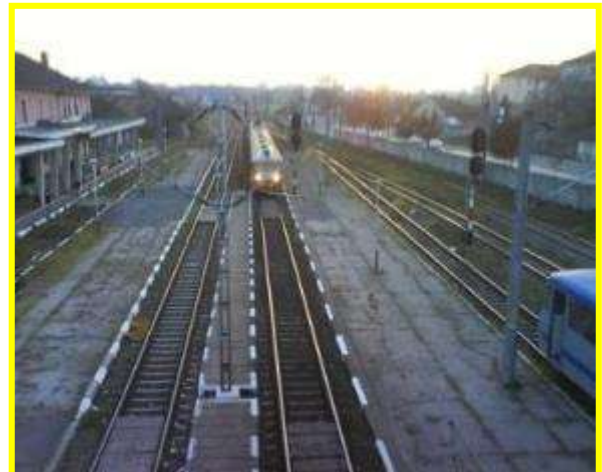


Romania General Transport Master Plan

Summary of the Entire Project





UNIUNEA EUROPEANA



GUVERNUL ROMANIEI



Instrumente structurale
2007-2013

Asistență tehnică pentru elaborarea unui
Master Plan General de Transport
CCI: 2007 RO 161 RO 003
Cod Proiect: POST/2011/4/1/0



PROGRAMA OPERATIONALA SECURII TRANSPORT
TRANS
Mobilitate în România. Conectat cu Europa

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Romania General Transport Master Plan

Summary of the Entire Project

Rev No	Comments	Checked by	Approved by	Date
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Reference: Executive Summary

Date Created: February 2015

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IMPORTANT NOTE

The current draft document should be read strictly from the perspective of the following:

CAVEATS

Status of current document

1. The current document is a working draft of the Master Plan Report. This version is not final and will be updated with the results of more detailed analysis which is being carried out in particular for the rail, ports, airports and intermodal transport sectors. The updating process will be done in parallel with the incorporation of the feed-back collected from the public consultation process.
2. The Strategic Environmental Assessment (SEA) procedure (including the Appropriate Assessment) is ongoing. Upon completion its conclusions will be incorporated in the final version of the Master Plan report.

Coverage of the Master Plan

3. The Master Plan refers to the major objectives of the national transport system. Therefore it is a high-level planning instrument relevant for major interventions (projects and other actions) with significance for the objectives of the national transport system – which are suitable for modelling, appraisal and prioritisation at Master Plan level. This means a range of small scale interventions are not within the scope of the Master Plan, which does not mean they shouldn't be financed by the Ministry of Transport, but that the Master Plan is not a proper instrument for planning it and therefore that there should be a different process of defining, planning and prioritising such interventions. Typical interventions outside the scope of the Master Plan are:
 - (i) Actions required for the day-to-day running of business (regular operations and maintenance activities of the various entities under MoT), e.g. administrative buildings, office equipment, consumables, operating costs, regular maintenance, etc.
 - (ii) Investments of nature of such small size and detailed nature that goes well below the Master Plan level, e.g. small scale renewals/rehabilitations of small rail stations, small scale safety interventions, small scale intra-zone interventions which cannot be modelled, etc.
4. In addition, there is another group of projects not evaluated within the Master Planning exercise. These are the "Reference Case" projects i.e. those already committed investments which had financing already decided (and often were already under construction) at the time of defining the "Reference Case" for the purpose of the National Transport Model (year 2013). The list and map of the committed "Reference Case" projects assumed to continue to be implemented "by default" is provided in Annex ...

Time horizon of the Master Plan

5. The Master Plan planning horizon is the year 2030. Given the level of uncertainty associated with long-term forecasting, any action beyond the year 2030 should be reconfirmed on the basis of an updated plan (e.g. carried out within 10 years time i.e. in 2025).
6. However, for more volatile sectors, especially airports – where the level of uncertainty in the traffic forecast is much higher than e.g. for roads sector, the Master Plan horizon to be taken up for implementation should not exceed the year 2020, whilst any projects beyond 2020 should be reconfirmed on the basis of the actual market (demand/traffic) developments.

Level of analysis and relation with Feasibility Studies

7. The level of the Master Plan analysis is high by its very nature. Consequently and in order to ensure a fair comparison basis across projects and thus a relevant comparison of their economic performance indicators, high-level uniform assumptions have been made on the project costs (based on average values per km/type of infrastructure/type of terrain). This means the cost estimates used in the Master Plan do not necessarily match precisely more detailed estimates from e.g. existing Feasibility Studies (FS), which is not an error but a methodological choice. However, normally the difference between the

Master Plan estimates and FS values should not exceed <25-30%>, which is the usual approximation margin for this level of analysis.

8. Inherent from the high level of analysis is the approximation of the economic performance, which because of (i) the margin in the cost estimation and (ii) the scale of the economic benefits (i.e. some local benefits –e.g. intra-zone- might not be captured by the National Transport Model) should be considered preliminary until a more detailed analysis at the level of each project is carried out further at FS level. A methodological consequence was the choice of not excluding projects at the usual threshold of the economic discount rate (5%) but lowering the pass/fail bar to 3% EIRR at this level, whilst the final decision on the economic acceptance of any project would be (re-)confirmed on the basis of the more detailed analysis of both the costs and benefits at FS level.
9. The same logic applies to the technical solutions. The Master Plan defined generic measures (interventions) to serve the specific operational objectives defined in response to the problems identified – e.g. “Improve travel speeds on Bucharest – West Road Corridor”. To enable model testing, costing and economic appraisal, certain preliminary technical solutions have been defined e.g. 2x2 motorway/express-way, rehabilitation of a rail section to a specific speed, extension of a passenger terminal to a certain capacity, etc. Such technical solutions will need to be however reconfirmed at the level of each particular project within the FS on the basis of a detailed options analysis including more detailed cost, capacity, economic and environmental impact analyses. In this respect it is imperative that the ToR for the new Feasibility Studies launched for the Master Plan projects includes clear and explicit provisions for such capacity and options analysis.
10. Similarly, the recommended approach - which will have to be reconfirmed for each case within Feasibility Studies - is that the infrastructure should be designed in such a way as to allow future development (for example from an expressway profile to a motorway profile, from 2 lanes to 3 lanes per direction, etc) if and when such developments are justified by the demand and covered by funding sources.

Conclusions

11. In summary, this Master Plan has been produced at a point in time based upon the best information available at that time and underpinned by a robust process which has been used to appraise the various schemes being proposed. There will be changes which occur over time which will impact upon the costs, standards and performance of each individual infrastructure scheme proposed. These include, inter alia:
 - (i) Changes in the timetable for implementation of other schemes, across all modes, which impact upon the scheme in question;
 - (ii) Improved information as a consequence of feasibility, or other, studies in to the particular scheme; and
 - (iii) External factors, such as changes in the macro level economic performance of the country, which impact upon forecast demand for a particular scheme.
12. Each of these will potentially affect the required standard of the improvement, the costs of implementation and the economic merit of an individual scheme. It is important therefore that the Master Plan is seen as a live document which provides a robust platform for moving the transport sector forward, but which also needs to be maintained and reviewed over time in order to ensure that the objectives for improving the transport sector are met.
13. This Master Plan Report will be supported by a separate Implementation Plan which will outline the schedule for when projects will be delivered. The Implementation Plan will take into account project maturity and eligibility for alternative funding streams, criteria which have not been included in the multi criteria assessment which has been used to develop the Master Plan list of projects. It is therefore possible that in the Implementation Plan projects will be delivered in a different order to that indicated in the prioritised list of projects in this Master Plan Report.

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Glossary and Terminology

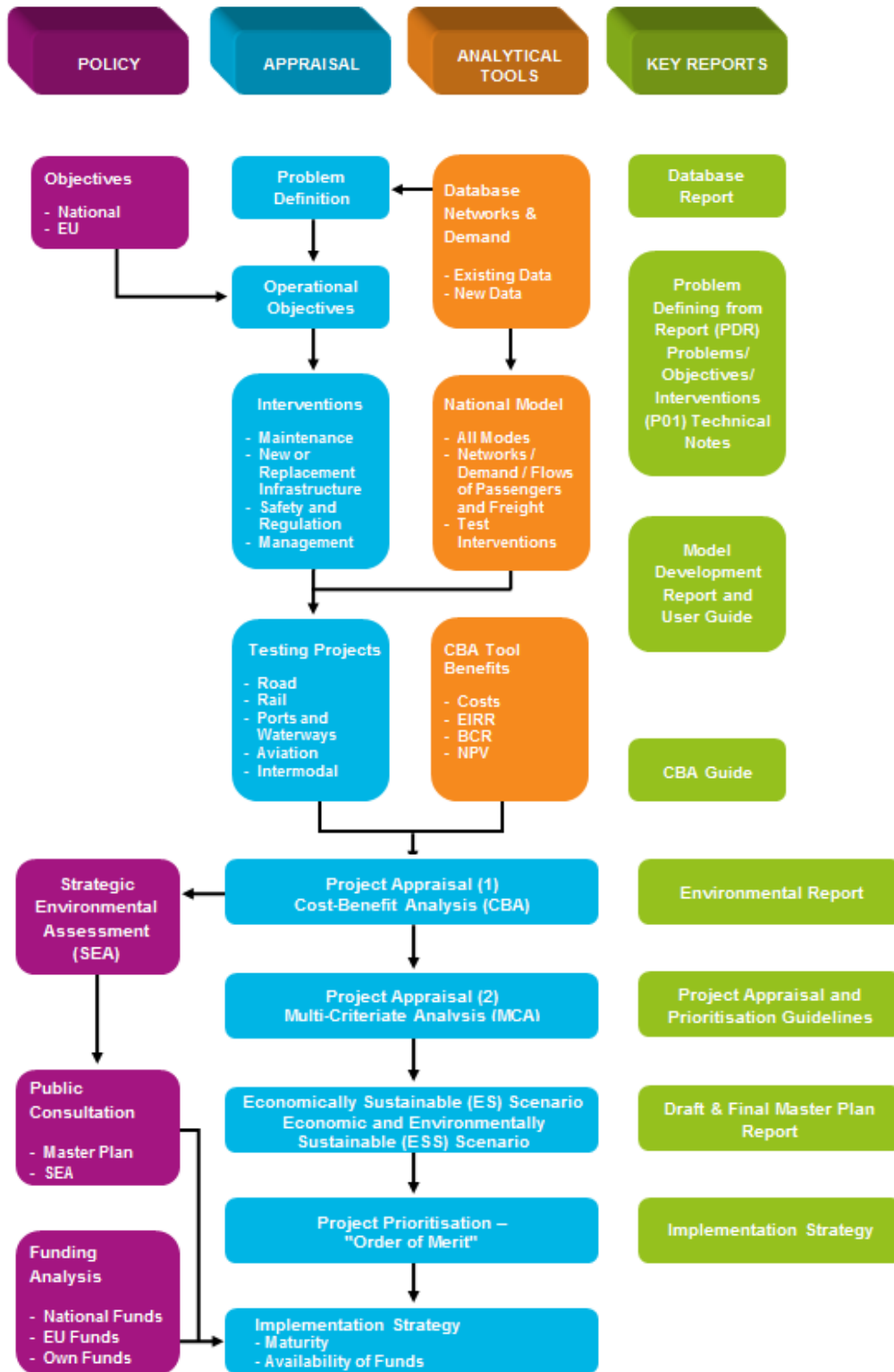
ACN	The Administration of Navigable Channels in Romania
AIS	Automatic Information System to track ships
APDF	The Administration of the River Ports in Romania, located in Giurgiu
Base Year	2011, the year for which the National Transport Model was calibrated.
CESTRIN	The Centre of Research and Road Technical Studies in Romania, part of CNADNR
CFR Calatori	The publicly-owned passenger train operating company
CFR Infrastructure (also CFR SA)	The publicly-owned rail infrastructure company
CFR Marfa	The publicly-owned freight train operating company
CNADNR	The Administration of National Roads and Motorways in Romania
Desiro Train	A modern diesel multiple unit train
DMU	Diesel multiple unit: typically a 2 or 4 car set that can be coupled together and can be driven from either end.
ECR	AECOM Existing Conditions Report
EMU	Electric multiple unit
Euro RAP	European Road Assessment Programme, an international organisation dealing with road safety
Fairway	The navigable part of the River Danube
GDP	Gross Domestic Product
GJT	Generalised Journey Time. It includes waiting, access time and fares (converted to time equivalents)
GTMP	General Transport Master Plan
ILS	Instrument Landing System
Intermodal Transport	Transport that uses two or more modes, for example road and rail, or water and road.
Inter-Regio	Limited stop passenger rail services
NAPA	North Adriatic Ports Association
NTM	National Transport Model
Passenger kms	The aggregate distance travelled by passengers
PCN	Pavement Classification a measure of the loading capacity of runways and taxiways
PSC	Public Service Contract, the agreement between the government and rail operators to provide socially necessary rail services
Push-pull	A type of loco-hauled train operation where the train can be driven from either end
Push Tug	The type of tug used on the River Danube to push barges
Reference Case	The transport networks that would exist if existing committed projects were completed. It forms a reference against which “new” projects can be assessed.
Regio	Stopping passenger rail services
Tonne kms	The aggregate distance freight is carried
UNTRR	National Union of Road Hauliers from Romania
UTI	Unité du Transport Intermodal, a container or unit load

Introduction

1. Introduction

- 1.1.1 The General Transport Master Plan (GTMP) represents a unique opportunity for Romania. For the first time Romania will have a soundly-based, comprehensive plan for all the major modes of transport, for the period up to 2030. It provides a staged programme of interventions which encompass not only proposals to improve the transport infrastructure, but also dealing with maintenance, management and operations, and safety.
- 1.1.2 The Master Plan also provides the justification for projects to be included in the Sectoral Operational Programme for Transport (SOPT) for the period 2014 – 2020 in detail, and for projects promoted under the Connecting Europe Facility (CEF). It will also provide the basis for projects to be financed in the period beyond 2020, although the precise nature of the successor programmes to the SOPT have yet to be decided.
- 1.1.3 The Master Plan will only succeed in its objectives if there is continuous, whole-hearted support for its programme over the medium and long term. Major transport investments take 6-10 years to plan, two – four years to build, and have an economic life of 30-50 years. This applies not only to the organisations who are responsible for implementation of the projects and policies, but also to the successive Governments and key Ministries such as Transport, European Funds, and Finance.
- 1.1.4 Providing good-quality transport is not an end in itself. Efficient transport is a critical component of economic development, both nationally and globally. Transport availability affects global development patterns and can be a boost or a barrier to economic growth within individual nations. Transportation investments link factors of production together in a web of relationships between producers and consumers to create a more efficient division of production, leverage geographical comparative advantage, and provide the means to expand economies of scale and scope.
- 1.1.5 The overall process for creating the Master Plan is shown on Figure 1.1. The process has three main elements
- a **Policy** input which determines the overall objectives, the funds available to implement the Master Plan; the Strategic Environmental Assessment (SEA), and feedback from Public Consultation;
 - the Appraisal Process, which determines how projects are selected, tested, and the criteria for inclusion in the Master Plan and Implementation Strategy; and
 - the Analytical Tools for testing and quantifying the impact of projects. The most important are the National Transport Model (NTM) and the Cost-Benefit Analysis (CBA) Tool.
- 1.1.6 At various stages in the Project key Reports were produced which describe the important processes in more detail. These are also shown on Figure 1.1.

Figure 1.1 Master Plan Processes



2 Existing Situation

2.1 Introduction

2.1.1 The Plan involved a thorough investigation of the existing conditions, problems and their underlying causes. Across all modes, four common themes emerged:

- Romania has a serious **infrastructure deficit**, in terms of its quality: coverage of the transport networks is generally good.
- **Inadequate Maintenance and Renewals**, particularly of the rail networks has been inadequate leading to a decline in level of service and reliability, and contributing to a substantial decline in passenger volumes especially, and to a lesser extent, freight volumes.
- This situation is largely a result of inadequate finance over a long period of time, but it is exacerbated by **Management and Operating practices**, which affect rail, road and water transport, but again rail is particularly adversely affected.
- **Safety** is a concern, particularly on the road network where Romania has the worst safety record in Europe.

2.1.2 In the following paragraphs we give an overview of the current status of each mode of transport, the most serious issues to be addressed, and a summary of the Master Plan approach in addressing these problems. There is a discussion in detail in each of the modal chapters in the Master Plan Report (Chapters 4-8), and a detailed analysis of the problems of each mode in the Problem Definition Report, available on the Ministry of Transport's website.¹ The connection between Problems, Objectives and Interventions is described in a series of Technical Notes.

2.1.3 The availability of funds constrains investment in transport in Romania, as it does in all European countries. Therefore, the Master Plan cannot contain solutions for all the identified problems and still remain a realistic plan. Therefore, the final list of interventions is a list of priorities for public sector investment for the foreseeable future.

2.2 Rail Transport

2.2.1 In our opinion, it is no exaggeration to say that Romanian Railways are in a crisis situation. Several steps are required. These include:

- serious reforms to the structure of the railway and the PSC, in order to encourage decisions which have a commercial return;
- substantially increased spending on maintenance and renewals to achieve European standards, to deal with the backlog of repairs, and maintain the primary route network in good condition;
- increased investment in rehabilitation to current design speeds on the main national and international lines, and
- the introduction of regular interval timetable, convenient for passenger needs.

Unless these steps are taken, it is our view that within 10 years the railway will cease to play a national role in Romania.

2.2.2 Since 1990 passenger kilometres have fallen by 90%, and freight kilometres by 70%, although the position with rail freight has stabilised. Average speeds for passenger trains have fallen to 45kph in 2012 from 60kph in 1990, and the average speed of freight trains is a mere 23kph.

¹ <http://www.ampost.ro/pagini/master-plan-general-de-transport>

Between 60-80% of the track-related assets are life expired, there were 1,800 temporary speed restrictions in 2012, and we estimate that current speeds are 20-30% below the design speed of the track. The track and other fixed assets are under-utilised: about 90% of traffic (both passengers and freight) is transported on 54% of the routes (63% of track-km), whilst about 20% of the routes (14% of track-km) carry only 1% of the traffic. 1,000 stations generate less than 50 trips per day and 533 stations have less than 10 passengers per day.

- 2.2.3 A trend-based forecast suggests that passenger kilometres would decline by a further 75% by 2030, while the NTM analysis suggests a decline of 22% by 2020 and 40% by 2030. Whichever forecast is assumed, the future is bleak without drastic action.
- 2.2.4 These reductions are primarily due to three factors:
- inadequate maintenance which leads to longer, and therefore uncompetitive, journey times;
 - a timetable which is not commercially driven (the PSC is mainly dependant on train kms rather than timetables which meet customer needs); and
 - demographic changes such as the dispersion of population and the increase in car ownership.
- 2.2.5 Tests using the National Model suggest that inadequate maintenance is responsible for a large proportion of the forecast 22% decline in passenger kilometres.
- 2.2.6 The Master Plan proposals concentrate largely on the first two elements, that of increasing maintenance spend to European norms, and comprehensive rehabilitation of the mainline network, combined with introducing a regular interval timetable for Inter-Regio services operated by modern rolling stock. At current (low) levels of car ownership, there is little that Government can do to limit car ownership, but there are many interventions which can be introduced to make rail more attractive and increase rail useage.
- 2.2.7 There are also institutional changes that can be made which will help to make the rail industry in Romania more dynamic. These are included in the Master Plan interventions.

2.3 Road Transport

- 2.3.1 Road maintenance is also inadequate, although the situation is not as serious as that of rail. Only 50% of the National Road network in good condition, and approximately 65% of the national network is beyond its service life. The estimate using the method developed for the World Bank suggests that regular maintenance and renewals expenditure should increase by €560m and rehabilitation and modernisation by €650m per annum to clear the backlog by 2020.
- 2.3.2 The Master Plan therefore contains a larger financial allocation for road maintenance and renewals that will, over time, keep the national network in a mostly good condition. The Plan also makes a recommendation regarding the organisation of the maintenance contracts which will improve the quality and efficiency of maintenance.
- 2.3.3 Slow journey times lead to inefficient use of both working and non-working time and have an adverse impact on national and regional economies, and reduce employment, commercial, shopping and leisure activities. Romania is a large country with many regional centres, and the economic competitiveness of these centres is adversely affected by the poor level of service offered by the road network.
- 2.3.4 The level of service provided by the road network is generally poor, in terms of average speeds. These are 66 kph on the National Road network, 44% below the target of 100kph for the EU

Core and Comprehensive Networks. Romania has the lowest provision of motorway-standard road in the EU per head of population.

2.3.5 The Master Plan therefore contains proposals to develop a network of motorways which will link the main economic regions of Romania, and its main trading partners, with a motorway standard network. This will be supplemented by a modern expressway-standard (ie 2*2 lanes with grade-separated junctions) network which will complete a national network of high quality roads.

