers and freight); travellers satisfaction; change in the GDP and employment rates
CBA/MCA	CBA/MCA
Sustainability	Litres of fuel used in transport per pkm and inhabitants; tonnes of CO_2 produced by transport per time period and inhabitant; tonnes NOx derived from transport; % reduction air pollutants by road transport (passengers and freight); % reduction in road accidents fatalities and seriously injured; % reduction in noise levels in UCA's and tourism areas

Figure 98.
Indicators proposed for Physical or Technical measures

The values of the above-mentioned indicators will be compared with the values expected before the implementation of each measure, according to the studies/ analyses/projects supporting the feasibility of each measure. The evaluation will be carried out at the date on which the measure is planned to be implemented and also over the implementation period (at least every 2 years). As several of the measures in the Transport Master Plan have an implementation period of 5 or 10 years, an evaluation every two and a half years is proposed.

Two main timelines established for the implementation of the measures are the years 2020 and 2025. The following elements will be verified at the end of 2020 and 2025 at a plan level:

- Ratio measures completed to measures planned to be completed;
- Ratio actual project cost to project cost planned of the measures completed;
- Result of the ex-post evaluation of the measures completed in comparison with the ex-ante evaluation.

Transport Malta has been designated as entity responsible for overseeing the implementation and monitoring of the Transport Master Plan and, in this respect, will obtain information that is already available to other entities as part of the monitoring process and where gap exist in these data sets carry out the data collection and analysis to enable the comprehensive monitoring of the Transport Master Plan and the individual projects / measures contained therein. Certain monitoring indicators may need to evolve over time as experience with the data collection, collation and analysis is gained and better indicators developed.


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09

CONCLUSION

This chapter sets out the key aspects of the Transport Mater Planning process and the integration of the various preparatory aspects that brings this document into fruition. The Transport Master Plan 2025 has 10 year timeline and is the first of a series of Master Plans envisaged to fit within the long term National Transport Strategy, which has a 2050 time horizon.

The Transport Master Plan deals with all modes of transport, namely: road transport, public transport, intermodal transport, internal and external maritime transport and aviation. The Transport Master Plan also identifies horizontal aspects common to all modes of transport.

With this in mind the Transport Master Plan 2025 has been prepared as explained below.

09.1 LEGAL REQUIREMENTS

A key requirement of Annex XI of Regulation 1303/2013[48], which sets out the common provisions for funding by the main transport funding under European Regional Development Fund and the Cohesion Fund, is the fulfilment of the so-called ex-Ante Conditionality (EAC).

In completing this Transport Master Plan, European Commission and JASPERS guidance on the fulfilment of ex-Ante Conditionality requirements have been closely followed. Regular contact, discussion with and review by JASPERS has also been a hall-mark of the development of both the National Transport Strategy and the Transport Master Plan 2025.

09.2 METHODOLOGY

The methodology applied in developing the Transport Master Plan was initially based on spatial planning information and plans, data collection with respect to supply and demand, surveys to calibrate data sets collected prior to the development of this master plan, to the Transport Master Plan base year of 2014.

9.2.1 POLICY FRAMEWORKS

As a starting point, the analysis of all extant national, EU and international commitments and policy frameworks were identified and available information on gaps between the commitments and the current state of play at the base year was identified. As part of this process, various sectors of the economy that either depend on transport, or contribute to the transport sector were considered. Where documented policy frameworks were not available, the preparatory phases of the transport master Plan included engaging with the various stakeholders or government entities to understand the sector.

[48] Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006

9.2.2
ISSUES ANALYSIS

In carrying out the analysis of the available data and existing conditions, the problems in the various aspects of transport have been identified. These range from supply issues (e.g. infrastructure availability, public transport routes and capacity, rolling stock) through demand issues (e.g. inefficient mobility needs, origin-destination matrices), the inter-relation of supply and demand (e.g. excessive or unrestricted utilization of the supply) as well as organizational (e.g. economic actors in the market, institutions and resources).

The functional regions of the urban hub of Malta as well as the island of Gozo were considered distinctly from the general approach for the wider island of Malta. Quality of the various factors was considered alongside the raw quantity (e.g. age profile of vehicles, walkability). Other key aspects that have been considered include: accessibility; capacity; safety; security; interoperability; equal access; operations and maintenance; GHG emissions; climate change adaptation needs; noise, vibration, air pollution and visual aspects; Natura 2000 sites; energy efficiency and reduced energy demand; and complex ICT systems.

09.3
OBJECTIVES AND MEASURES

In line with the National Transport Strategy framework, the Transport Master Plan defines the "Operational Objectives" in line with the eight Guiding Principles established in the Strategy. These objectives are designed to address the Goals in line with the Guiding Principles.

Addressing each objective, the Transport Master Plan sets out measures that have been devised to address the problems and issues identified, such as to reach the targets established by the National Transport Strategy and further elaborated in the Transport Master Plan. Measures include infrastructure measures, but also the necessary supporting soft measures, as well as measures which prepare for possible future infrastructure interventions and help inform the decision makers in the development of these future measures.