2.3.6 Romanian has the worst road safety record in the EU. In terms of the following Key Performance Indicators:

- Fatalities per million inhabitants: 94 against an EU average of 60, rank 24th out of 28
- Fatalities per 10 billion passenger kilometres: 259 versus an EU average of 61, rank 28th out of 28; and
- Fatalities per million passenger cars: 466 versus an EU average of 126, rank 28th out of 28.

2.3.7 While motorways and expressways have a much lower accident rate than single-carriageway roads, it is not feasible, or economic, to replace all single carriageway roads by these safer roads. Therefore, the Master Plan also contains proposals for low cost safety improvements at 138 worst locations (“blackspots”) for accidents across the country. These projects give a very good return in economic terms, and will provide safer environments for both pedestrians and drivers before the much more expensive road building programme is completed.

2.4 Ports and Waterways

2.4.1 Romania has three main maritime ports, Constanta, Galati and Braila. The latter two are located on the maritime section of the River Danube, while Constanta is a deep water port on the Black Sea. It is connected with the River Danube via a man-made channel, and has good road and rail connections with Bucharest, and thence the south and west of the country and Hungary.

2.4.2 Connections of these three ports with central, and Northern Romania are less good and the road and rail projects address this issue.

2.4.3 There are also smaller maritime ports of Mangalia and Midia on the Black Sea, and a series of ports on the River Danube, the largest of which are Giurgiu, Oltenita and Drobeta Turnu-Severin.

2.4.4 Constanta is by far the largest Port in Romania. Table 2.1 shows data of tonnes handled in 2011 for the top 10 ports in Romania. Constanta handled 83% of the total freight in these ports, the next highest being Galati with 9%. These data demonstrate the importance of Constanta as the main maritime gateway for Romania’s imports and exports.

Table 2.1 Freight Handled at Romanian Ports

Rank	Port Name	Port Type	Tonnes Handled (per annum, 2011)	% of top 10 ports
1	Constanta	Maritime (Deep Sea)	46,000,000	82.6%
2	Galati	Maritime	5,100,000	9.2%
3	Tulcea	Maritime	1,650,000	3.0%
4	Braila	Maritime	1,203,000	2.2%
5	Oltenita	Fluvial	508,000	0.9%
6	Drobeta-Turnu-Severin	Fluvial	490,000	0.9%
7	Giurgiu	Fluvial	256,000	0.5%
8	Orsova	Fluvial	188,000	0.3%
9	Calafat	Fluvial	139,000	0.2%
10	Cernavoda	Fluvial	132,000	0.2%
Total			55,666,000	100.0%

Source: MT Naval Directorate

2.4.5 Nonetheless, the Master Plan recognises that investment in selected Ports, as well as at Constanta, is required to exploit the opportunities that the River Danube offers for those commodities where water transport is competitive. There are two main issues to be addressed:

- First, the River Danube is a natural waterway and as such experiences continual problems of variability in the depth and width of the navigable channel (the so-called “fairway”). This leads to delays and unpredictable journey times which do not meet the requirements of today’s logistics industry; and
- Secondly, the maritime Ports in particular often have sufficient theoretical capacity but that capacity is for traffic that no longer exists, or consists of obsolete equipment. Therefore, real problem at many of Romania’s Ports is not a shortage of capacity per se, but antiquated and inefficient infrastructure that is not suited to the modern logistics industry. An efficient and competitive Port requires sufficient berthing, modern crainage and handling equipment for its existing and future markets, modern storage facilities for specific commodities (eg cereals), and good land connections.

The Master Plan proposals therefore concentrate on investment in making the Danube navigable all the year round (except during extreme weather events), and investment in modern facilities at Ports which have a long term future.

2.4.6 Similar to the roads and rail sectors, inadequate maintenance is also an issue for waterways. Romania spends 11,300 EUR per km per annum maintaining the section of the Danube for which it is responsible, compared with 250,000 EUR per km, which is spent by Austria. Romania’s Danube users rely on maintenance by Bulgaria on its section, and the latest information we have is that Bulgaria currently spends only 2,100 EUR per km.

2.5 Aviation

- 2.5.1 The aviation sector in Romania is well developed with a number of major airlines serving destinations across Europe, particularly the major national and international airport at Bucharest, but also from the west of Romania. The sector is well developed with a number of major airlines serving destinations across Europe.
- 2.5.2 Airports play an important role in the economic development of a region, as well as the nation as a whole. Airports facilitate the rapid movement of people and high value, time-sensitive goods and therefore foster trade and commerce. Tourism is relatively undeveloped in Romania. Airports, together with services by low-cost operators in particular, offer increased accessibility, which in turn fuels the tourism sector. Increasing the number of visitors and airport users means more money flows into the local economy.
- 2.5.3 The numbers of passengers using Romanian airports is set out in Table 2.2 below. Bucharest (Henri Coanda) is the national air gateway for international travelers, and it accounts for approximately 67% of all passenger traffic. Together with Timisoara and Cluj, these three airports accounts for 89% of passenger traffic.

Table 2.2 Passengers at Romanian Airports, 2012

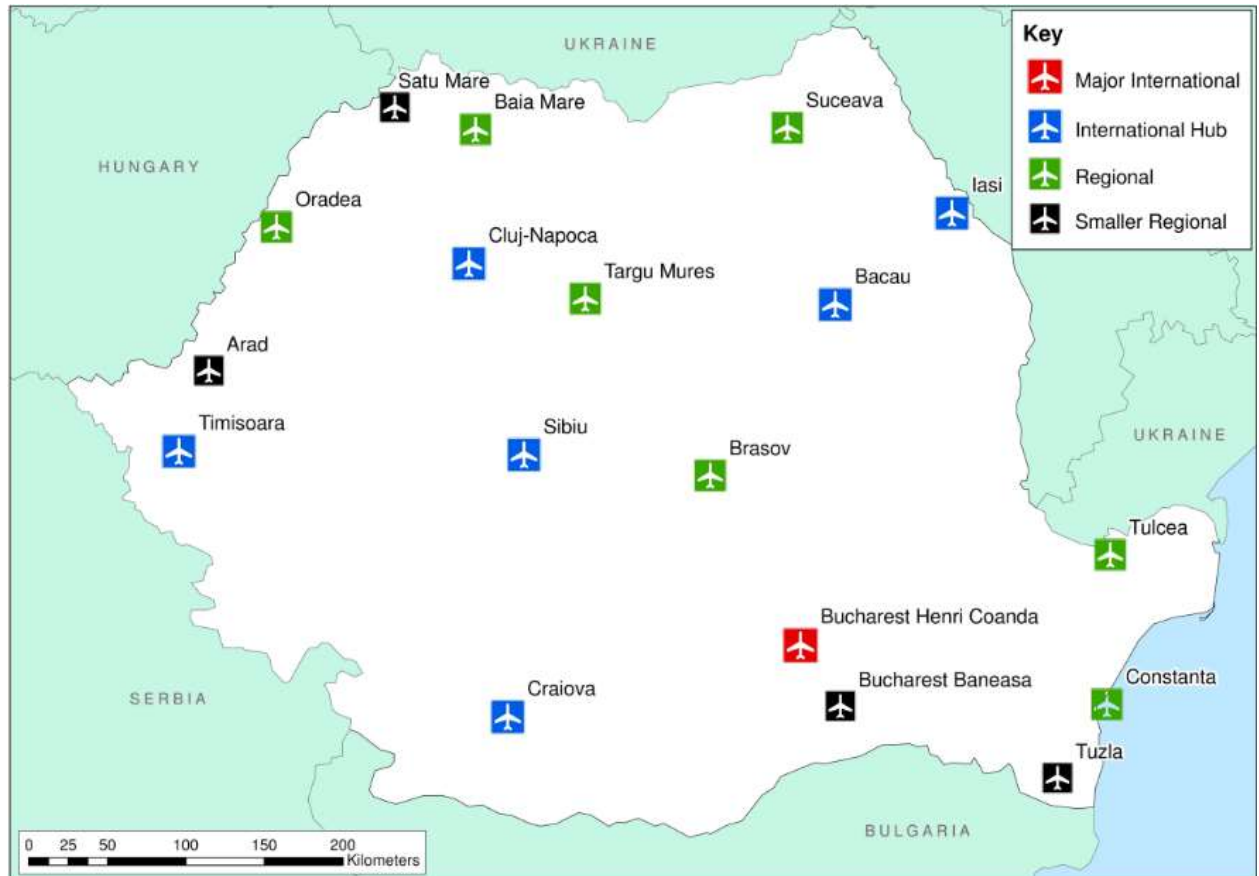
	Domestic	International	TOTAL
Bucharest (Henri Coanda)	649,682	6,670,884	7,320,566
Timisoara	336,152	1,019,867	1,356,019
Cluj-Napoca	189,139	815,682	1,004,821
Bacau	21,106	306,308	327,414
Targu Mures	10,477	216,361	226,838
Iasi	139,185	45,298	184,483
Sibiu	26,482	150,424	176,906
Constanta	11,647	64,817	76,464
Oradea	58,887	1,659	60,546
Craiova	19,397	11,872	31,269
Suceava	26,224	984	27,208
Satu Mare	19,534	3,207	22,741
Baia Mare	18,017	551	18,568
Arad	0	0	0
Brasov	0	0	0
TOTAL	1,525,929	9,307,914	10,833,843

Source: Civil Aviation Authority

- 2.5.4 In a country with the size, and topography of Romania there is potential for air to play an increasing role. The Master Plan identifies a hierarchy of airports to give regional access to international air travel, as well as domestic connectivity to more localised catchments. The designations are as follows:
- Major International Airport - airport with international routes serviced by national carriers, low cost carriers, chartered flights (above 5 million passengers per annum)

- International Hub Airports - airports that serves as hubs with European and regional routes served by national carriers, low cost carriers and chartered flights (between 1 million and 5 million passengers per annum)
- Regional Airports - airports mostly served by low cost carriers and chartered flights within Romania and adjacent countries (between 30,000 and 1 million passengers per annum)
- Smaller Regional Airports - airports that is mainly served by domestic and chartered flights (below 30,000 passengers per annum).

2.5.5 Figure 2.1 show the future designation of airports in Romania.



Source: AECOM Analysis

Figure 2.1: Location and Future Classification of Airports in Romania

Further details are given in Chapter 7 of the Master Plan Report.

2.5.6 That said there are a number of issues to be addressed in order to ensure continued growth and competitiveness of the sector. These are:

- Upgrading of navigational equipment, and aircraft de-icing equipment, to enable all the year round operations except during extreme weather events;
- Lengthening and strengthening runways to enable airports to handle the types of aircraft typically used by European operators, and to perform their designated roles;
- Increasing taxiway and apron capacity where there is sufficient demand;

- Increasing passenger terminal capacity to meet forecast demand;
- Improvements to surface access (fixed public transport links such as metro and heavy rail) where demand is sufficient to justify these projects; and
- More detailed assessments of the demand for air cargo terminals, especially at regional airports

2.5.7 The air sector differs from other modes in that demand is heavily dependent on both terminal facilities and services. An airport without appropriate flights does not generate air traffic, but in turn an airline will not start services unless suitable facilities are available on the ground. This reality has two practical consequences for the Master Plan:

- Our forecasts for air passenger traffic are assessments of potential demand if the airport can attract services, particularly international flights, commensurate with its designation; and
- Our recommendations for investment in increased capacity are conditional upon airports having agreements with operators for additional flights in place, if the airport improves its facilities. We recognise the practical problems with such a policy but the master Plan cannot support speculative investments.

2.6 Intermodal Transport

2.6.1 Intermodal transport, by which we mean road/rail and water/rail where the trunk haul is made by rail, represents the future for modern rail freight transport. Since the 1960s there has been a global trend of increased containerisation of goods. Containers are unitised in a standard format which allows global shipping companies (as well as other transport companies) to effectively and efficiently plan their loads. It also means that handling equipment is the same, and handling costs are far below those of traditional methods. Containerisation reduces the chance of theft and spillage as containers are sealed at source, reducing insurance costs. It means that turnround time of ships and loaded trains has more than halved and transport costs have reduced sharply. Containers can be used transport most types of commodities including re-frigerated goods and liquids.

2.6.2 However, the degree of containerisation in Romania transports is far below that of many other European countries (although greater than in neighbouring Bulgaria). The data in table 10.4 shows that containerisation is particularly advanced in Italy, Turkey, Austria and Germany but Bulgaria and Romania are lagging behind. The volume and percentage in countries like Austria are high due to the Alpine effect where on certain routes it is compulsory to use rail services and there is a considerable volume of transit traffic. But the sheer size of Romania, and the potential for transit traffic, means that intermodal transport should have a bright future.

2.6.3 The low level of containerisation in Romania is due to a number of factors. These include historic working practices, relatively cheap labour, lack of investment in inland terminals including cranes and secure storage, lack of modern supply chains, lack of modern rail wagons designed for efficient container operation, and very slow, unreliable journey times by rail.

2.6.4 The Master Plan proposals address these issues in several ways. We have identified locations where intermodal terminals will be successful in attracting viable throughput of more than 7,500 TEU per annum by 2030. Once this network is established we are confident that our forecasts are at the lower end, since in Romania intermodal transport is essentially a „new Mode” and therefore forecasting is inherently uncertain. In chapter 8 of the Master Plan report we also set out potential throughputs which are considerably in excess of our base forecasts.

2.6.5 These terminals will provide a network of intermodal terminals across Romania. There are four major „tri-modal” terminals located at Constanta and the major river ports, six existing terminals which are operating successfully, and 10 new terminals which could either be re-furbishments of existing terminals, or, more likely, new builds with modern facilities. Some of these could be integrated into commercial developments such as „freight villages” with other warehousing and distribution facilities, haulage companies businesses and vehicle servicing, but we have assessed and costed only the intermodal elements.

2.6.6 The network of major intermodal terminals is shown on Figure 2.2.



Source: AECOM Ports and Inland Intermodal Terminal Analysis and NTM

Figure 2.2 Proposed Network of Intermodal Terminals

2.6.7 The operation of intermodal terminals is closely integrated with the logistics industry, which is 100% privately run. Having consulted existing and potential operators of intermodal facilities, our recommendation is that the intermodal terminals should be designed, built and operated by the private sector in order to fully exploit their potential. However, as we point out, operating intermodal terminals is virtually a start-up industry in Romania and in many cases a small amount of public investment may be required.

2.6.8 We recommend that, at a minimum, the public sector contributes planning permits, land purchase, and the connections to the national, or local road and rail networks.

2.6.9 The rail rehabilitation proposals described outlined above will also benefit rail freight transport, because the rehabilitation will include re-signalling, regenerative braking and increases in axle loads to 22.5 tonnes, the European standard. But for block container trains in particular we also recommend raising the speed limit to 120 kph and to change the protocols of train control so that these trains are given higher priority.

Overall Objectives

3 Overall Objectives

3.1 High-Level Objectives

3.1.1 A series of high-level objectives for the Master Plan were formulated which guided the formulation of interventions proposed for the Plan. These objectives were derived from the following National and European documents:

- The objectives in the Terms of Reference (ToR)
- Mission: Minister's Statement in the Forward to the Strategic Plan of the Ministry of Transport and Infrastructure
- EU White Paper on Transport 2011
- Romanian Government Statement on Transport Policy (Program de Guvernare 2012-2016)
- Partnership Agreement 2014 – 2020 (see pages 176-177)
- AECOM Existing Conditions Report
- National Spatial Plan Section 1 Transport Networks
- EU Core Networks for Road and Rail

3.1.2 From these documents the following common themes, and high-level objectives were derived:

- **Economic Efficiency:** the transport system should be economically efficient as far as transport operations and users themselves are concerned. Specifically, the benefits of investments in transport should exceed the cost of that investment.
- **Sustainability:** the transport system must economically, financially and environmentally sustainable. The so-called sustainable modes of transport – rail, bus and waterways - which are more energy efficient and have lower emissions should be developed as a priority.
- **Safety:** investment in transport should produce a safer transport system. The economic cost of accidents is monetised in the economic evaluation, but since the goals of the Government, the EU and the ToR are clearly a reduction in transport-related accidents, safety must remain as a separate objective.
- **Environmental Impact:** Transport investment should minimise negative impact on the physical environment.
- **Balanced Economic Development:** The transport system should be configured to enable economic development both nationally and regionally. The investment should also favour equity as far as Romanian citizens are concerned.
- **Funding:** Availability of EC funding from the Structural Funds (CF and ERDF, Connecting Europe Facility (CEF)) and PPP will affect “buildability” and therefore the prioritisation of projects. The overall programme will have to be within a realistic estimate of national and other funds over the plan period.

3.1.3 Below these objectives, operational objectives were established for each mode based on a detailed, location-specific analysis of the problems which each mode experiences. Extensive consultations were carried with stakeholders in both the public and private sector as part of the problem analysis.

Operational Objectives

- 3.1.4 The operational objectives were derived from the in-depth analysis of the problems of each mode of transport. Care was taken in the problem analysis to ensure that each defined problem was specific, identified the underlying cause, and was geographically precise wherever possible. The operational objectives are therefore specific to each problem, but were grouped under the high-level objectives described above.
- 3.1.5 The operational objectives are set out in the modal chapters (chapters 4-8 of the Master Plan report), and in the Problems /Objectives /Interventions Technical Notes.

3.2 Interventions

- 3.2.1 The definition of interventions follow the setting of operational objectives. This procedure ensures there is a clear and identifiable connection between high-level objectives, the identified problems and the corresponding operational objectives, and the interventions themselves. This approach also ensures that the interventions address real, transport-related problems. The use of the National Model, and associated data, ensures that there is a quantitative basis for the problem definition, objectives, and interventions.
- 3.2.2 We invited the Ministry of Transport and stakeholders to submit their proposals and aspirations for their own areas of responsibility. The value of the interventions they proposed, which were predominantly for new or improved infrastructure, amounted to €74.8 bn. The funds available for infrastructure projects are €9.5 bn to 2020, and €24.7 to 2030. Thus the available funds represent less than half of the aspirations of the project sponsors.
- 3.2.3 The Master Plan cannot generate additional funding, but it can ensure that, in a situation where funding is limited, the available funds are allocated to areas where they provide the greatest benefit. The AECOM team, in conjunction with the Ministry of Transport and JASPERS, developed a series of interventions which include, but are not limited to, infrastructure interventions. In some cases these corresponded to projects proposed by stakeholders, but in many cases the projects were different, or scaled back in scope to meet the specific problem, or the forecast demand.
- 3.2.4 The analysis of the existing and future situations highlighted the serious shortcomings in maintenance and renewals on the railways and roads. The overall strategy therefore has two main pillars:
- The protection of existing assets by ring-fencing long term financing for improved maintenance and renewals. This will benefit all Romanian citizens (and visitors) who use the countries' transport systems; and
 - Selected infrastructure improvements, which gave the best value for money, and met the operational objectives.
- 3.2.5 The Master Plan also contains a series of so-called "soft" measures for each mode such as institutional reforms, changes in the Public Service Contracts (PSC) of rail operators, changes to the size and duration of road maintenance contracts and so on. These all have the common objective of increasing efficiency and encouraging commercial behaviour, and should, therefore, have a net financial gain.
- 3.2.6 Interventions to increase safety, particularly on roads, and allow flights to operate safely in adverse weather conditions, were also included.

Testing Projects

4 Testing projects

- 4.1.1 Interventions in the domains of rail, road, ports and waterways, and intermodal transport were tested with the National Model. The model is fully described in the Model Development Report, which is summarised in Chapter of this Report, but there are some important features of the model which need to be fully understood when interpreting the results.
- 4.1.2 The model uses the well established four stage process which involves:
- Stage 1: Trip production and attraction: estimating the total number of passenger journeys or tonnes of freight generated by, and attracted to, each zone.
 - Stage 2: The distribution of passenger journeys and tonnes of freight between zones;
 - Stage 3: The choice of for passenger journeys or freight movements between zones
 - Stage 4: The route chosen between zones for every zone to zone movement of pasengers and freight, for each mode of transport.

Mathematical relationships, calibrated by observed data, determine how the model carries out the functions in each of these four stages.

- 4.1.3 The model is highly complex – the full runs of the model for three years (2020, 2030 and 2040) take approximately 30 hours - but it is important to understand how the interventions affect the model outputs. Generally speaking, the driver of change in distribution of traffic, mode choice and route choice is change in travel cost, either in terms of travel time (since time is money), or the money cost of travel such as fares, vehicle operating costs, tariffs, and handling charges for freight. Various examples are given below. In these example the word “traffic” is generic: it ecompasses all modes of travel, and both pasengers and freight.
- 4.1.4 An improvement to either road infrastructure, or faster trains and more frequent services, will produce a change in the distribution of traffic, because travel between the cities and town served by the new road or better train service will be easier and these settlements will be accessible from a larger area. In addition, a change in mode choice will occur because one mode, either road or rail in this example, will become relatively more attractive. The final response will be a change in route choice, because the improved route will offer a quicker journey, and greater capacity. Not only will traffic transfer to the improved route from the roads or rail services in the same corridor, but will transfer from further afield. This means that the traffic on a new or significantly improved route will be much greater than the existing traffic on the immediate parallel route.
- 4.1.5 An improved, or new intermodal terminal (or network of terminals since there must be proper facilities at both ends of the joirney) will attract additional containerised traffic because of reduced handling costs. If combined with faster container trains, the additional traffic will be reinforced. There will be a switch of traffic from road to rail, through the mode choice mechanism, and some change to the distribution of freight traffic, although not as marked as with passenger travel.
- 4.1.6 These mechanisms apply in a similar way to all modes of transport. It is important to note that the process is essentially neutral in its operation: the mechanisms for distribution, mode choice and route choice are mathematical and based on observed behaviour. Secondly, the changes in volumes of traffic by road, rail, water and intermodal transport are outputs from the National Model, not inputs to it. Thus there are no pre-conceived targets or outcomes in the process.

- 4.1.7 A large number of projects were tested with the National Model. The panel below gives the approximate number. Many of the projects were tested several times due to variations in the project specification, or in combination with other projects, so the numbers given below are conservative:

Mode	<i>Road</i>	<i>Rail</i>	<i>Ports and Waterways</i>	<i>Intermodal Transport</i>
Number of Projects	92	34	12	13

The rail projects comprised three elements, infrastructure re-habilitation on a complete long distance route, revised timetables, and new rolling stock, so each rail project is in effect a whole route strategy.

- 4.1.8 Aviation projects were not tested with the National Model, but with a specially developed aviation model, which reflects the additional traffic which would arise if an airport attracts additional services as well as improves its own facilities. The model uses a combination of non-overlapping catchment areas and trip rates for different levels of flights to forecast potential passenger traffic. However, the aviation model does use data from the National Model in the CBA analysis.
- 4.1.9 As discussed in section 10.2, and in greater detail in Chapter 4 and the Problem Definition Report, road safety is a serious concern in Romania. A bespoke model was developed which identified the locations on the National road network with the most serious accident problems, identified the causes, and proposed the most appropriate solutions from a menu of proven safety treatments. The model also performs a CBA. 138 high-priority sites were identified by these means.

Project Appraisal – Role of Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA)

5 Project Appraisal Role of CBA and MCA

- 5.1.1 As described in the National Assessment Guidelines, Volume 1, and summarised in Section 2.6 of the Master Plan Report, projects were initially sorted according to their economic performance.
- 5.1.2 For road projects, this was a two stage process: first, the individual projects which met each operational objective were assessed using CBA, and secondly, the individual projects were assembled into two alternative “Level 1” strategies which made a coherent network; these were again subject to a CBA, with the best performing strategy and the projects within it being carried forward to an MCA. Further residual problems were identified assuming the preferred Level 1 strategy was in place, and so-called “Level 2” projects were identified to address these problems.
- 5.1.3 Strictly speaking, the CBA pass/fail criteria were that projects should have an EIRR greater than 5% (the discount rate), and a Benefit-Cost Ratio (BCR) greater than 1. However, these criteria were relaxed for rail projects, for a number of reasons:
- As we have shown earlier, rail passenger transport in particular has been in decline for a number of years, with the result that existing rail traffic is not always sufficient to justify the large investments required in rail improvements. If CBA criteria were to be strictly applied it would reinforce this situation by rejecting rail improvements in favour of road projects, which would add further to railway decline to the point where, in our opinion, rail would cease to play a worthwhile role in national transport;
 - Because of under-investment in railways over a long period, the scale of investment required is larger than it would have been under a “normal” investment programme; this means investment costs are higher; reducing the EIRR and BCR for rail projects.
 - Rail infrastructure has to be built to meet exacting construction and safety standards; gradients cannot be severe, high speed running requires good horizontal alignment without severe curves, and there are EU standards for minimum line speeds on the Core TEN-T network. This means that there is limited scope for adjusting standards and therefore costs, in order to improve economic performance.
- 5.1.4 Following the assessment using CBA, projects were assembled into two scenarios using Multi-Criteria Analysis (MCA) techniques. The two scenarios are characterised as follows:
- 5.1.5 **Economically Sustainable (“ES”) Scenario:** This scenario emphasises projects which perform well in economic terms, with the economic efficiency criteria having the largest weighting (70%) having the highest weighting. Projects on the Core TEN-T were given 30% weighting.
- 5.1.6 **Economic and Environmentally Sustainable (“EES”) Scenario:** This scenario gives additional weighting to the physical environmental impacts, especially the impact of Natura 2000 sites, with less on economic efficiency. The weighting for economic efficiency was reduced to 50%, physical impact on the environment 20%, and whether or not the project was located on the Core Ten-T network, 20%. An additional criterion, with 10% weighting, namely “balanced economic development”, was introduced. This latter criterion gave some weighting to projects which would assist economic development in Romania’s regions.

5.1.7 The criteria used, which were agreed with MT, JASPERS and the EC, and their weightings, were as follows:

Table 5.1 Criteria and Weightings for the ES and EES Scenarios

Criteria	ES	EES
Economic Efficiency	70%	50%
Trans-European Integration/TEN-T Policy	30%	20%
Environmental Impact	-	20%
Sustainability	Not scored but dealt with the distribution of funds by mode	
Balanced Economic Development	-	10%

Source: AECOM, MT, JASPERS and EC

The measure of economic efficiency includes the benefits due to accident reduction, and changes in emissions and air pollution, so there is an implicit recognition of some environmental impacts in the cost-benefit analysis.

5.1.8 The scoring of each criterion is given in Tables 5.2-3 below, for the ES and EES scenarios.

Table 5.2 Scoring of Projects for the ES Scenario Criteria

No.	Master Plan High-Level Objective	Criteria	Indicator/Reference	Weight	Scoring criteria	Scoring (points)
A	Economic Efficiency	Economic Performance	EIRR	70%	5%	0
					Maximum EIRR	100
					> 5% < highest EIRR%	Proportionally from 100 = highest EIRR
B	Trans-European Integration	Relation with TEN-T network	TEN-T Regulation	30%	Core TEN-T link	100
					Comprehensive TEN-T link	30
					Other links	0
C	Sustainability	Contribution to cleaner transport modes policy	White Paper		Not scored under MCA but dealt with via pre-allocation of funding per sectors: this scenario assumes 51% roads, 44% for rail and 5% for Ports, IWT, Intermodal and Aviation	

Source: AECOM, MT, JASPERS and EC

Table 5.3 Scoring of Projects for the ES Scenario Criteria

No.	Master Plan High-Level Objective	Criteria	Indicator/Reference	Weight	Scoring criteria	Scoring (points)
A	Economic Efficiency	Economic Performance	EIRR	50%	5%	0
					Maximum EIRR	100
					> 5% < highest EIRR%	Proportionally from 100 = highest EIRR
B	Trans-European Integration	Relation with TEN-T network	TEN-T Regulation	20%	Core TEN-T link	100
					Comprehensive TEN-T link	50
					Secondary connectivity with TEN-T	10
					Other links	0
C	Environmental Impact	Potential environmental impact (in particular on NATURA 2000 sites)	SEA	20%	Very high	-100
					High	-80
					Moderate	-50
					Low	-30
					None	0
D	Sustainability	Contribution to cleaner transport modes policy	White Paper	Not scored under MCA but dealt with via pre-allocation of funding per sectors: this scenario assumes 51% roads, 44% for rail and 5% for Ports, IWT, Intermodal and Aviation		
E	Balanced Economic Development	Improving the accessibility of less accessible regions	GTMP accessibility maps	10%	Improving link to an area with low accessibility both to foreign and domestic markets	100
					Improving link to an area with low accessibility to foreign markets	70
					Improving link to an area with low accessibility to domestic markets	50
					Links to areas with good accessibility	0

Source: AECOM, MT, JASPERS and EC

5.1.9 We should clarify the respective roles of the MCA and the Implementation Strategy. The MCA procedure gives an “order of merit” to projects, essentially of their value to the economic and social development of Romania. However, for practical reasons such as project maturity, which includes factors such as availability of Feasibility Studies, environmental investigations, national and local political support, as well as availability of funds, such as Cohesion Funds, which the

EC has stipulated must be used first for projects on the currently-defined Core TEN-T the Implementation Strategy will have a different order to the projects to that produced by the MCA procedure. In other words, the MCA procedure determines which projects should be in the Preferred Strategy, but the overall strategy will remain the same.

- 5.1.10 In Chapter 6 below we give the results of the MCA process and the resulting composition of the ES and EES scenarios.

**Environmentally Sustainable (ES)
Scenario and Economical and
Environmentally Sustainable (EES)
Scenario**

6 ES and EES Scenarios

6.1 Economically Sustainable (“ES”) Scenario

- 6.1.1 This section describes the projects included in the ES Scenario following the application of the MCA. Table 6.1 sets out the ES Scenario road projects according to their scores from the MCA.

Table 6.1 List of road investments – ES Scenario

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost	
	H0	Safety Interventions	n/a	n/a	18.5%	150.0	150.0	
1	Selected Level 1	H7	Sibiu-Brasov Motorway	Comprehensive TEN-T link	74.3	17.3%	817.3	817.3
2		H8	Ploiesti-Comarnic Motorway	Comprehensive TEN-T link	48.7	12.5%	310.4	1,127.7
3		H6	Craiova-Pitesti Motorway	Comprehensive TEN-T link	47.3	12.2%	870.3	1,998.0
4		H1	Comarnic-Brasov Motorway	Comprehensive TEN-T link	29.3	8.8%	1,117.0	3,115.0
5		H12	Brasov-Bacau Motorway	Comprehensive TEN-T link	20.1	7.1%	2,067.6	5,182.6
1	Level 2	OR18B	Bucharest Southern Ring Road Upgrade	Core TEN-T link	100.0	14.5%	175.7	5,358.3
2		OR7A	Bacau-Suceava Expressway	Core TEN-T link	86.3	12.6%	645.4	6,003.7
3		OR15	Sibiu-Pitesti Motorway	Core TEN-T link	82.3	12.1%	2,471.2	8,474.9
4		OR19	Bucharest-Alexandria Expressway	Core TEN-T link	79.8	11.8%	369.6	8,844.5
5		OR7B	Suceava-Siret Expressway	Core TEN-T link	79.1	11.7%	186.1	9,030.6
6		OR13C	Buzau-Focsani Expressway	Core TEN-T link	74.5	11.0%	282.0	9,312.6
7		OR13D	Targu Neamt-Iasi-Ungheeni Motorway	Core TEN-T link	72.7	10.8%	700.0	10,012.6
8		OR12	Nadaselu - Suplacu de Barcau Motorway	Comprehensive TEN-T link	69.3	13.2%	550.0	10,562.6
9		OR10	Lugoj- Craiova Expressway	Core TEN-T link	66.6	10.0%	1,810.9	12,373.5
10		OR9B	Turda-Halmeu Expressway	Other links	63.0	13.5%	975.4	13,348.9
11		OR19D	Henri Coanda Airport connection to A3	Core TEN-T link	61.9	9.3%	125.6	13,474.5
12		OR17	Gaesti-Ploiesti-Buzau-Braila Expressway	Comprehensive TEN-T link	60.0	11.9%	1,279.6	14,754.1
13		OR13	Targu Mures-Targu Neamt Motorway	Core TEN-T link	55.0	8.4%	3,400.0	18,154.1
14		OR6B	Bacau-Focsani-Braila-Galati Expressway	Comprehensive TEN-T link	54.4	11.2%	1,024.2	19,178.3
15		OR21	A1 Widening Bucharest-Pitesti	Core TEN-T link	49.1	7.6%	442.0	19,620.3
16		OR8	Bacau-Piatra Neamt Expressway	Other links	41.2	10.6%	335.1	19,955.4
17		OR14	Brasov-Pitesti Expressway	Comprehensive TEN-T link	39.0	9.1%	1,842.6	21,798.0
18		OR18A	Bucharest Ring Road Motorway	Core TEN-T link	35.2	5.7%	1,683.8	23,481.8
19		OR7C	Suceava-Botosani Expressway	Other links	28.4	8.9%	345.8	23,827.6
20		OR11	Constanta-Tulcea-Braila Expressway (including Braila Bridge)	Comprehensive TEN-T link	11.9	5.4%	1,369.3	25,196.9
1	Bypasses	BP12	Adjud	Core TEN-T link	85.4	19.0%	46.2	46.2
2		BP10	Targoviste	Comprehensive TEN-T link	79.0	22.7%	78.0	124.2
3		BP4	Roman	Core TEN-T link	73.2	15.9%	62.0	186.1
4		BP11	Filiasi	Core TEN-T link	71.8	15.6%	27.7	213.8
5		BP15	Falticeni	Core TEN-T link	62.4	13.2%	41.3	255.1
6		BP5	Focsani	Core TEN-T link	62.1	13.1%	76.1	331.2
7		BP25	Vatra Domei	Comprehensive TEN-T link	60.2	17.9%	18.3	349.4
8		BP3	Sighisoara	Comprehensive TEN-T link	51.8	15.8%	47.7	397.1
9		BP28	Timisoara South	Core TEN-T link	48.5	9.7%	127.4	524.5
10		BP7	Buzau	Core TEN-T link	39.7	7.5%	104.8	629.3
11		BP21	Giurgiu	Core TEN-T link	39.3	7.4%	72.0	701.4
12		BP6	Ramnicu Sarat	Core TEN-T link	37.1	6.8%	37.0	738.4
13		BP9	Ramnicu Valcea	Core TEN-T link	34.8	6.2%	195.4	933.8
14		BP20	Sfantu Gheorghe	Comprehensive TEN-T link	34.3	11.4%	34.0	967.8
15		BP14	Ludus	Comprehensive TEN-T link	33.5	11.2%	102.5	1,070.3
16		BP23	Barlad	Comprehensive TEN-T link	33.3	11.1%	51.1	1,121.4
17		BP16	Caransebes	Core TEN-T link	32.6	5.7%	80.8	1,202.2
18		BP24	Slobozia	Comprehensive TEN-T link	31.1	10.6%	23.3	1,225.6
19		BP13	Mizil	Core TEN-T link	30.0	1.9%	36.0	1,261.5
20		BP22	Vaslui	Comprehensive TEN-T link	23.4	8.6%	72.9	1,334.5
21		BP17	Beclean	Comprehensive TEN-T link	22.6	8.4%	42.2	1,376.7
22		BP27	Mangalia	Comprehensive TEN-T link	18.9	7.5%	44.1	1,420.8
23		BP18	Bistrita	Comprehensive TEN-T link	15.1	6.5%	157.0	1,577.8
24		BP19	Miercurea Ciuc	Comprehensive TEN-T link	9.0	4.8%	110.5	1,688.3
25		BP26	Campulung Moldovenesc	Comprehensive TEN-T link	9.0	2.5%	99.3	1,787.6

Source: AECOM GTMP MCA Scoring of Projects

6.1.2 Table 6.2 sets out the EES Scenario road projects according to their scores from the MCA.

Table 6.2 EES Scenario Road Projects

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost	
	H0	Safety Interventions	n/a	n/a	18.5%	150.0	150.0	
1	Selected Level 1	H7	Sibiu-Brasov Motorway	Comprehensive TEN-T link	57.6	17.3%	817.3	817.3
2		H8	Ploiesti-Comarnic Motorway	Comprehensive TEN-T link	39.4	12.5%	310.4	1,127.7
3		H6	Craiova-Pitesti Motorway	Comprehensive TEN-T link	34.4	12.2%	870.3	1,998.0
4		H1	Comarnic-Brasov Motorway	Comprehensive TEN-T link	15.5	8.8%	1,117.0	3,115.0
5		H12	Brasov-Bacau Motorway	Comprehensive TEN-T link	14.9	7.1%	2,067.6	5,182.6
1	Level 2	OR18B	Bucharest Southern Ring Road Upgrade	Core TEN-T link	71.0	14.5%	175.7	5,358.3
2		OR7A	Bacau-Suceava Expressway	Core TEN-T link	70.2	12.6%	645.4	6,003.7
3		OR12	Nadaselu - Suplacu de Barcau Motorway	Comprehensive TEN-T link	57.0	13.2%	550.0	6,553.7
4		OR19	Bucharest-Alexandria Expressway	Core TEN-T link	56.6	11.8%	369.6	6,923.3
5		OR13C	Buzau-Focsani Expressway	Core TEN-T link	55.8	11.0%	282.0	7,205.4
6		OR7B	Suceava-Siret Expressway	Core TEN-T link	52.1	11.7%	186.1	7,391.5
7		OR13D	Targu Neamt-lasi-Ungheni Motorway	Core TEN-T link	51.5	10.8%	700.0	8,091.5
8		OR15	Sibiu-Pitesti Motorway	Core TEN-T link	51.3	12.1%	2,471.2	10,562.6
9		OR6B	Bacau-Focsani-Braila-Galati Expressway	Comprehensive TEN-T link	46.5	11.2%	1,024.2	11,586.8
10		OR9B	Turda-Halmeu Expressway	Other links	44.0	13.5%	975.4	12,562.2
11		OR19D	Henri Coanda Airport connection to A3	Core TEN-T link	43.8	9.3%	125.6	12,687.8
12		OR17	Gaesti-Ploiesti-Buzau-Braila Expressway	Comprehensive TEN-T link	43.4	11.9%	1,279.6	13,967.4
13		OR10	Lugoj- Craiova Expressway	Core TEN-T link	40.1	10.0%	1,810.9	15,778.3
14		OR21	A1 Widening Bucharest-Pitesti	Core TEN-T link	34.7	7.6%	442.0	16,220.3
15		OR7C	Suceava-Botosani Expressway	Secondary connectivity with TEN-T	32.3	8.9%	345.8	16,566.1
16		OR13	Targu Mures-Targu Neamt Motorway	Core TEN-T link	31.9	8.4%	3,400.0	19,966.1
17		OR14	Brasov-Pitesti Expressway	Comprehensive TEN-T link	25.4	9.1%	1,842.6	21,808.7
18		OR18A	Bucharest Ring Road Motorway	Core TEN-T link	24.7	5.7%	1,683.8	23,492.5
19		OR8	Bacau-Piatra Neamt Expressway	Other links	19.4	10.6%	335.1	23,827.6
20		OR11	Constanta-Tulcea-Braila Expressway (including Braila Bridge)	Comprehensive TEN-T link	17.1	5.4%	1,369.3	25,196.9
1	Bypasses	BP10	Targoviste	Comprehensive TEN-T link	57.0	22.7%	78.0	78.0
2		BP12	Adjud	Core TEN-T link	56.6	19.0%	46.2	124.2
3		BP4	Roman	Core TEN-T link	47.9	15.9%	62.0	186.1
4		BP11	Filiasi	Core TEN-T link	46.9	15.6%	27.7	213.8
5		BP25	Vatra Dornei	Comprehensive TEN-T link	43.6	17.9%	18.3	232.1
6		BP15	Falticeni	Core TEN-T link	40.1	13.2%	41.3	273.3
7		BP5	Focsani	Core TEN-T link	39.9	13.1%	76.1	349.4
8		BP3	Sighisoara	Comprehensive TEN-T link	37.6	15.8%	47.7	397.1
9		BP28	Timisoara South	Core TEN-T link	33.2	9.7%	127.4	524.5
10		BP20	Sfantu Gheorghe	Comprehensive TEN-T link	25.1	11.4%	34.0	558.5
11		BP14	Ludus	Comprehensive TEN-T link	24.5	11.2%	102.5	661.0
12		BP23	Birlad	Comprehensive TEN-T link	24.3	11.1%	51.1	712.1
13		BP7	Buzau	Core TEN-T link	23.9	7.5%	104.8	817.0
14		BP21	Giurgiu	Core TEN-T link	23.7	7.4%	72.0	889.0
15		BP24	Slobozia	Comprehensive TEN-T link	22.8	10.6%	23.3	912.3
16		BP6	Ramnicu Sarat	Core TEN-T link	22.0	6.8%	37.0	949.4
17		BP9	Ramnicu Valcea	Core TEN-T link	20.5	6.2%	195.4	1,144.8
18		BP16	Caransebes	Core TEN-T link	18.9	5.7%	80.8	1,225.6
19		BP22	Vaslui	Comprehensive TEN-T link	17.3	8.6%	72.9	1,298.5
20		BP13	Mizil	Core TEN-T link	17.0	1.9%	36.0	1,334.5
21		BP17	Beclean	Comprehensive TEN-T link	16.7	8.4%	42.2	1,376.7
22		BP27	Mangalia	Comprehensive TEN-T link	14.1	7.5%	44.1	1,420.8
23		BP18	Bistrita	Comprehensive TEN-T link	11.4	6.5%	157.0	1,577.8
24		BP19	Miercurea Ciuc	Comprehensive TEN-T link	7.0	4.8%	110.5	1,688.3
25		BP26	Campulung Moldovenesc	Comprehensive TEN-T link	7.0	2.5%	99.3	1,787.6

Source: AECOM GTMP MCA Scoring of Projects

6.1.3 Some of the identified bypasses are part of larger Level 1 or Level 2 projects. The decision to advance these proposals as separate projects will be determined within the Implementation

Strategy which will examine the funding opportunities and the maturity of each project. If the larger Level 1 or Level 2 project appears as feasible early in the implementation plan, then a separate bypass will not be needed. A value for money analysis based on the lifetime forecast for the bypass as an individual entity will determine the best solution.