09.4
PRIORITISATION

The measures identified were prioritized individually, as well as grouped into defined scenarios. Using the GIS based computer model, Cube Voyager, to simulate the base year (for calibration purposes) as well as for a number of future years, it was possible to generate short and medium term metrics that enabled the selection of measures at individual and scenario grouped level. When tested together, the model provided data that enabled the interplay between the varied measures when grouped to be assessed.

This model was also been used to assist in the provision of long term trending data that enables the long term effects of the measures to be understood.

09.5 TARGETS

Based on the Strategic targets established in the National Transport Strategy, the Transport Master Plan defines the targets being aimed for as at the end of 2025. Monitoring of the effects of the measures towards achieving the targets will be carried out throughout the lifetime this plan.

09.6 REALISTIC AND MATURE PROJECT PIPELINE

A key requirement of Regulation (EU) No 1303/2013 is that the master plan provides a realistic and mature project pipeline.

As required by the Guidance for the fulfilment of the Ex-Ante Conditionality for Transport, the Transport Master Plan includes a list of prioritised projects (studies, upgrading or works) that Malta envisages launching over the period and will be requesting support from the ERDF and CF for them[49]. This list includes the name of the authorities and stakeholders involved in the lead of these projects, the foreseen expenditures and a financing plan.

The list also includes a realistic timetable for delivery of the projects identified indicating dates (where applicable) for feasibility studies, a Cost Benefit Analysis, EIA procedure, an implementation timetable including procurement and permission procedures, and for potential state aid notification.

09.7 CAPACITY TO DELIVER

As a separate report accompanying this Transport Master Plan, the Capacity Report[50] has been prepared and provides an adequate description of the measures already in place to ensure the capacity of Transport Malta to deliver the project pipeline.

These measures are based on the analysis of both the bottlenecks and of the weaknesses within Transport Malta (as the beneficiary) and its related entities so as to deliver the project pipeline in a timely manner. This report deals with:

- tendering (including tenders without competition, irregularities)
- implementing environmental requirements
- developing and prioritising the project pipeline
- financial project management
- funding for maintenance and operations
- administrative burden and red tape
- managing the implementation of complex systems (such as ITS, VTMIS, e-maritime services).
- training and appropriate internal procedures to monitor and identify potential delays and to ensure a smooth and effective procurement;

[49] Regulation 1315/2013 of the European Parliament and of the Council, including priorities for investments in the core TEN-T network and the comprehensive network where investment from the ERDF and CF in envisaged; and secondary connectivity.
[50] Transport Malta (2016), National Transport Strategy – Capacity Report

The report identifies the early warning system that is in place to identify and solve any difficulties arising when delivering the project pipeline, and procedural measures to enable the implementation or replace projects quickly when implementation is blocked so as to ensure that EU programming period timelines are safeguarded.

09.8 ENVIRONMENTAL ASPECTS

Throughout the process of development of the measures in the Transport Master Plan, environmental aspects have been considered and taken into account. The various environmental considerations have been documented within the issues analysis for the Transport Master Plan.

To further support and document this process and to make it available to the public, the environmental aspects of the measures have been assessed within the process of Strategic Environmental Assessment (SEA), and it's supporting Appropriate Assessment, are documented in the SEA Environmental Report. The SEA Environmental Report and the draft final Transport Master Plan has been made available for public consultation in terms Subsidiary Legislation 549.61 - Strategic Environmental Assessment Regulations, which transpose Directive 2001/42/EC "of the European Parliament and of the Council on the assessment of the effects of certain plans and programmes on the environment" into national law. Monitoring of the environmental impacts is a pre=requisite of the SEA process and this will be carried out and published as required by law.

No significant trans-boundary effects were identified and therefore no consultation with neighbouring states was required.

The Transport Master Plan will be finalised with the conclusion of the SEA process.

09.9 FINAL REMARKS

In conclusion, Transport Malta believes that this Transport Master Plan is appropriately researched, grounded and documented to enable the appropriate implementation of policies, measures and supporting actions for the period up to 2025.

ANNEX I
LIST OF SUPPORTING DOCUMENTS

Supporting Document 1 - List of Measures

- Road Transport
- Public Transport
- Intermodal
- Internal Maritime
- External Maritime
- Aviation
- Common to all modes

Supporting Document 2 – Consultation Feedback and Commentary
– Feedback on Transport Master Plan

ANNEX II
REFERENCED DOCUMENTS

Transport Malta (2016) – National Transport Strategy, 2050

Transport Malta (2016) – Transport Master Plan, 2025 – Consultation Draft

Transport Malta (2016) – National Transport Strategy - Strategic Environmental Assessment Environmental Report

Transport Malta (2015) – National Transport Strategy - Existing Conditions and Data Diagnostic Report, 2014

Transport Malta (2015) – National Transport Strategy - Forecasting Report

Transport Malta (2015) – National Transport Strategy - Base Year Model

Transport Malta (2016) – Transport Master Plan – Capacity Report

This document has been prepared with the technical support of the
INECO-SYSTEMATICA Consortium and the environmental assessments have had
the contribution of Adi Associates Environmental Consultants Ltd.

Operational Programme I – Cohesion Policy 2007-2013
Investing in Competitiveness for a Better Quality of Life
Project part-financed by the European Union European Regional Development Fund (ERDF)
Co-financing rate: 85% EU Funds; 15% National Funds

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