6.1.4 Tables 6.3-4 set out the ES and EES Scenario rail projects according to their scores from the MCA

Table 6.3 ES Scenario Rail Projects

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	DS10R	Emergency interventions for section Bucharest to Giurgiu via Gradistea	Core TEN-T link	100.0	49.0%	0.0	0.0
2	DS02A	Bucharest to Constanta. New rolling stock and re-timetabling	Core TEN-T link	99.9	48.9%	28.8	28.8
3	DS01R	Emergency interventions for section Bucharest to Hungary via Brasov + Teius to Cluj	Core TEN-T link	69.0	29.5%	67.7	96.5
4	DS11R	Emergency interventions for section Craiova to Calafat	Core TEN-T link	58.7	23.0%	1.5	98.0
5	DS03R	Emergency interventions for section Bucharest to Arad via Craiova and Timisoara	Core TEN-T link	56.9	21.9%	73.2	171.2
6	DS04R	Emergency interventions for section Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine	Core TEN-T link	51.6	18.6%	90.7	261.8
7	DS06R	Emergency interventions for section Cluj-Napoca to Iasi	Core TEN-T link	51.3	18.4%	52.5	314.3
8	DS10A	Bucharest to Giurgiu via Gradistea. Rehabilitation to design speed.	Core TEN-T link	45.4	14.7%	132.1	446.4
9	DS04A	Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine. Rehabilitation to design speed.	Core TEN-T link	31.8	6.2%	3,093.2	3,539.7
10	DS01A	Bucharest to Hungary via Brasov + Teius to Cluj. Rehabilitation to design speed.	Core TEN-T link	30.7	5.5%	2,784.9	6,324.6
11	DS03A	Bucharest to Arad via Craiova and Timisoara. Rehabilitation to design speed.	Core TEN-T link	30.5	5.3%	2,242.5	8,567.1
12	DS11A	Craiova to Calafat. Rehabilitation to design speed.	Core TEN-T link	30.0	4.5%	168.6	8,735.7
13	DS06A	Cluj-Napoca to Iasi. Rehabilitation to design speed.	Core TEN-T link	30.0	0.3%	2,580.7	11,316.4
14	DS03S	Freight test Filiasi - Tg Jiu	Comprehensive TEN-T link	27.7	16.7%	6.1	11,322.4
15	DS05B	Bucharest to Sibiu via Pitesti and Ramnicu Valcea. New link, rehabilitation to design speed and	Comprehensive TEN-T link	14.0	8.1%	1,159.9	12,482.4
16	DS08A	Oradea to Timisoara. Rehabilitation to design speed.	Comprehensive TEN-T link	9.0	2.8%	358.8	12,841.2
17	DS09A	Oradea to Cluj-Napoca via Satu Mare and Baia Mare. Rehabilitation to design speed.	Comprehensive TEN-T link	9.0	-1.4%	1,110.7	13,951.8
18	DS07B	Cluj-Napoca to Oradea. Rehabilitation to enhanced speed, line doubling and electrification.	Comprehensive TEN-T link	9.0	-0.1%	1,473.4	15,425.2

Source: AECOM GTMP MCA Scoring of Projects

Table 6.4 EES Scenario Rail Projects

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	DS10R	Emergency interventions for section Bucharest to Giurgiu via Gradistea	Core TEN-T link	80.0	49.0%	0.0	0.0
2	DS02A	Bucharest to Constanta. New rolling stock and re-timetabling	Core TEN-T link	73.9	48.9%	28.8	28.8
3	DS11R	Emergency interventions for section Craiova to Calafat	Core TEN-T link	50.5	23.0%	1.5	30.3
4	DS03R	Emergency interventions for section Bucharest to Arad via Craiova and Timisoara	Core TEN-T link	49.2	21.9%	73.2	103.5
5	DS04R	Emergency interventions for section Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine	Core TEN-T link	45.4	18.6%	90.7	194.2
6	DS06R	Emergency interventions for section Cluj-Napoca to Iasi	Core TEN-T link	45.2	18.4%	52.5	246.7
7	DS10A	Bucharest to Giurgiu via Gradistea. Rehabilitation to design speed.	Core TEN-T link	35.0	14.7%	132.1	378.7
8	DS03S	Freight test Filiasi - Tg Jiu	Comprehensive TEN-T link	33.3	16.7%	6.1	384.8
9	DS01R	Emergency interventions for section Bucharest to Hungary via Brasov + Teius to Cluj	Core TEN-T link	30.0	29.5%	67.7	452.5
10	DS04A	Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine. Rehabilitation to design speed.	Core TEN-T link	25.3	6.2%	3,093.2	3,545.7
11	DS01A	Bucharest to Hungary via Brasov + Teius to Cluj. Rehabilitation to design speed.	Core TEN-T link	24.5	5.5%	2,784.9	6,330.7
12	DS03A	Bucharest to Arad via Craiova and Timisoara. Rehabilitation to design speed.	Core TEN-T link	24.4	5.3%	2,242.5	8,573.1
13	DS11A	Craiova to Calafat. Rehabilitation to design speed.	Core TEN-T link	24.0	4.5%	168.6	8,741.7
14	DS06A	Cluj-Napoca to Iasi. Rehabilitation to design speed.	Core TEN-T link	24.0	0.3%	2,580.7	11,322.4
15	DS05B	Bucharest to Sibiu via Pitesti and Ramnicu Valcea. New link, rehabilitation to design speed and	Comprehensive TEN-T link	17.6	8.1%	1,159.9	12,482.4
16	DS08A	Oradea to Timisoara. Rehabilitation to design speed.	Comprehensive TEN-T link	14.0	2.8%	358.8	12,841.2
17	DS09A	Oradea to Cluj-Napoca via Satu Mare and Baia Mare. Rehabilitation to design speed.	Comprehensive TEN-T link	14.0	-1.4%	1,110.7	13,951.8
18	DS07B	Cluj-Napoca to Oradea. Rehabilitation to enhanced speed, line doubling and electrification.	Comprehensive TEN-T link	14.0	-0.1%	1,473.4	15,425.2

Source: AECOM GTMP MCA Scoring of Projects

6.1.5 Table 10.5 sets out the ES and EES Scenario Ports and Waterways projects according to their scores from the MCA.

Table 10.5 Ports and Waterways Projects, ES and EES Scenarios

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulative Cost
1	P-GL-S	Galati Port	Core TEN-T link	74.0	39.9%	17.6	17.6
2	P-GR-S	Giurgiu Port	Core TEN-T link	51.7	24.3%	4.3	22.0
3	P-DOV-S	Orsova/Drobeta	Core TEN-T link	50.9	23.8%	25.1	47.1
4	P-OT-S	Oltenita Port	Comprehensive TEN-T link	50.0	30.1%	5.6	52.7
5	P-DB-S	Drobeta Turnu Severin Port	Core TEN-T link	49.4	22.8%	17.3	70.0
6	P-CV-S	Cernavoda Port	Core TEN-T link	48.9	22.4%	6.9	76.9
7	P-OV-S	Orsova Port	Comprehensive TEN-T link	42.4	24.8%	7.8	84.7
8	P-CB-S	Corabia Port	Other links	32.8	25.1%	4.5	89.2
9	W1	Dredging of the joint Romanian-Bulgarian sector of the Danube	Core TEN-T link	30.9	19.6%	206.7	295.9
10	P-All-S	Sulina Channel Improvements	Core TEN-T link	30.4	9.5%	20.0	315.9
11	P-CO-S	Constanta Port	Core TEN-T link	29.5	8.9%	351.1	667.0
12	P-CF-S	Calafat Port	Core TEN-T link	24.0	2.4%	19.7	686.8
13	P-MV-S	Moldova Veche Port	Comprehensive TEN-T link	17.2	7.2%	3.7	690.4
14	P-TL-S	Tulcea Port	Comprehensive TEN-T link	14.0	-1.1%	16.0	706.4
15	W36	Bucharest to Danube Canal Connection	Core TEN-T link	10.0	4.7%	1,500.8	2,207.2
16	P-BS-S	Basarabi Port	Other links	4.0	1.2%	5.6	2,212.8

Source: AECOM GTMP MCA Scoring of Projects

6.1.6 The Bucharest – Danube Channel could have commenced construction in the period 2020 – 2030. However, we are reluctant to recommend this project at this time, for several reasons:

- Bucharest is already well-connected to the east and west by rail and road, and one of the primary objectives of the Master Plan is to re-invigorate the railway. Testing with the National Model showed that the channel would have a significant, adverse impact on the Constanta – Bucharest – Craiova – Hungary rail corridor.
- The proposals for improvements to the Ports at Giurgiu and Oltenita gave very good economic value, with EIRR of 24% and 30% respectively, for modest investments of €4.3m and €5.6m respectively. If the Bucharest – Danube Channel were to be implemented, it would jeopardise these investments.
- The Channel is expensive and barely economically viable. It has an estimated cost of €1.5bn, and an EIRR of only 4.7%.

6.1.7 For these reasons we recommend that the viability of the Channel is re-examined in the mid 2020s when the impact of the Port improvements, and rail improvements, would become clearer.

6.1.8 Tables 6.6-7 set out the ES and EES Scenario Aviation link projects according to their scores from the MCA.

Table 6.6 Aviation Projects, ES Scenario

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	A8	Oradea	Comprehensive TEN-T link	70.5	47.6%	1.2	1.2
2	A12	Targu Mures	Other links	70.0	53.5%	15.6	16.8
3	A6	Craiova	Comprehensive TEN-T link	59.9	40.3%	17.3	34.2
4	A10	Sibiu	Comprehensive TEN-T link	52.1	34.9%	49.8	84.0
5	A11	Suceava	Comprehensive TEN-T link	45.9	30.6%	4.0	88.0
6	A5	Constanta	Comprehensive TEN-T link	37.9	25.0%	8.2	96.1
7	A13	Timisoara	Core TEN-T link	31.2	5.8%	76.5	172.7
8	A7	Iasi	Comprehensive TEN-T link	26.9	17.4%	10.8	183.5
9	A2	Baia Mare	Comprehensive TEN-T link	18.8	11.8%	2.3	185.8
10	A1	Bacau	Comprehensive TEN-T link	17.6	11.0%	85.1	270.9
11	A4	Cluj	Comprehensive TEN-T link	13.4	8.1%	38.1	309.0
12	A16	Tulcea	Comprehensive TEN-T link	9.0	5.0%	15.4	324.3
13	A9	Satu Mare	Other links	1.7	6.2%	0.8	325.2

Source: AECOM GTMP MCA Scoring of Projects

Table 6.7 Aviation Projects, EES Scenario

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	A8	Oradea	Comprehensive TEN-T link	43.9	47.6%	1.2	1.2
2	A12	Targu Mures	Other links	40.0	53.5%	15.6	16.8
3	A6	Craiova	Comprehensive TEN-T link	36.4	40.3%	17.3	34.2
4	A10	Sibiu	Comprehensive TEN-T link	30.8	34.9%	49.8	84.0
5	A11	Suceava	Comprehensive TEN-T link	26.4	30.6%	4.0	88.0
6	A5	Constanta	Comprehensive TEN-T link	20.6	25.0%	8.2	96.1
7	A7	Iasi	Comprehensive TEN-T link	12.8	17.4%	10.8	106.9
8	A13	Timisoara	Core TEN-T link	10.8	5.8%	76.5	183.5
9	A2	Baia Mare	Comprehensive TEN-T link	7.0	11.8%	2.3	185.8
10	A1	Bacau	Comprehensive TEN-T link	6.1	11.0%	85.1	270.9
11	A4	Cluj	Comprehensive TEN-T link	3.2	8.1%	38.1	309.0
12	A16	Tulcea	Comprehensive TEN-T link	0.0	5.0%	15.4	324.3
13	A9	Satu Mare	Other links	-8.8	6.2%	0.8	325.2

6.1.9 The 2020 and 2030 proposals for intermodal transport are shown on Tables 6.8-9, for the ES, and EES scenarios respectively.

Table 6.8 Intermodal Projects, ES Scenarios

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	I-BU-S	Bucuresti IMT	Core TEN-T link	100.0	13.8%	18.0	18.0
2	I-TM-S	Timisoara IMT	Core TEN-T link	42.7	6.6%	18.0	36.0
3	I-CR-S	Craiova IMT	Core TEN-T link	42.7	6.6%	18.0	54.0
4	I-BC-S	Bacau IMT	Core TEN-T link	41.1	6.4%	18.0	72.0
5	I-SU-S	Suceava IMT	Core TEN-T link	41.1	6.4%	18.0	90.0
6	I-CJ-S	Cluj-Napoca IMT	Core TEN-T link	40.3	6.3%	18.0	108.0
7	I-DB-S	Drobeta Turnu Severin IMT	Core TEN-T link	34.9	5.6%	8.0	116.0
8	I-GL-S	Galati IMT	Core TEN-T link	30.0	4.7%	23.0	139.0
9	I-GR-S	Giurgiu IMT	Core TEN-T link	30.0	1.4%	10.0	149.0
10	I-IS-S	Iasi IMT	Core TEN-T link	30.0	3.9%	18.0	167.0
11	I-TU-S	Turda IMT	Core TEN-T link	30.0	0.1%	18.0	185.0
12	I-OR-S	Oradea IMT	Comprehensive TEN-T link	9.0	3.8%	18.0	203.0

Source: AECOM GTMP MCA Scoring of Projects

Table 6.9 Intermodal Projects, EES Scenarios

	Code	Project Description	TEN-T	Score	EIRR	Cost (2014 prices)	Cumulated Cost
1	I-BU-S	Bucuresti IMT	Core TEN-T link	80.0	13.8%	18.0	18.0
2	I-TM-S	Timisoara IMT	Core TEN-T link	39.1	6.6%	18.0	36.0
3	I-CR-S	Craiova IMT	Core TEN-T link	39.1	6.6%	18.0	54.0
4	I-SU-S	Suceava IMT	Core TEN-T link	37.9	6.4%	18.0	72.0
5	I-BC-S	Bacau IMT	Core TEN-T link	37.9	6.4%	18.0	90.0
6	I-CJ-S	Cluj-Napoca IMT	Core TEN-T link	37.4	6.3%	18.0	108.0
7	I-DB-S	Drobeta Turnu Severin IMT	Core TEN-T link	33.5	5.6%	8.0	116.0
8	I-GL-S	Galati IMT	Core TEN-T link	30.0	4.7%	23.0	139.0
9	I-GR-S	Giurgiu IMT	Core TEN-T link	30.0	1.4%	10.0	149.0
10	I-TU-S	Turda IMT	Core TEN-T link	30.0	0.1%	18.0	167.0
11	I-IS-S	Iasi IMT	Core TEN-T link	24.0	3.9%	18.0	185.0
12	I-OR-S	Oradea IMT	Comprehensive TEN-T link	20.0	3.8%	18.0	203.0

Source: AECOM GTMP MCA Scoring of Projects

6.1.10 In each of these three scenarios there will be included the interventions on rehabilitation and modernisation of national roads. The selected road sections will be modernised using the budget set aside for renewals, and included in the funding analysis. The rehabilitation of these roads does not result in an increase in capacity, or connectivity, but is rather a structured

programme of timely heavy maintenance in order to ensure that serious deterioration does not take place in their condition. The projects were prioritised using a combination of demand and surface condition. The resulting priority list of projects is shown as shown in Table 6.10.

Table 6.10 Rehabilitation and Modernisation of National Roads

Nr.	Project Description	Length (km)	Estimated Cost (2014 prices, mill EUR, VAT excluded)	Route classification	Demand AADT+ 2xHGV	Condition
ROAD SECTOR - Transregio Roads						
1	Brasov - Sighisoara - Tg Mures (DX 3)	161	102.1	TEN-T Comprehensive	16,391	2.64
2	Braila - Slobozia - Dranjna (A2) - Calarasi - Chiciu (BG)	142	71	Other	16,032	2.33
3	Constanta - Vama Veche (BG)	49	36.7	TEN-T Comprehensive	15,727	1.04
4	A1 - Arad - Salonta - Oradea	122	60.5	TEN-T Comprehensive	14,303	1.15
5	Dr.Tr.Severin – Tg. Jiu – Rm.Valcea – Pitesti	246	134.8	Other	13,553	1.35
6	Vaslui - Barlad - Tecuci - Galati	179	89.5	Partial TEN-T Comprehensive	13,397	2.36
7	Filiasi - Tg. Jiu - Petrosani - Hateg - Deva - A1	226	136.5	TEN-T Comprehensive	13,227	1.08
8	Botosani - Targul Frumos	73	36.5	Other	12,540	2.78
9	Suceava - Vatra Dornei - Bistrita - Saratel -Dej	242	156.9	Other	11,554	2.03
10	Saratel - Reghin - Tg Mures	78	44	Other	10,670	1.00
11	A3 (Oradea) - Carei - Satu Mare - DX 4	137	68.5	Other	10,600	2.88
12	A1 (Deva) - Brad - Stei - Oradea - A3	197	124.3	Other	8,366	1.00
13	Corabia - Caracal - Dragasani - Rm. Valcea - DX 2	199	112.4	Other	7,708	2.61
14	Zalau - Satu Mare	81	40.5	TEN-T Comprehensive	7,571	1.04
15	A5 - Sf. Gheorghe - B. Tusnad - Miercurea Ciuc - Ditrau (DX 3)	147	79.1	Other	6,708	3.32
16	Iasi - Vaslui - Bacau	151	99.5	Other	6,675	3.38
17	Targu Neamt - Piatra Neamt	35	19.1	Other	6,063	2.36
18	Iacobeni - Borsa - S.Marmatiei - Negresti Oas - DX 4	235	159.1	Other	4,461	2.03
19	Caransebes - Resita - Bocsa - Voiteg	104	62.6	Other	3,668	1.83
20	Focsani - A5 - Tg. Secuiesc	114	84	Other	3,529	2.37
Subtotal Drumuri Transregio		2,918.0	1,112.1			
ROAD SECTOR - Eurotrans Roads						
Nr.	Project Description	Length (km)	Estimated Cost (2014 prices, mill EUR, VAT excluded)	Route classification	Demand AADT+ 2xHGV	Condition
1	Bucuresti - Giurgiu (BG)	55	41.25	TEN-T Core	21,148	2.02
2	A1 - Timisoara - Moravita (SRB)	59	29.5	TEN-T Core	10,990	3.90
3	Craiova - Calafat (BG)	83	41.5	TEN-T Core	6,513	1.00
4	Drobeta Tr. Severin - Calafat (BG)	96	50.8	TEN-T Core	5,721	2.22
Subtotal Drumuri Eurotrans		293.0	163.1			

6.2 Appraisal of the ES and EES Scenarios

- 6.2.1 The final stage in the appraisal process is the comparison between the ES and EES scenarios.
- 6.2.2 Projects have been prioritized in two potential development scenarios, as follows:
- An Economic Sustainability Scenario (ES);
 - An Economic and Environmental Sustainability Scenario (EES);
- 6.2.3 Prioritized projects for each mode of transport have been combined in these two scenarios. The Scenarios were tested with the National Transport Model, in order to identify the one which generate the best economic efficiency results.

6.2.4 Following the economic evaluation, the two scenarios were assessed using an Appraisal Summary Table (AST). The outcomes of economic, and wider appraisal, for the two scenarios is given below.

6.3 Economic Indicators

6.3.1 Tables 6.11 shows the key economic performance indicators for the ES and EES scenarios.

Table 6.11 Key Economic Indicators, ES and EES Scenario

Project Title	EES Final Strategy	ES Final Strategy	Difference (EES - ES)
Undiscounted Costs (million EUR in 2010 prices)	31,550.65	32,441.85	-891.19
CAPEX (million EUR)	31,290.57	32,181.76	-891.19
OPEX (million EUR)	260.08	260.08	0.00
Discount year	2010	2010	-

	Incremental Cost or Benefit (Million EUR) counted	Share in Total Costs / Benefits	Incremental Cost or Benefit (Million EUR) Discounted	Share in Total Costs / Benefits	Absolute Difference	% of Total Difference in Costs/ Benefits
Cost to Infrastructure Manager						
CAPEX	18,503.78	100%	18,980.22	100%	-476.44	100%
OPEX	40.55	0%	40.55	0%	0.00	0%
Cost to Operator						
CAPEX	0.00	0%	0.00	0%	0.00	0%
OPEX	17.84	0%	17.84	0%	0.00	0%
Benefit To Users						
Value of Time	30,346.49	60.75%	28,671.32	59.28%	1,675.17	105.98%
Vehicle Operating Costs	815.36	1.63%	1,349.44	2.79%	-534.09	-33.79%
External Impacts						
Accidents (Safety)	12,932.99	25.89%	12,570.52	25.99%	362.47	22.93%
Noise	359.53	0.72%	360.25	0.74%	-0.72	-0.05%
Air Pollution	6,425.50	12.86%	6,160.33	12.74%	265.18	16.78%
Climate Change	-912.19	-1.83%	-724.82	-1.50%	-187.37	-11.85%
Present Value of Costs	18,544.33		19,020.76		-476.44	
Present Value of Benefits	49,950.45		48,369.81		1,580.64	
Net Present Value (NPV)	31,406.12		29,349.04		2,057.07	
EIRR	10.86%		10.50%		0.36%	
Benefit/Cost Ratio	2.69		2.54		0.15	

6.3.2 The underlying purpose of the Master Plan is to contribute to Romania's economic growth. The undiscounted benefits from the Master Plan total some €179bn, which equates to approximately 2% of Romania's GDP in the period 2020 – 2050.

- 6.3.3 The two scenarios were also compared using more comprehensive criteria, which included Environment (physical impacts), Policy with regard to the TEN-T, and Accessibility.

Table 6.11 ES and EES Scenarios: Appraisal Summary Table (AST) (to be modified)

Attribute	Description	Value		Score	
		ES Scenario	EES Scenario	ES Scenario	EES Scenario
Economy					
Economic Internal Rate of Return: (EIRR)	EIRR is the discount rate that needs to be applied so that the discounted value of the total stream of net economic benefits is equal to the initial capital investment. It is independent of project size and is effectively the economic return on the inves	10.5%	10.9%	47	50
NPV	The value of discounted benefits less discounted costs over the economic life of the programme.	29,349	31,406	47	50
Time Savings	The economic value of time savings to passengers and freight produced by the investment in transport.	28,671	30,346		
Operating Costs	The economic value of operating costs produced by the investment in transport discounted over the economic life of the programme. In practice, can be positive or negative.	1,349	815		
Safety	The economic value of the savings in human life produced by the investment in transport discounted over the economic life of the programme.	12,571	12,933		
External Impacts: Noise, Air Pollution, Climate Change	The economic value of the changes in noise levels, air pollution, and climate change produced by the investment in transport discounted over the economic life of the programme.	5,795	5,874		
	Noise	360	360		
	Air Pollution	6,160	6,426		
	Climate Change	-725	-912		
Overall Score, Economic Performance				94	100
Environment					
Impact on Conservation Areas/Natura 2000	Physical impact of the programme on Natura 2000 areas				
Impact on Landscape	Physical Impact on other areas of landscape quality				
Overall Score, Environmental Performance					
Policy					
Strategic Connectivity – on TEN-T Core /Comprehensive or National Routes	The degree to which the programme adds to the TEN-T network in Romania				
	% kms of Road projects on Core TEN-T (L1 +L2)				
	% of Rail Projects on Core TEN-T				
Overall Score Policy Performance					
Accessibility					
Accessibility – Improves the connectivity of Romania's regions and increases accessibility to	The methodology uses the sum of employment opportunities from each zone to every other zone, divided by the generalized cost of travel, weighted by mode, between each zone. The measure is best used in a comparative way, ie the difference between each sce	16.10%	17.90%	90	100
Overall Score Accessibility Performance				90	100
Overall Score (unweighted)				184	200
Overall Score (weighted)					

6.3.4 The conclusion is that the Economic and Environmentally Sustainable scenario performed better, and that this strategy should be the long term plan for Romania.

Funding Analysis

7 Funding Analysis

- 7.1.1 Whilst the process of problems analysis, setting objectives and defining interventions, and the subsequent testing and appraisal of projects gives an order of merit of the projects, it does not generate the funds needed to implement them. It is a Government responsibility to allocate funds to the various sectors for which it is responsible, and the responsibility of Ministries, including of course the Ministry of Transport, to spend that allocation wisely. The role of the Master Plan is thus to ensure that the funds available are spent on projects that give the best return.
- 7.1.2 The funding analysis is based on a certain percentage of GDP to be allocated to maintenance and capital investment. It is recognised that there will, in reality, be other costs incurred by the Government and other parties involved in implementing the Master Plan, but the “rules of the game” are that these two elements are those which should provide the constraint in which the Master Plan projects will be implemented. These two elements make up the majority of expenditure by the Government.
- 7.1.3 The so-called “soft measures” will require some financing to implement, but the costs involved are small compared with the maintenance and investment budgets, and in any case most of the soft measures should be self-financing over time.
- 7.1.4 To prevent uncertainty regarding the long-term funding assurance for the pipeline of projects included in the Master Plan, a commitment from the Government of Romania is needed to allocate a certain percentage of GDP for the transport sector, seen as an ex-ante conditionality for the European Commission to approve the Master Plan and, further on, the Large Infrastructure Operational Programme (POIM) for the 2014-2020 period.
- 7.1.5 As an immediate action to this requirement, a decision of the Romanian Government was issued in December 2013 on the commitment of 2% of GDP for the transport sector². It is clearly specified in this commitment that the allocation of 2% of GDP shall be allocated only for investments and maintenance works for the transport infrastructure, on all modes of transport.
- 7.1.6 In addition to this, the European Commission has specified that the Master Plan should be developed based on a hierarchical approach to allocation of funds to expenditure items, with expenditure on essential items, such as the maintenance of the rail and road networks, to be guaranteed. The remaining funds (after these commitments have been fully funded) are then available for new investment and maintenance. Following these requirements, a spreadsheet model was produced to quantify the available funds for Master Plan projects to be implemented by 2020 and 2030. Its key assumptions and the considered methodology are described below.
- 7.1.7 One of the particular aspects of the assumptions regarding the financial plan for the Master Plan was that the net EU funding (Cohesion Funds, European Regional Development Funds and Connecting Europe Facility funds) are included in the allocation of 2% of GDP. This means that there is a direct correlation between the required national contributions to sustain the EU funded projects and the available remaining budgets.
- 7.1.8 Based on the this approach and the estimations for the up-front committed expenditures (related mainly to maintenance, renewals and rehabilitations for road and rail network) the total available

² Romanian Government letter no. 57338 submitted to European Commission on 09/12/2013

budgets for investments in the transport sector, by mode, are estimated for the timelines 2020 and 2030. The headline figures are included in Table 7.1.

Table 7.1 Distribution of expenditures in the transport sector for 2014-2020 and 2021-2030 (mill Eur, 2014 fixed prices)

			2014-2020		2021-2030		2014-2030	
2% from GDP available for the transport sector	A		22,599		43,216		65,815	
Maintenance and lifecycle costs	B1		7,260	32.1%	20,650	47.8%	27,910	42.4%
Rehabilitation works for the viable road network	B2		4,578	20.3%	0	0.0%	4,578	7.0%
Available Public Funds for investments, including EU and National Contribution, from which	C	=A-B1-B2	10,761	47.6%	22,566	52.2%	33,327	50.6%
EU Contribution	C1		6,332		9,046		15,379	
National Co-financing	C2		1,923		2,747		4,669	
Sustainability indicator/Net National Funds	D	=C-C1-C2	2,506		10,773		13,279	
Phased projects and Bucharest Metro	E		1,911		3,200		5,111	
Available for GTMP projects (total inc. EU + national)	F	=C-E	8,850	39.2%	19,366	44.8%	28,216	42.9%
+ 30% Over commitment	G	=F*1.3	11,505		25,176		36,680	
Roads			5,867	51%	12,840	51%	18,707	51%
Rail			5,062	44%	11,077	44%	16,139	44%
Ports, Inland Waterways			324	56%	732	66%	1,056	58%
Aviation			188	33%	357	28%	545	30%
Intermodal			63	11%	170	14%	233	13%

Source: GTMP Funding Analysis

7.1.9 One of the key figures in the above financial plan is line D, the Sustainability Indicator. This shows the available net national funds after the deduction from the remaining funds (after the up-front allocations for maintenance, renewals and rehabilitations) of the EU funds and of the corresponding national contribution to sustain the EU funded projects. These represents the net national funds available to sustain projects which are a priority on short term (2020) but which:

- a) are not eligible for EU funding; or

b) are eligible for EU funding but due to financial constraints or exceeded budgets cannot be promoted on short term only from EU budgets.

7.1.10 The total available budget to promote 2020 and 2030 Master Plan projects include two major funding sources:

- EU funds (CF, ERDF and CEF); and
- National Budget to support the co-financing and the projects supported from national funds only.

7.1.11 Total budgets by funding sources are Summarised in Table 7.2.

Table 7.2 Available budget for Master Plan projects by funding sources (mill EUR, 2014 prices)

Funding sources	2014-2020	2021-2030	2014-2030
1. Total budget available, from which	11,505	25,176	36,680
2. Net EU funds	6,332	9,046	15,379
Cohesion Funds - CF	3,404	4,863	8,267
European Regional Development Funds - ERDF	1,200	1,714	2,914
Connecting Europe Facility Funds - CEF	1,728	2,469	4,197
3. National Co-financing	2,111	3,015	5,126
Cohesion Funds - CF	1,135	1,621	2,756
European Regional Development Funds - ERDF	400	571	971
Connecting Europe Facility Funds - CEF	576	823	1,399
4. Total budget for EU funded projects (=1+2, EU + National contribution)	8,443	12,062	20,505
Cohesion Funds - CF	4,539	6,484	11,023
European Regional Development Funds - ERDF	1,600	2,286	3,886
Connecting Europe Facility Funds - CEF	2,304	3,292	5,596
5. National Budget (=1-4)	3,061	13,114	16,175
6. Total national funds (=3+5)	5,172	16,129	21,302

Source: GTMP Funding Analysis

7.1.12 On average, for the first period of project implementation 2014-2020, 1.3 bn eur are available for projects respectively 1.9 bn EUR for the next 2021-2030 period. The sources of funding for the overall budget of 36.7 bn over the whole Master Plan period 2014-2030 are European Union funds (42%) and Romanian National Budget (58%, including the necessary co-financing for EU-funded projects).

7.1.13 To estimate the impact on the list of projects that can be implemented in the horizon of the Master Plan (2014-2030) several scenarios were developed regarding the available funds allocated from the National Budget (Table 7.3).

Table 7.3 Available budget for Master Plan projects as function of % of GDP (mill EUR)

Percentage of GDP	2014-2020	2021-2030	2014-2030
2.00%	11,505	25,176	36,681
2.25%	15,177	32,198	47,375
2.50%	18,849	39,221	58,070

Source: GTMP Funding Analysis

- 7.1.14 Total investment cost for projects identified in the Master Plan process, across all modes, is 45.3 bn EUR in fixed 2014 prices. A sensitivity analysis shows that an allocation of 2.2% of GDP is enough to support the full list of identified interventions.

Public Consultation

8 Public Consultation

- 8.1.1 Reference has already been made to the wide-ranging consultations which took place while the Master Plan was being formulated, particularly with respect to the specification of interventions.
- 8.1.2 Following the publication of the Master Plan at the end of August, a series of Public Consultations on the Master Plan took place at the Ministry of Transport in October and November, where presentations were given by the Ministry followed by question and answer sessions from the audience. Each consultation was on a particular mode of transport, namely Roads, Railways, Ports, Aviation and Intermodal Transport. A wide range of interests were represented at the consultations, including industry representatives, trade bodies, councillors, special interest groups, company representatives, journalists, and members of the public.
- 8.1.3 A number of written submissions were received, 51 in total. These were analysed and, and if the points made were relevant these were taken into account in the final plan.

Cross-Sectional Analysis

9 Cross-Sectional Analysis

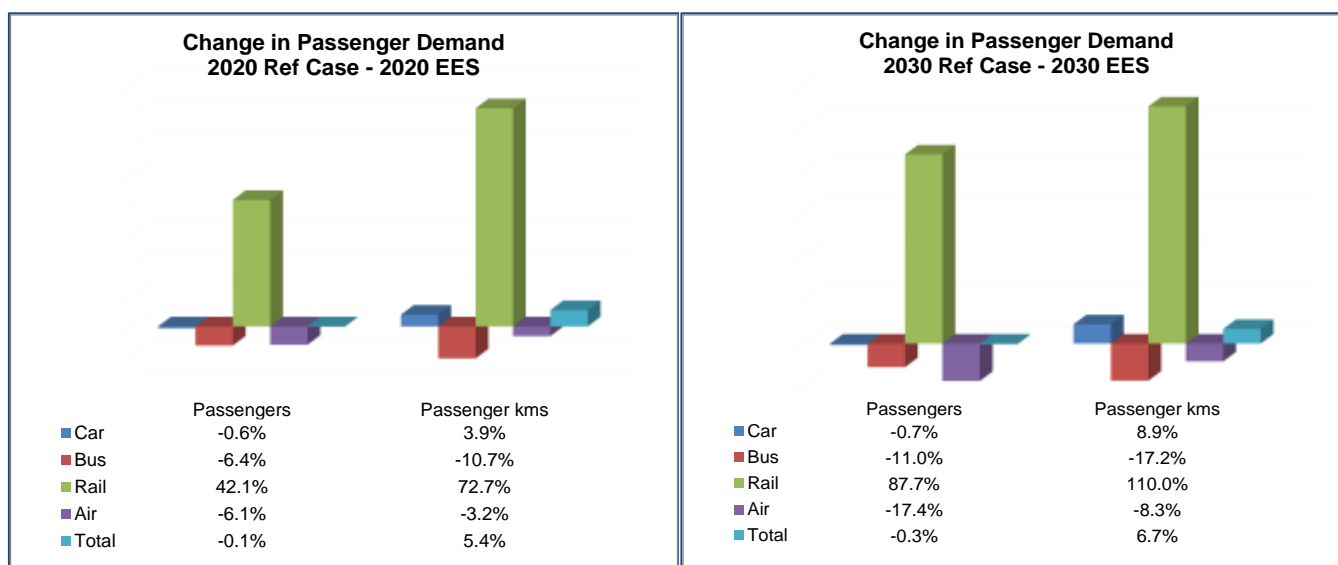
9.1.1 Although all of the analysis and modelling for the Master Plan has been undertaken on a multi-modal basis, much of the analysis in this Report has been described on a modal basis. In this section we describe the main issues at a cross-sectoral level.

9.2 Operational Performance of the EES Scenario

9.2.1 The NTM produces a large volume of data which demonstrate how the transport network is performing. In this section, the performance of the EES is compared with the Reference Scenario, which represents the future situation that would exist without the Master Plan projects, that is with financially committed projects only. This is the most valid comparison because it shows on a like for like basis what difference the Master Plan is forecast to make.

9.2.2 Comparisons with the Base situation (2011) are also shown but these also contain changes that would occur in transport demand between the different years, regardless of the Master Plan projects.

9.2.3 Figure 9.1 shows the forecast changes in passenger transport in 2020 and 2030.



Source: AECOM, National Transport Model

Figure 9.1 Evolution of Passenger Transport in 2020 and 2030 EES vs. Ref Case

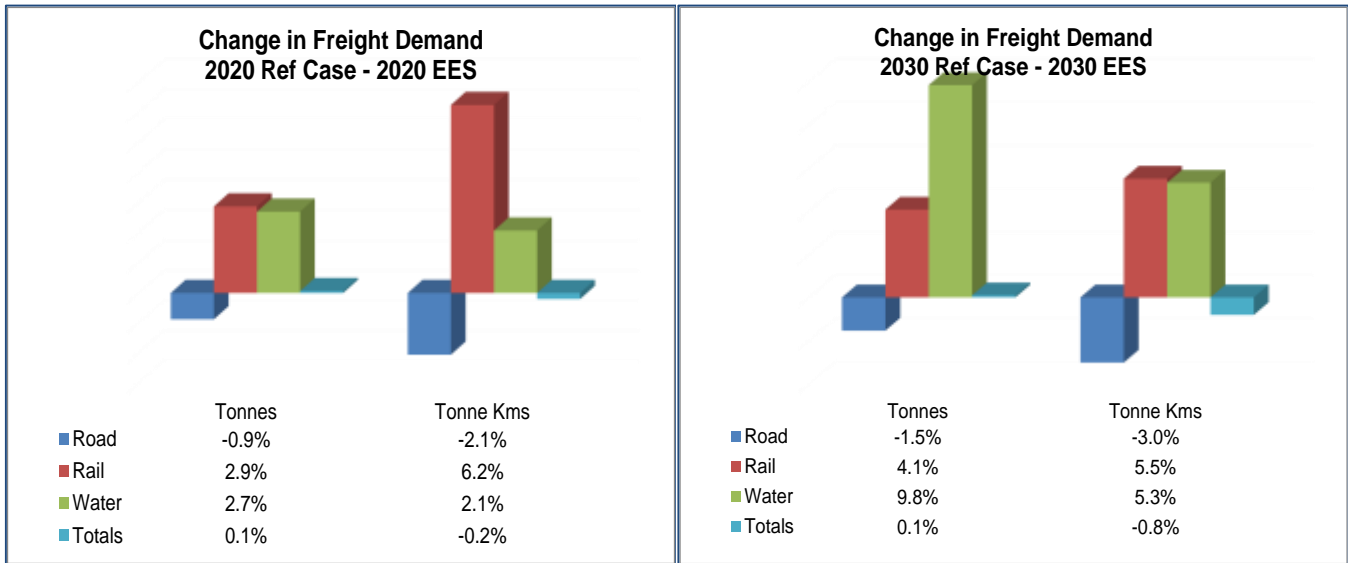
9.2.4 The results show that, with the investments in improved maintenance, and in line speeds and service improvements, substantial increases in rail passenger traffic could be achieved. The forecast increase is a 42% increase in rail passengers, and 73% increase in passenger kms by 2020, rising to 88% and 110% by 2030 when the full strategy should be in place.

9.2.5 By contrast, the forecast increases in road traffic are modest, with a small decrease in car passenger traffic and a modest rise in passenger kms. The rail investments lead to a decrease in bus passenger kms of 11% and 17% in 2020 and 2030 respectively.

9.2.6 One feature of the forecast impacts is the increase in average journey lengths – passenger kms grow to a larger extent than passenger numbers, and this is to be expected given the

higher speeds, shorter journey times, and greater connectivity, that the Master Plan interventions will provide.

9.2.7 Figure 9.2 provides similar information for freight traffic.



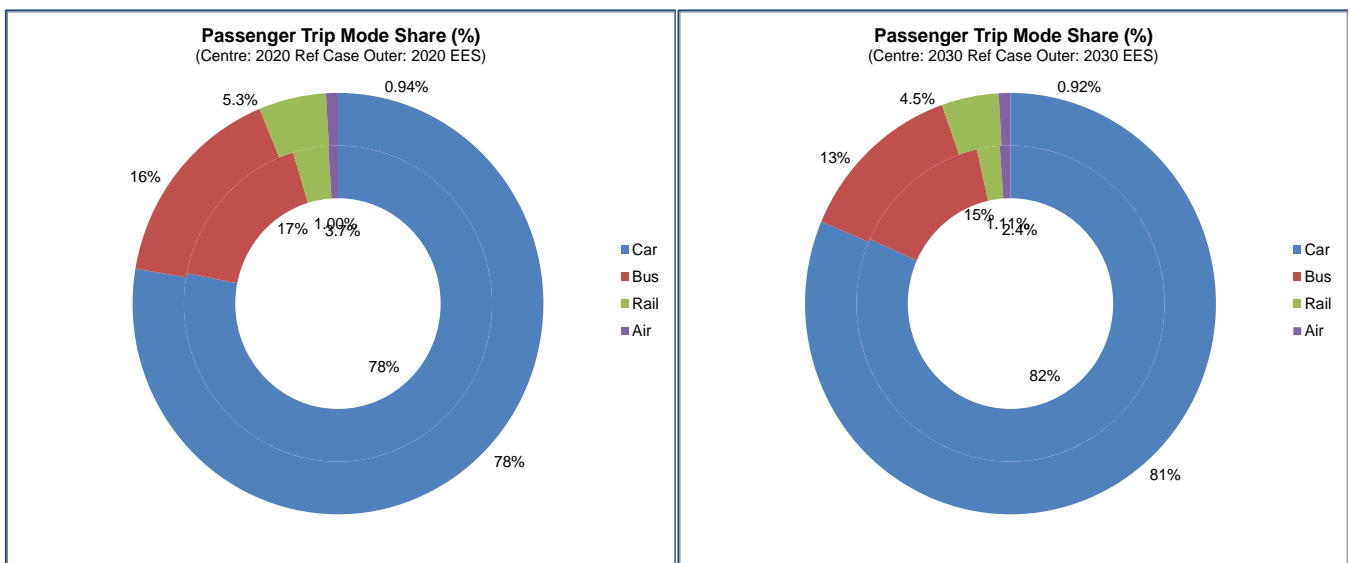
Source: AECOM, National Transport Model

Figure 9.2 Evolution of Freight Transport in 2020 and 2030 EES vs. Ref Case

9.2.8 The same pattern for freight traffic is evident, although the impact is less, for two reasons. First, the relative improvement in freight train speeds is less than for passenger services, and secondly, the transit time is only one element of the cost of moving freight.

9.2.9 Freight tonne kms grow at roughly twice the rate of tonnes lifted. Here the largest increases in tonnes carried and tonne kms are again in rail freight, where tonne kms are forecast to increase by 6% in both 2020 and 2030. Waterborne freight is also forecast to increase in both 2020 and 2030, as a result of investment in increasing the navigability of the Danube, and port improvements.

9.2.10 Figure 10.3 shows the change in mode choice.

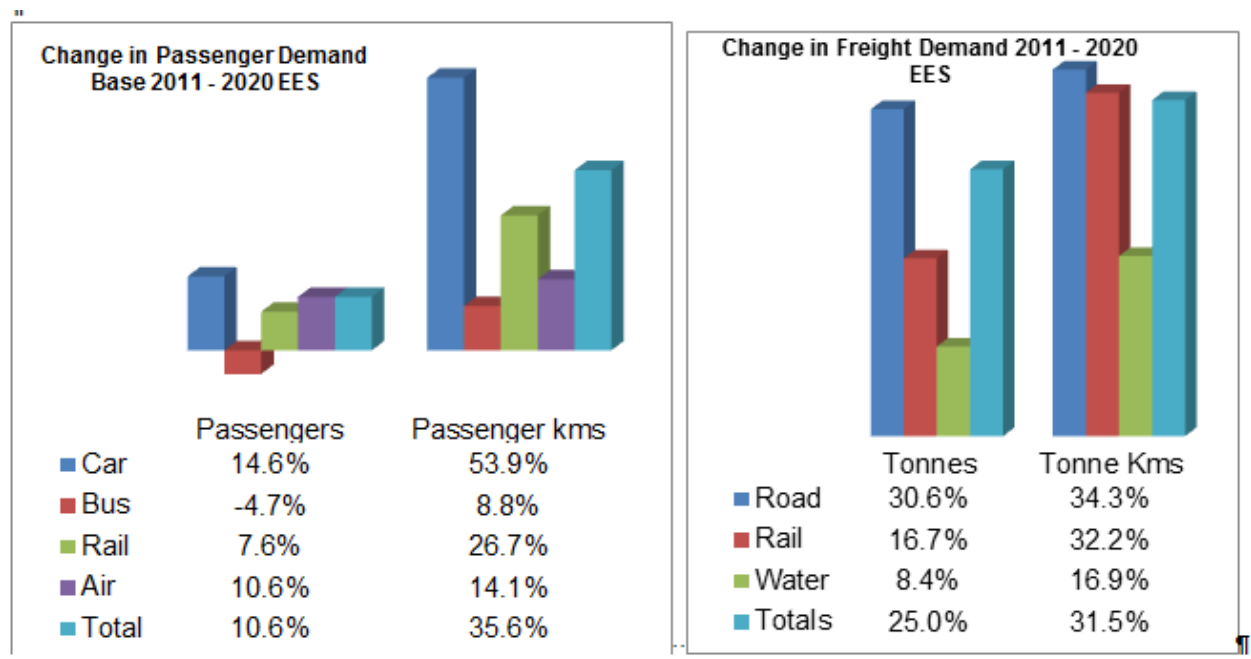


Source: AECOM, National Transport Model

Figure 10.3 Changes in the Overall Mode Choice

9.2.11 Here, the performance of rail should be assessed against a historical backdrop of decreasing mode share. The forecasts from the National Model show that rail mode share can be increased with investment, improved maintenance and better services, even in an expanding travel market and with increasing car ownership, and with significant improvements to the road network.

9.2.12 The difference between the Base Year and 2020 and 2030 EES scenario are shown in Figure 9.3, for passenger and freight transport.



Source: AECOM, National Transport Model

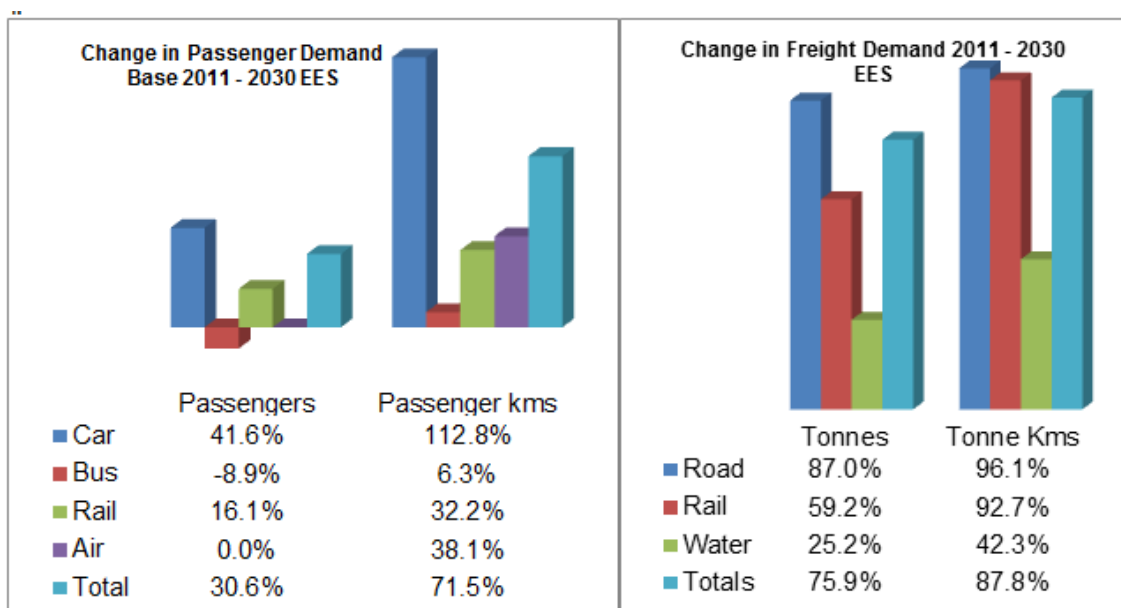
Figure 9.3 Change in Passenger and Freight Demand, 2011 – 2020, EES Strategy

9.2.13 These results show, on the passenger transport side, increases in the number of passengers and passenger kms for all modes of transport. Comparing these results with the Reference Case comparisons, we can see that the increases in road passengers is not due to the EES strategy itself (which leads to a reduction in road passengers), but is due to underlying factors such as increasing car ownership and the completion of motorways in the Reference Case.

9.2.14 What is impressive is the turnaround in rail passenger transport. After more than 20 years of continuous decline, the investment in improved maintenance, rehabilitation and additional services is forecast to reverse this decline and produce an increase of 27% in rail passenger kms over the base year position.

9.2.15 The situation is similar in 2030, with increases in all modes of transport for both passenger and freight. The reason for the increase in road passenger (and freight) transport is the same as that in 2020: the increases are due to an underlying trend, not the EES projects.

9.2.16 Again, the forecast increase in both rail passenger and freight is noteworthy, demonstrating once more that the historical trends in rail transport can be reversed with suitable investment.



Source: AECOM, National Transport Model

Figure 9.4 Change in Passenger and Freight Demand, 2011 – 2030, EES Strategy

9.3 Allocation of resources per mode: € per pass km, € per tonne km

9.3.1 One measure of the contribution of each mode to the national transport picture is passenger and tonne kms. We have analysed the investments in the road, rail and waterways sector in relationship to the contribution each make in terms of these measures. The results are presented below:

Table 9.1 EES Scenario: Spending per Passenger km and tonne km

	Expenditure in the Master Plan (m. euro)	Passenger kms/day	Tonne kms/day	€/passenger km day	€/tonne km/day
Roads	18,707	156,721,866	194,257,197	119	96
Rail + Intermodal	16,139	19,096,378	43,614,918	845	370
Waterways	1,056		41,717,021		25

Source: Funding Analysis and national Model

9.3.2 The table must be interpreted with care. The two measures are not an indication of what each mode deserves to receive. The projects in each mode are justified in a logical, structured manner, from problem identification through to intervention and appraisal, and each investment stands on its own merit. The road and rail networks are starting from different points with regard to their development. Water transport is largely provided by the River Danube, which is resource provided by nature, and is not entirely man-made like roads or railways.

9.3.3 Nevertheless, the data do illustrate a conscious intention in the Master Plan to address the decline in the railway network and attempt to re-vitalise the railway so that it again plays a significant role in national transport, and to safeguard its future.

9.4 Heavy Goods Vehicle Road User Charge (RUC)

9.4.1 One means of increasing revenue from road users, and hence income to the Ministry of Transport to help make good the transport infrastructure deficit in Romania, would be to introduce road user charging. Such a policy would be consistent with the EU 2011 Transport White Paper.

9.4.2 There are two principles to establish in designing an RUC scheme:

- a) What will be the justification for the charge? For example, will it contribute to maintenance and environmental costs, and will it replace other charges such as fuel tax or vignettes?
- b) To which roads will the charge apply? If the charge is applied only to motorways and national roads, there will be a transfer of HGV traffic to the less suitable County roads.
- c) How much revenue will be allocated to transport expenditure?

The scheme as tested by AECOM has the following features

9.4.3 A RUC rate of 0.66 Lei (€0.15) per HGV km has been used; this has been calculated to reimburse the average annual CNADNR maintenance deficit between 2014-2020 and the environmental impact of HGV traffic in 2020. It also includes a 20% uplift to cover the administration and operating costs of the RUC scheme. It has been assumed that the 20% administration cost will not be available to CNADNR for activities other than administration of the RUC. Thus the justification for the charge is essentially an environmental one, and the charge could be described as an ecotax.

9.4.4 In order to avoid diversion of HGV traffic to County roads, the charge was applied to all roads. This implies that the technology to be used would be GIS-based.

9.4.5 How revenue is used is a vital part of gaining public and industry acceptance for charges. In the analysis which follows, we have assumed two scenarios, one in which all revenue from road users, net of maintenance and re-habilitation costs, are retained by MT/CNADNR, and the other in which fuel tax goes into general government tax revenues via the Ministry of Finance. This latter scenario seems a more likely outcome.

9.4.6 The introduction of a HGV Road User Charge (RUC) will result in a change in revenue to CNADNR. This note outlines the estimated cash flows (costs and revenues) to CNADNR after 2020 if HGV RUC is introduced.

9.4.7 The Annual costs expected to be incurred by CNADNR have been taken from the cost recovery work done by for the World Bank in 2013. It has been assumed that when a HGV RUC is introduced the existing vignette scheme will stop, therefore vignette revenues to CNADNR will also cease.

For comparison, the rates in other European countries in June 2014 were as follows:

Country	Rate/km
Austria	0.16 - 0.44
Poland	0.20 - 0.40
Germany	0.14 – 0.29

Sources: <http://roadpricing.gw-world.com/en/RoadPricingAustria.aspx>;
<http://www.gddkia.gov.pl/en/1126/motorway-tolls>
<http://www.ages.de/en/hgv-toll-germany-tariffs.html>

The RUC rates in these countries varies by size and weight of vehicle, and also by emission category, to encourage cleaner vehicles. If an HGV charging scheme were introduced in Romania a similar tariff should operate.

- 9.4.8 The CNADNR share of RUC revenue has been calculated from the number of HGV km on the CNADNR network. It is assumed that RUC generated on non- CNADNR network will be allocated elsewhere.
- 9.4.9 The calculation of RUC revenues and fuel duty revenues take into account that once RUC is implemented HGV vehicle km will reduce over the ‘without RUC’ case. In 2020 total HGV vehicle km on the CNADNR network are predicted to reduce by ~4% relative to a situation without RUC.
- 9.4.10 The table below shows the annual costs and revenues to CNADNR between 2020-2030 in m euro.

Table 9.2 Potential Revenues from an HGV Charging Scheme

		2020	2021	2022	2023	2024	2025
Revenue	CNADNR Revenues (excluding Vignette)	75	78	81	83	86	89
	CNADNR share of HGV fuel duty	900	932	964	998	1033	1069
	CNADNR share of HGV RUC	1305	1367	1429	1491	1553	1616
	Total Revenue (excluding fuel duty)	1380	1445	1510	1575	1640	1705
	Total Revenue (including fuel duty)	2280	2376	2474	2573	2673	2774
CNADNR Costs		364	267	1287	9459	339	242
Surplus (if fuel duty goes to CNADNR)		1916	2110	1186	-6887	2334	2532
Surplus (if fuel duty does NOT go to CNADNR)		1016	1178	222	-7884	1301	1463
		2026	2027	2028	2029	2030	Total
Revenue	CNADNR Revenues (excluding Vignette)	93	96	99	103	106	989
	CNADNR share of HGV fuel duty	1106	1145	1185	1227	1270	11829
	CNADNR share of HGV RUC	1678	1740	1802	1864	1926	17772
	Total Revenue (excluding fuel duty)	1770	1836	1901	1967	2033	18761
	Total Revenue (including fuel duty)	2877	2981	3086	3194	3302	30590
CNADNR Costs		820	249	819	249	2756	16852
Surplus (if fuel duty goes to CNADNR)		2057	2732	2267	2944	546	13738
Surplus (if fuel duty does NOT go to CNADNR)		950	1587	1082	1718	-724	1909

AECOM Analysis using World Bank Study Cost Recovery Study and the National Model

- 9.4.11 In our view, the most realistic assumption regarding the potential surplus to CNADNR is the lower figure of €1.9bn over the period 2020 – 2030. This assumes that the revenue from fuel duty is part of the Government’s overall tax revenue, and will not be available to CNADNR or MT to spend on transport projects.
- 9.4.12 However, at this stage HGV RUC is not a recommendation of the Master Plan. We present the results here to show what could be achieved by this initiative, but we recognise that it is a controversial policy which would be unpopular with industry as it increases their costs. France has recently abandoned its scheme (the ecotaxe) because of opposition from the haulage industry, despite all-party support.

- 9.4.13 One particular issue concerns the use of the surplus revenue. RUC schemes are never popular, but do enjoy more support if the surplus revenue is allocated to transport investment (and especially road transport investment).
- 9.4.14 However, HGV RUC is an EU policy. Therefore, we recommend that a Technical Assistance project is launched to investigate the feasibility of such a scheme in Romania, including which roads should be included, the precise charge, the technology to be used, how surplus the revenue should be spent, experience in other countries, and consultation with industry.

9.5 Accessibility

- 9.5.1 A additional analysis was done on the relative accessibility of the main urban areas, considering the number of employees.
- 9.5.2 The formula for the effectity density is given below:

$$U = \sum_j^{i \neq j} \left(A_j / (d_{ij})^\alpha \right) + A_i / d_i$$

where:

U = Effective Density in a specific zone i

A_j = Measure of economic activity in other zones – we have used number of employees for the analysis

d_{ij} = Generalised cost of travel between zone i and other zones (composite GC matrix)

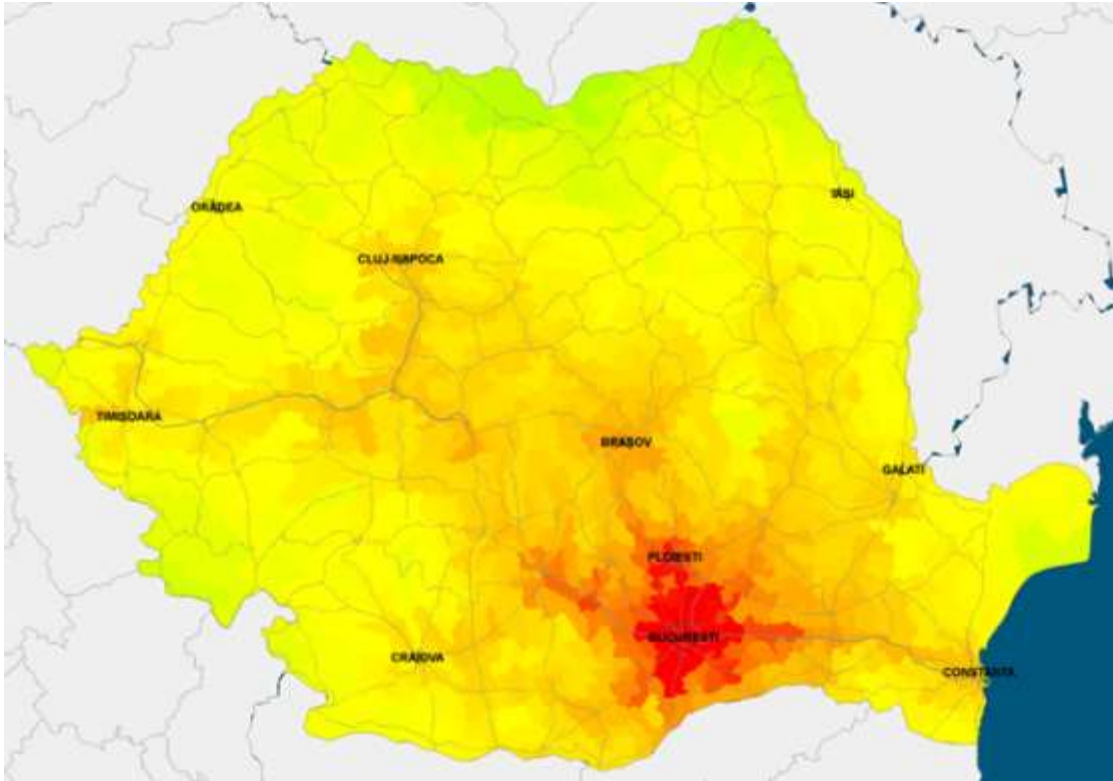
A_i = Measure of economic activity in the specific zone i – we have used number of employees
d_i = typical generalised cost of travel for an internal trip (assumed 30 mins for all zones within Romania)

α = 1.0

- 9.5.3 The effective density numbers have units of employees per minute. The absolute effective density number for a zone does not have an own meaning; what is important is the % difference in values, either between different regions in the same year or between the same regions in different scenarios or years.
- 9.5.4 Effective density for a zone is calculated by looking at each of the other zones in the model and calculating the number of employees in the zones divided by the generalised cost (in minutes) of getting from the original zone to the other zones. This gives a value for each of the other zones. The values for all other zones are added together and this is the effective density for the original zone. This process is then repeated for each zone in the model. we then take weighted average across zones within each county and across all zones in Romania. The effective density calculations are done with a series of matrix calculations within the model as it requires cost of travel between all origin-destination pairs.
- 9.5.5 The effective density of a zone is therefore bigger for a zone where you can travel to a large number of employees in other zones in a short time; and low if you can only travel to a smaller numbers of employees in longer times.
- 9.5.6 Because of the way it is calculated the effective density has units of employees per minute; however, it is not a measure of the number of employees that can be accessed in 1 minute, rather it is an indicator of how easy it is to access other employees from a zone relative to

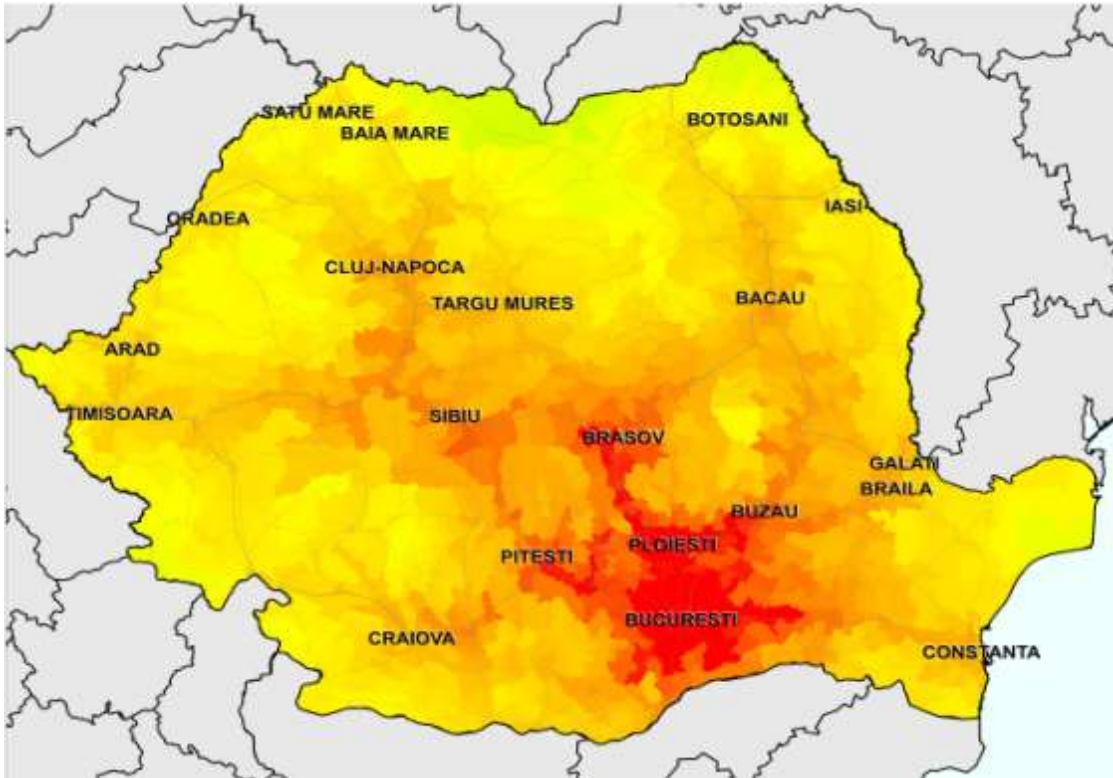
other zones. This is why % changes in effective density are used to assess impacts rather than at absolute values.

9.5.7 The Base Year, and 2030 Accessibility plots, for domestic travel are shown on Figures 9.5-6 below.



Source: AECOM National Travel Model

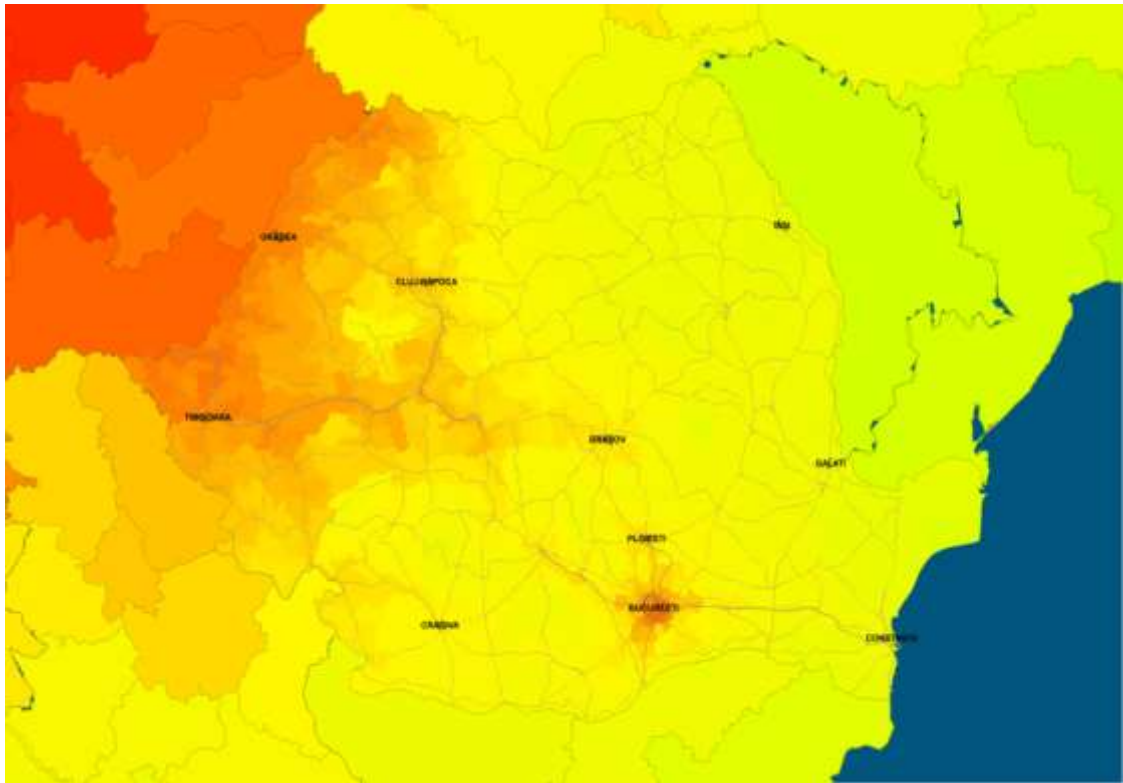
Figure 9.5 Base Year Accessibility, Domestic Travel.



Source: AECOM National Travel Model

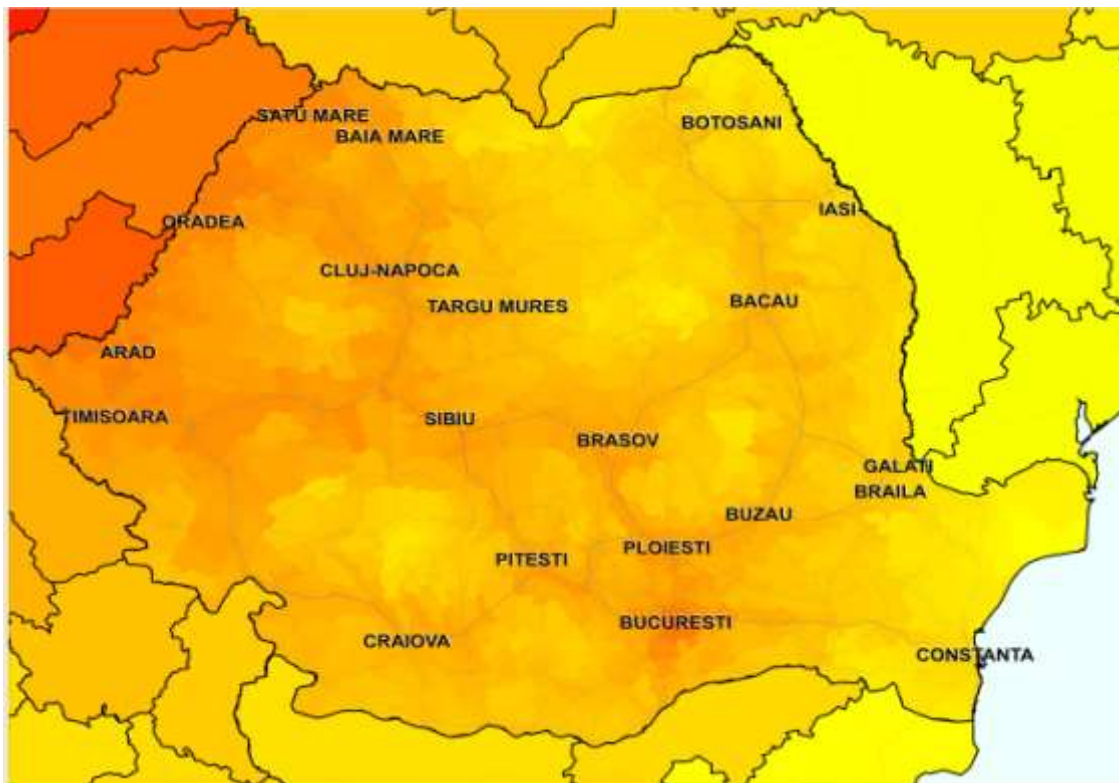
Figure 9.6 Base Year Accessibility, Domestic Travel.

- 9.5.8 A comparison between the two plots shows that accessibility to the peripheral parts of Romania, such as the north-eastern areas of the country in the Buzau – Iasi corridor has increased, and also to the north-west in the Cluj/Targu Mures area, and to the west around Timisoara.
- 9.5.9 Figures 9.7 and 9.8 show the accessibility of Romania to neighbouring countries, for the Base Year and the 2030 EES scenario.



Source: AECOM National Travel Model

Figure 9.7 Base Year Accessibility, Domestic Travel.



Source: AECOM EES Strategy and National Model

Figure 9.8 Base Year Accessibility, Domestic Travel.

- 9.5.10 The contrast between the base year and 2030 is marked. Most of the Western and Central areas of Romania will experience a significant increase in accessibility to external employment and markets, demonstrating the success that the Master Plan will have in helping Romania to improve its competitiveness in the wider, global market place.

Implementation Strategy

10 Implementation Strategy

10.1 Introduction

- 10.1.1 The Master Plan proposals were developed following the logical process of problem analysis and identification, objective setting, and then defining and appraising interventions. This was followed by multi-criteria analysis to rank the major interventions. This process is summarised in Chapters 1-6 of this report.
- 10.1.2 The Implementation Plans for each Sector take into account further issues, particularly the constraints imposed by the eligibility of projects for particular EU funds, and the maturity of projects. The Implementation Plans consider the following issues, as part of the coordinated approach to realising the full potential of the Master Plan.
- Recommendations for Institutional Reform, including recommendations for changes in Management and Operating practices;
 - Maintenance and renewals expenditure required to ensure that the sustainably sized transport networks are maintained to appropriate international standards;
 - Targeted safety interventions, in particular for the roads sector where Romania has the worst road fatality record of all EU member states;
 - Master Plan project's eligibility for alternative funding sources, including Cohesion Funds, ERDF so that the Implementation Plan seeks to make best of limited available funds;
 - State of readiness for delivery of Master Plan projects. This includes an analysis of length of time likely to be required to complete the design/feasibility stages of the project delivery process, taking into account that for a number of Master Plan projects this phase of work is already underway or tenders have been launched for these services.
- 10.1.3 Table 10.1 shows an overview of the current status of each mode of transport, with respect to the most serious issues to be addressed, and a summary of the Master Plan approach in addressing these problems. There is a discussion in detail in each of the modal chapters in the Master Plan Report (Chapters 4-8), and a detailed analysis of the problems of each mode in the Problem Definition Report (available on the Ministry of Transport's AM POS-T website³). The connection between Problems, Objectives and Interventions is described in a series of Technical Notes.
- 10.1.4 The implementation Strategies for each mode are presented in subsequent sections.

³ http://www.ampost.ro/fisiere/pagini_fisiere/Raport_privind_definirea_problemelor.pdf

Table 10.1 Main issues and proposed solutions for each mode of transport

General theme	Mode of Transport	Main issues identified	Proposed solution in the Master Plan
Inadequate Maintenance	Roads	Inadequately maintained existing and future assets on the national network	Adopt best practice PMS approach to prioritization of roads maintenance and perform detailed review of the existing assets and O&M funding requirements
	Railways	The current network size faces a substantial and growing disparity against both the demand and the financial resources available to maintain and operate it.	Focus the scarce maintenance and development resources on a reduced sustainable network.
	Ports and Waterways	Inconsistent maintenance spend along the Danube which has led to an inconsistent navigational experience	Increasing maintenance budgets to match consistently across borders
	Intermodal	Poor locations/quality of the intermodal terminals	Replace or refurbish existing facilities and improve operations
Management & Operations	Roads	Institutional capacity issues	Improved institutional & organization stability and capacity to ensure efficient and effective management
		Significant damage to roads assets (pavements and structures predominantly) by excessive axle loads	Review appropriateness of axle load legislation and ensure sufficient monitoring and checking procedures
		High administrative costs on local and national hauliers from complex and uncoordinated charging regimes	Introduce single coordinated system for charging covering the entire road network
		Excessive delays at certain Border Crossings	Use of ITS to provide alternative route information coupled with improved management of border crossing arrangements
	Railways	The rail sector in Romania is in a generalized crisis	A comprehensive reform package to be implemented as soon as possible
		The passenger services rail business is uncompetitive and largely uncommercial	Define clear level of service requirements (limited to the primary network), increase frequency on the competitive corridors, introduce regular-interval service timetable and purchase of new rolling stock
		The regulatory, organization and management systems currently in place fail to ensure efficiency, competitiveness and accountability	The relations between the public transport authority, CFR Infrastructure and the operators to be restructured
		The management of the public rail companies is inefficient.	Re-launch private management techniques with a proper selection process of an efficient business management profile
	Intermodal	Low Average Commercial Speed of Freight Trains	Establish a contract between infrastructure provider and train operators which requires compensation for delays and dedicated measures implemented by CFR Infrastructure
		Poor operation of the existing terminals	Increase efficiency of operations by adopting best practices and privatization of facilities
		CFR Marfa's delayed privatization	Remove uncertainty over the future of CFR Marfa and privatize as soon as possible
	Ports and	Limited operating hours	Advise authorities to be flexible in opening times/days so

General theme	Mode of Transport	Main issues identified	Proposed solution in the Master Plan
	Waterways		that facilities are available if demand exists
		High operating costs	Adopt a commercial attitude and review port charges to operators to ensure water freight is competitive
		Large amounts of paperwork and bureaucracy	Review port and customs administration procedures and rationalize and improve communication
		Crews and port staff need training for modern logistics practices	Establish suitable training for the needs of the sector
		Barge emissions standards are applied to EU operators only	Romania to work with Danube countries to agree operational plans
	Aviation	Availability of airports during extreme winter months	Upgrading the lighting systems and purchase of de-icing equipments in certain airports
		Poor integration between authorities and airport managers regarding the planning for future expansion plans	Improve communications between airport management and local authorities
Safety & Security	Roads	Very high fatal accident rates on the road network compared to rest of the EU	Soft measures and punctual investments to improve the accident records
	Roads	Lack of secure and safe parking for goods vehicles.	Provision of appropriate parking facilities along the TEN-T routes
	Ports and Waterways	Load and infrastructure theft is a problem for vessels and ports on the Danube	Improve security for vessels and ports
		Accidents occur on the Danube	Establish suitable training for the needs of the naval sector at all grades.
Infrastructure Deficit	Roads	High travel times leading to uncompetitive service on the key national connectivity corridors	Improve travel speeds on main identified connectivity corridors by offline investments (motorways and expressways)
	Railways	Uncompetitive passenger services between the main cities of Romania because of low commercial speeds and poor frequencies which have resulted in a low rail market share below its potential	Combination of timetable, rolling stock & infrastructure enhancements on identified corridors
		Old freight terminals are inefficient and/or poorly located particularly intermodal sites	Rehabilitation of existing facilities and building new ones
		The majority of the Romanian rail network has a low maximum axle weight of 20.5 tones	Allow 22.5 tons axle weights on rehabilitated routes
	Ports and Waterways	Lack of Reliable, Consistent Navigation along the Danube	Improvements to the navigation of the Danube, in particular the shared Romanian – Bulgarian section
		Some ports have poor road and rail connections, particularly within the port	Improve immediate local and internal road/rail connections
		Undeveloped or antiquated port infrastructure	Refurbish existing port infrastructure and/or build new and specialized facilities in the ports part of the Primary Network
		There is no direct water link for traffic from the Danube to Bucharest which is causing costly transshipment for goods and tourists	Create Bucharest - Danube Canal Connection

General theme	Mode of Transport	Main issues identified	Proposed solution in the Master Plan
	Aviation	Passenger Terminal Capacity Constraints in certain airports	Extension of existing terminals or develop new terminals in certain airports
		Airside Constraints	Extension of the runways, apron stands and taxiways in certain airports
		Lack of cargo terminal facilities / intermodal freight facilities	Analyze the opportunity of developing a cargo terminal
	Intermodal	Low level of containerization in Romania	Proposals of building a sustainable network of new or refurbished network of intermodal terminals

10.2 Road projects Implementation Programme

10.2.1 As described in Section 1, the status of the projects (defined as “project maturity”) stands for an important criterion to define the implementation calendar. Table 10.2 describes the identified road projects, including their status of preparation.

Table 10.2 Description of road schemes

Mode	Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Roads	Safety & Security	H0	Safety Interventions (treatment of Black Spots)	CNADNR SA	n/a	150.0	Feasibility Study required
Roads	Maintenance & Renewals		Adopt best practice PMS approach to prioritization of roads maintenance and perform detailed review of the existing assets and O&M funding requirements	CNADNR SA	n/a	n/a	n/a
Roads	Management & Operations		Improved institutional & organization stability and capacity to ensure efficient and effective management	MT / CNADNR SA	n/a	n/a	n/a
Roads	Management & Operations		Review appropriateness of axle load legislation and ensure sufficient monitoring and checking procedures	MT / CNADNR SA	n/a	n/a	n/a
Roads	Management & Operations		Introduce single coordinated system for charging covering the entire road network	MT / CNADNR SA	n/a	n/a	n/a
Roads	Management & Operations		Use of ITS to provide alternative route information coupled with improved management of border crossing arrangements	CNADNR SA	n/a	n/a	n/a
Roads	Safety & Security		Provision of appropriate parking facilities along the TEN-T routes	CNADNR SA	n/a	n/a	n/a
Roads	New infrastructure	H7	Sibiu-Brasov Motorway	CNADNR SA	57.6	817.3	Feasibility Studies available (yr. 2007 and 2009) but need revising
Roads	New infrastructure	H8	Ploiesti-Comarnic Motorway	CNADNR SA	39.4	310.4	Feasibility Study required
Roads	New infrastructure	H6	Craiova-Pitesti Motorway	CNADNR SA	34.4	870.3	Feasibility Study available for Craiova-Pitesti Expressway (yr. 2007)
Roads	New infrastructure	H1	Comarnic-Brasov Motorway	CNADNR SA	15.5	1117.0	Feasibility Study available (2009) - needs revising
Roads	New infrastructure	H12	Brasov-Bacau Motorway	CNADNR SA	14.9	2067.6	Tender for FS on-going
Roads	New infrastructure	OR18B	Bucharest Southern Ring Road Upgrade	CNADNR SA	71.0	175.7	Feasibility Study available
Roads	New infrastructure	OR7A	Bacau-Suceava Expressway	CNADNR SA	70.2	645.4	Tender for FS on-going
Roads	New infrastructure	OR12	Nadaselu - Suplacu de Barcau Motorway	CNADNR SA	57.0	550.0	Feasibility Study available
Roads	New infrastructure	OR19	Bucharest-Alexandria Expressway	CNADNR SA	56.6	369.6	Tender for FS on-going

Mode	Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Roads	New infrastructure	OR13C	Buzau-Focsani Expressway	CNADNR SA	55.8	282.0	Tender for FS on-going
Roads	New infrastructure	OR7B	Suceava-Siret Expressway	CNADNR SA	52.1	186.1	Tender for FS on-going
Roads	New infrastructure	OR13D	Targu Neamt-Iasi-Ungheni Motorway	CNADNR SA	51.5	700.0	Tender for FS on-going
Roads	New infrastructure	OR15	Sibiu-Pitesti Motorway	CNADNR SA	51.3	2471.2	Tender for FS on-going
Roads	New infrastructure	OR6B	Bacau-Focsani-Braila-Galati Expressway	CNADNR SA	46.5	1024.2	Feasibility Study required
Roads	New infrastructure	OR9B	Turda-Halmeu Expressway	CNADNR SA	44.0	975.4	Feasibility Study required
Roads	New infrastructure	OR19D	Henri Coanda Airport connection to A3	CNADNR SA	43.8	125.6	Feasibility Study required
Roads	New infrastructure	OR17	Gaesti-Ploiesti-Buzau-Braila Expressway	CNADNR SA	43.4	1279.6	Feasibility Study required
Roads	New infrastructure	OR10	Lugoj- Craiova Expressway	CNADNR SA	40.1	1810.9	Feasibility Study required
Roads	Rehabilitation	OR21	A1 Widening Bucharest-Pitesti	CNADNR SA	34.7	442.0	Feasibility Study required
Roads	New infrastructure	OR7C	Suceava-Botosani Expressway	CNADNR SA	32.3	345.8	Feasibility Study required
Roads	New infrastructure	OR13	Targu Mures-Targu Neamt Motorway	CNADNR SA	31.9	3400.0	Tender for FS on-going
Roads	New infrastructure	OR14	Brasov-Pitesti Expressway	CNADNR SA	25.4	1842.6	Feasibility Study required
Roads	New infrastructure	OR18A	Bucharest Ring Road Motorway	CNADNR SA	24.7	1683.8	Feasibility Study available (yr. 2008) but needs revising
Roads	New infrastructure	OR8	Bacau-Piatra Neamt Expressway	CNADNR SA	19.4	335.1	Feasibility Study required
Roads	New infrastructure	OR11	Constanta-Tulcea-Braila Expressway (including Braila Bridge)	CNADNR SA	17.1	1369.3	Tender for FS on-going
Roads	New infrastructure	BP10	Targoviste	CNADNR SA	57.0	78.0	Feasibility Study available but needs revising
Roads	New infrastructure	BP12	Adjud	CNADNR SA	56.6	46.2	Feasibility Study available but needs revising
Roads	New infrastructure	BP4	Roman	CNADNR SA	47.9	62.0	Feasibility Study available but needs revising
Roads	New infrastructure	BP11	Filiasi	CNADNR SA	46.9	27.7	Feasibility Study available but needs revising
Roads	New infrastructure	BP25	Vatra Dornei	CNADNR SA	43.6	18.3	Feasibility Study available but needs revising
Roads	New infrastructure	BP15	Falticeni	CNADNR SA	40.1	41.3	Feasibility Study available but needs revising
Roads	New infrastructure	BP5	Focsani	CNADNR SA	39.9	76.1	Feasibility Study available but needs revising

Mode	Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Roads	New infrastructure	BP3	Sighisoara	CNADNR SA	37.6	47.7	Feasibility Study available but needs revising
Roads	New infrastructure	BP28	Timisoara South	CNADNR SA	33.2	127.4	Feasibility Study available but needs revising
Roads	New infrastructure	BP20	Sfântu Gheorghe	CNADNR SA	25.1	34.0	Feasibility Study available but needs revising
Roads	New infrastructure	BP14	Ludus	CNADNR SA	24.5	102.5	Feasibility Study required
Roads	New infrastructure	BP23	Bârlad	CNADNR SA	24.3	51.1	Feasibility Study required
Roads	New infrastructure	BP7	Buzau	CNADNR SA	23.9	104.8	Feasibility Study required
Roads	New infrastructure	BP21	Giurgiu	CNADNR SA	23.7	72.0	Feasibility Study required
Roads	New infrastructure	BP24	Slobozia	CNADNR SA	22.8	23.3	Feasibility Study required
Roads	New infrastructure	BP6	Ramnicu Sarat	CNADNR SA	22.0	37.0	Feasibility Study required
Roads	New infrastructure	BP9	Ramnicu Valcea	CNADNR SA	20.5	195.4	Feasibility Study required
Roads	New infrastructure	BP16	Caransebes	CNADNR SA	18.9	80.8	Feasibility Study required
Roads	New infrastructure	BP22	Vaslui	CNADNR SA	17.3	72.9	Feasibility Study required
Roads	New infrastructure	BP13	Mizil	CNADNR SA	17.0	36.0	Feasibility Study required
Roads	New infrastructure	BP17	Beclean	CNADNR SA	16.7	42.2	Feasibility Study required
Roads	New infrastructure	BP27	Mangalia	CNADNR SA	14.1	44.1	Feasibility Study required
Roads	New infrastructure	BP18	Bistrița	CNADNR SA	11.4	157.0	Feasibility Study available but needs revising
Roads	New infrastructure	BP19	Miercurea Ciuc	CNADNR SA	7.0	110.5	Feasibility Study available but needs revising
Roads	New infrastructure	BP26	Câmpulung Moldovenesc	CNADNR SA	7.0	99.3	Feasibility Study available but needs revising
Roads	Rehabilitation		Rehabilitation/Modernisation of RegioTrans and InterRegio National Roads	CNADNR SA	n/a	n/a	Feasibility Studies required

10.2.2 Based on the agreed criteria for project implementation (funding eligibility and project maturity) a detailed implementation plan was defined for the projects described in Table 10.3.

Table 10.3 Detailed implementation programme for road interventions

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
	Safety Interventions (treatment of Black Spots)		ERDF			2015-2016
	Adopt best practice PMS approach to prioritization of roads maintenance and perform detailed review of the existing assets and O&M funding requirements		National Budget			2015-2016
	Improved institutional & organization stability and capacity to ensure efficient and effective management		National Budget			2015-2016
	Review appropriateness of axle load legislation and ensure sufficient monitoring and checking procedures		National Budget			2015-2016
	Introduce single coordinated system for charging covering the entire road network		National Budget			2015-2016
	Use of ITS to provide alternative route information coupled with improved management of border crossing arrangements		National Budget			2015-2016
	Provision of appropriate parking facilities along the TEN-T routes		National Budget			2015-2016
OR15	Sibiu-Pitesti Motorway	2,471.2	Core TEN-T link	Cohesion Fund	2015	2018-2023
OR7A	Bacau-Suceava Expressway (Bacau-Pascani as motorway)	645.4	Core TEN-T link	Cohesion Fund	2015	2017-2019
OR13D	Targu Neamt-Iasi-Ungheni Motorway	700.0	Core TEN-T link	Cohesion Fund	2015	2017-2020
OR13C	Buzau-Focsani Expressway	282.0	Core TEN-T link	Cohesion Fund	2021	2023-2025
OR19	Bucharest-Alexandria Expressway	369.6	Core TEN-T link	Cohesion Fund	2026	2028-2030
OR6B	Bacau-Focsani-Braila-Galati Expressway	1,024.2	Comprehensive TEN-T link	National Budget	2020	2023-2026
OR7B	Suceava-Siret Expressway	186.1	Core TEN-T link	Cohesion Fund	2021	2023-2025
OR19D	Henri Coanda Airport connection to A3	125.6	Core TEN-T link	Cohesion Fund	2023	2025-2026
OR17	Gaesti-Ploiesti-Buzau-Braila Expressway	1,279.6	Comprehensive TEN-T link	Cohesion Fund	2022	2025-2028
OR10	Lugoj- Craiova Expressway	1,810.9	Core TEN-T link	ERDF	2023	2025-2029
OR13	Targu Mures-Targu Neamt Motorway	3,400.0	Core TEN-T link	Cohesion Fund	2025	2028-2032
OR18A	Bucharest Ring Road Motorway	1,683.8	Core TEN-T link	Cohesion Fund	After 2030	After 2030
OR12	Nadaselu - Suplacu de Barcau Motorway	550.0	Comprehensive TEN-T link	ERDF	Available	2015-2018
H7	Sibiu-Brasov Motorway	817.3	Comprehensive TEN-T link	ERDF	2015	2018-2020

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
H1	Comarnic-Brasov Motorway	1,117.0	Comprehensive TEN-T link	ERDF	Available	2016-2020
H12	Brasov-Bacau Motorway	2,067.6	Comprehensive TEN-T link	ERDF	2017	2021-2026
H6	Craiova-Pitesti Motorway	870.3	Comprehensive TEN-T link	ERDF	2017	2021-2024
OR11	Constanta-Tulcea-Braila Expressway (including Braila Bridge)	1,369.3	Comprehensive TEN-T link	ERDF	2017	2020-2022
H8	Ploiesti-Comarnic Motorway	310.4	Comprehensive TEN-T link	ERDF	2026	2028-2030
OR9B	Turda-Halmeu Expressway	975.4	Other links	Cohesion Fund	2020	2022-2025
OR7C	Suceava-Botosani Expressway	345.8	Secondary connectivity with TEN-T	National Budget	After 2030	After 2030
OR14	Brasov-Pitesti Expressway	1,842.6	Comprehensive TEN-T link	ERDF	After 2030	After 2030
OR8	Bacau-Piatra Neamt Expressway	335.1	Other links	National Budget	After 2030	After 2030
OR18B	Bucharest Southern Ring Road Upgrade	175.7	Core TEN-T link	Cohesion Fund	Available	2015-2016
OR21	A1 Widening Bucharest-Pitesti	442.0	Core TEN-T link	Cohesion Fund	2017	2019-2021
BP10	Targoviste	78.0	Comprehensive TEN-T link	ERDF	2015	2018-2019
BP12	Adjud	46.2	Core TEN-T link	Cohesion Fund	2015	2018-2019
BP4	Roman	62.0	Core TEN-T link	Cohesion Fund	2015	2018-2019
BP11	Filiasi	27.7	Core TEN-T link	Cohesion Fund	2015	2018-2019
BP25	Vatra Dornei	18.3	Comprehensive TEN-T link	ERDF	2015	2018-2019
BP15	Falticeni	41.3	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP5	Focsani	76.1	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP3	Sighisoara	47.7	Comprehensive TEN-T link	ERDF	2020	2022-2023
BP28	Timisoara South	127.4	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP20	Sfântu Gheorghe	34.0	Comprehensive TEN-T link	ERDF	2020	2022-2023
BP14	Ludus	102.5	Comprehensive TEN-T link	ERDF	2020	2022-2023
BP23	Bârlad	51.1	Comprehensive TEN-T link	ERDF	2020	2022-2023
BP7	Buzau	104.8	Core TEN-T link	Cohesion Fund	2020	2022-2023

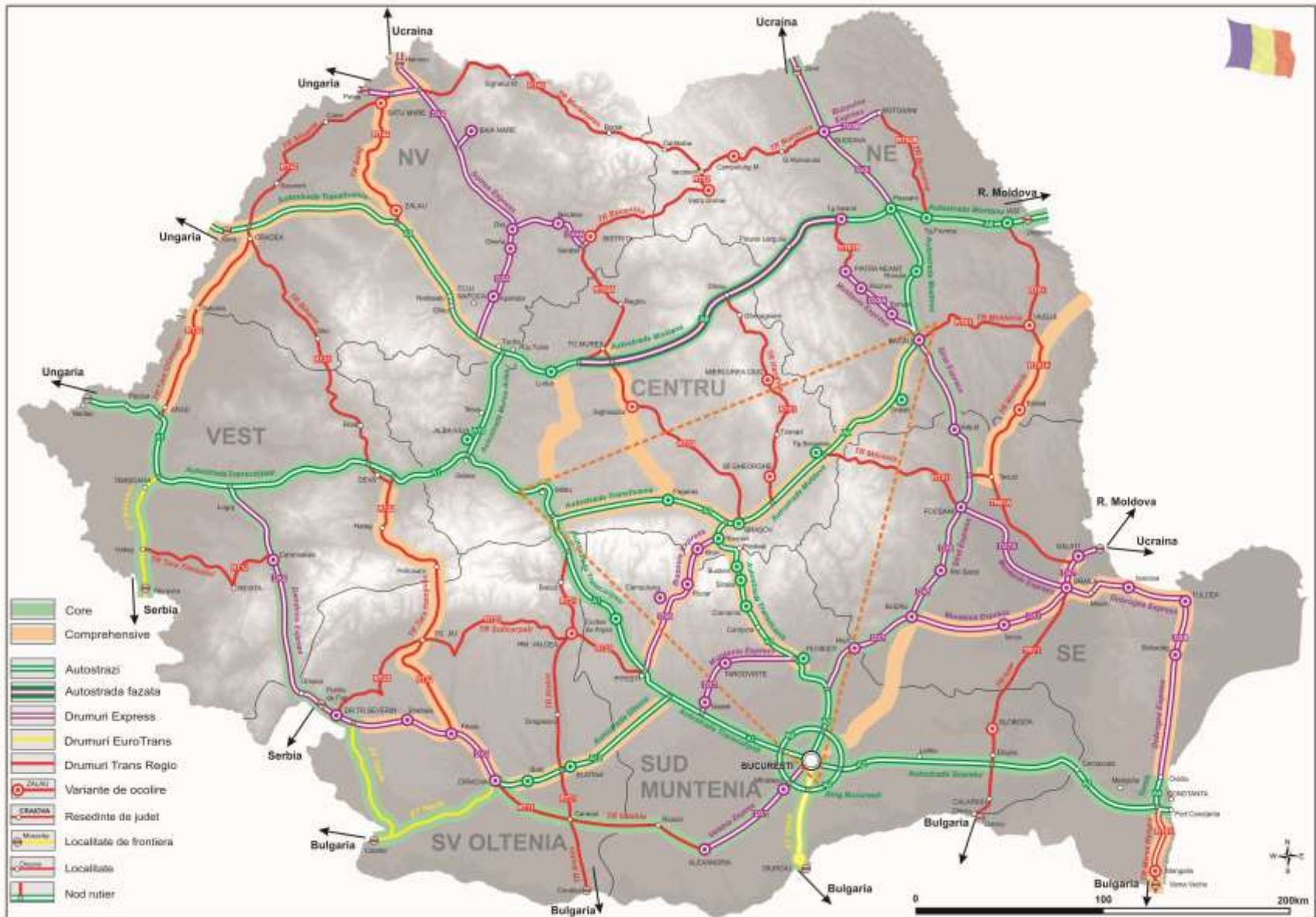
Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
BP21	Giurgiu	72.0	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP24	Slobozia	23.3	Comprehensive TEN-T link	ERDF	2020	2022-2023
BP6	Ramnicu Sarat	37.0	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP9	Ramnicu Valcea	195.4	Core TEN-T link	Cohesion Fund	2020	2022-2023
BP16	Caransebes	80.8	Core TEN-T link	Cohesion Fund	2030	After 2030
BP22	Vaslui	72.9	Comprehensive TEN-T link	ERDF	2030	After 2030
BP13	Mizil	36.0	Core TEN-T link	Cohesion Fund	2030	After 2030
BP17	Beclean	42.2	Comprehensive TEN-T link	ERDF	2030	After 2030
BP27	Mangalia	44.1	Comprehensive TEN-T link	ERDF	2030	After 2030
BP18	Bistrița	157.0	Comprehensive TEN-T link	ERDF	2030	After 2030
BP19	Miercurea Ciuc	110.5	Comprehensive TEN-T link	ERDF	2030	After 2030
BP26	Câmpulung Moldovenesc	99.3	Comprehensive TEN-T link	ERDF	2030	After 2030
	Rehabilitation/Modernisation of RegioTrans and InterRegio National Roads		Core / Comprehensive TEN-T link	CF/ERDF		2014-2030

10.2.3 The source of funding for road projects is summarised in Table 10.4 below.

Table 10.4 Sources of Funding for Road Projects (m eur, 2014 prices)

Funding Source	Period	Investment
Cohesion Fund	2014-2020	3,310.8
	2021-2030	8,531.8
ERDF	2014-2020	3,036.9
	2021-2030	6,230.7
National Budget	2014-2020	
	2021-2030	1,024.2
Private Funds	2014-2020	
	2021-2030	
Total 2014-2020		6,347.7
Total 2021-2030		15,786.7

Figure 10.1 Road Interventions in the Master Plan



10.3 Rail Projects Implementation Programme

10.3.1 The rail projects in the master Plan, and their current status, are set out in Table 10.5 below.

Table 10.5 Description and current status of rail interventions

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Maintenance		Focus the scarce maintenance and development resources on a reduced sustainable network.	MT / CFR SA	n/a	n/a	Feasibility Study required
Management & Operations		A comprehensive reform package to be implemented as soon as possible	MT / CFR SA	n/a	n/a	Feasibility Study required
Management & Operations		Define clear level of service requirements (limited to the primary network), increase frequency on the competitive corridors, introduce regular-interval service timetable and purchase of new rolling stock	MT / CFR SA	n/a	n/a	Feasibility Study required
Management & Operations		The relations between the public transport authority, CFR Infrastructure and the operators to be restructured	MT / CFR SA	n/a	n/a	n/a
Management & Operations		Re-launch private management techniques with a proper selection process of an efficient business management profile	MT / CFR SA	n/a	n/a	n/a
Maintenance & Renewals	DS10R	Emergency interventions for section Bucharest to Giurgiu via Gradistea	CNCF CFR SA	80.0	0.0	Feasibility Study required
Rehabilitation	DS02A	Bucharest to Constanta. New rolling stock and re-timetabling	CNCF CFR SA	73.9	28.8	Feasibility Study required
Maintenance & Renewals	DS11R	Emergency interventions for section Craiova to Calafat	CNCF CFR SA	50.5	1.5	Feasibility Study required
Maintenance & Renewals	DS03R	Emergency interventions for section Bucharest to Arad via Craiova and Timisoara	CNCF CFR SA	49.2	73.2	Feasibility Study required
Maintenance & Renewals	DS04R	Emergency interventions for section Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine	CNCF CFR SA	45.4	90.7	Feasibility Study required
Maintenance & Renewals	DS06R	Emergency interventions for section Cluj-Napoca to Iasi	CNCF CFR SA	45.2	52.5	Feasibility Study required
Rehabilitation	DS10A	Bucharest to Giurgiu via Gradistea. Rehabilitation to design speed.	CNCF CFR SA	35.0	132.1	Feasibility Study required
Rehabilitation	DS03S	Freight test Filiasi - Tg Jiu	CNCF CFR SA	33.3	6.1	Feasibility Study required
Rehabilitation	DS01R	Emergency interventions for section Bucharest to Hungary via Brasov + Teius to Cluj	CNCF CFR SA	30.0	67.7	Feasibility Study required
Rehabilitation	DS04A	Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine. Rehabilitation to design speed.	CNCF CFR SA	25.3	3093.2	Feasibility Study required
Rehabilitation	DS01A	Bucharest to Hungary via Brasov + Teius to Cluj. Rehabilitation to design speed.	CNCF CFR SA	24.5	2784.9	Feasibility Study available

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Rehabilitation	DS03A	Bucharest to Arad via Craiova and Timisoara. Rehabilitation to design speed.	CNCF CFR SA	24.4	2242.5	Feasibility Study required
Rehabilitation	DS11A	Craiova to Calafat. Rehabilitation to design speed.	CNCF CFR SA	24.0	168.6	Feasibility Study required
Rehabilitation	DS06A	Cluj-Napoca to Iasi. Rehabilitation to design speed.	CNCF CFR SA	24.0	2580.7	Feasibility Study required
Rehabilitation	DS05B	Bucharest to Sibiu via Pitesti and Ramnicu Valcea. New link, rehabilitation to design speed and electrification.	CNCF CFR SA	17.6	1159.9	Feasibility Study required
Rehabilitation	DS08A	Oradea to Timisoara. Rehabilitation to design speed.	CNCF CFR SA	14.0	358.8	Feasibility Study required
Rehabilitation	DS09A	Oradea to Cluj-Napoca via Satu Mare and Baia Mare. Rehabilitation to design speed.	CNCF CFR SA	14.0	1110.7	Feasibility Study required
Rehabilitation	DS07B	Cluj-Napoca to Oradea. Rehabilitation to enhanced speed, line doubling and electrification.	CNCF CFR SA	14.0	1473.4	Feasibility Study required

10.3.2 As part of the Implementation Strategy, the potential for implementing some ‘quick-wins’ in advance of delivering the overall package of works has also been considered. The introduction of these quick-wins will attract some new rail passengers, and should be regarded as “Phase 1” of the more comprehensive rehabilitation packages.

10.3.3 The implementation programme for the rail projects is set out in Table 10.6

Table 10.6 Detailed implementation calendar for rail projects

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
	Focus the scarce maintenance and development resources on a reduced sustainable network.					2015-2016
	A comprehensive reform package to be implemented as soon as possible					2015-2016
	Define clear level of service requirements (limited to the primary network), increase frequency on the competitive corridors, introduce regular-interval service timetable and purchase of new rolling stock					2015-2016
	The relations between the public transport authority, CFR Infrastructure and the operators to be restructured					2015-2016
	Re-launch private management techniques with a proper selection process of an efficient business management profile					2015-2016
DS10R	Emergency interventions for section Bucharest to Giurgiu via Gradistea		Core TEN-T link	Cohesion Fund	2015	2014-2020
DS02A	Bucharest to Constanta. New rolling stock and re-timetabling	28.8	Core TEN-T link	Cohesion Fund	2015	2014-2020

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
DS11R	Emergency interventions for section Craiova to Calafat	1.5	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS03R	Emergency interventions for section Bucharest to Arad via Craiova and Timisoara	73.2	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS04R	Emergency interventions for section Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine	90.7	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS06R	Emergency interventions for section Cluj-Napoca to Iasi	52.5	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS10A	Bucharest to Giurgiu via Gradistea. Rehabilitation to design speed.	132.1	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS03S	Freight test Filiasi - Tg Jiu	6.1	Comprehensive TEN-T link	ERDF	2015	2014-2020
DS01R	Emergency interventions for section Bucharest to Hungary via Brasov + Teius to Cluj	67.7	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS01A	Bucharest to Hungary via Brasov + Teius to Cluj. Rehabilitation to design speed.	2,784.9	Core TEN-T link	Cohesion Fund	2015	2014-2020
DS04A	Bucharest to Iasi via Bacau + Buzau to Galati + Pascani to Ukraine. Rehabilitation to design speed.	3,093.2	Core TEN-T link	Cohesion Fund	2018	2021-2030
DS03A	Bucharest to Arad via Craiova and Timisoara. Rehabilitation to design speed.	2,242.5	Core TEN-T link	Cohesion Fund	2018	2021-2030
DS11A	Craiova to Calafat. Rehabilitation to design speed.	168.6	Core TEN-T link	Cohesion Fund	2018	2021-2030
DS06A	Cluj-Napoca to Iasi. Rehabilitation to design speed.	2,580.7	Core TEN-T link	Cohesion Fund	2020	2021-2030
DS05B	Bucharest to Sibiu via Pitesti and Ramnicu Valcea. New link, rehabilitation to design speed and electrification.	1,159.9	Comprehensive TEN-T link	ERDF	2020	2021-2030
DS08A	Oradea to Timisoara. Rehabilitation to design speed.	358.8	Comprehensive TEN-T link	ERDF	2020	2021-2030
DS09A	Oradea to Cluj-Napoca via Satu Mare and Baia Mare. Rehabilitation to design speed.	1,110.7	Comprehensive TEN-T link	ERDF	2020	2021-2030
DS07B	Cluj-Napoca to Oradea. Rehabilitation to enhanced speed, line doubling and electrification.	1,473.4	Comprehensive TEN-T link	ERDF	2020	2021-2030

10.3.4 The rail proposals are shown on Figures 10.2 and 10.3

Figure 10.2 Revised Passenger Services: Regular Interval Timetable

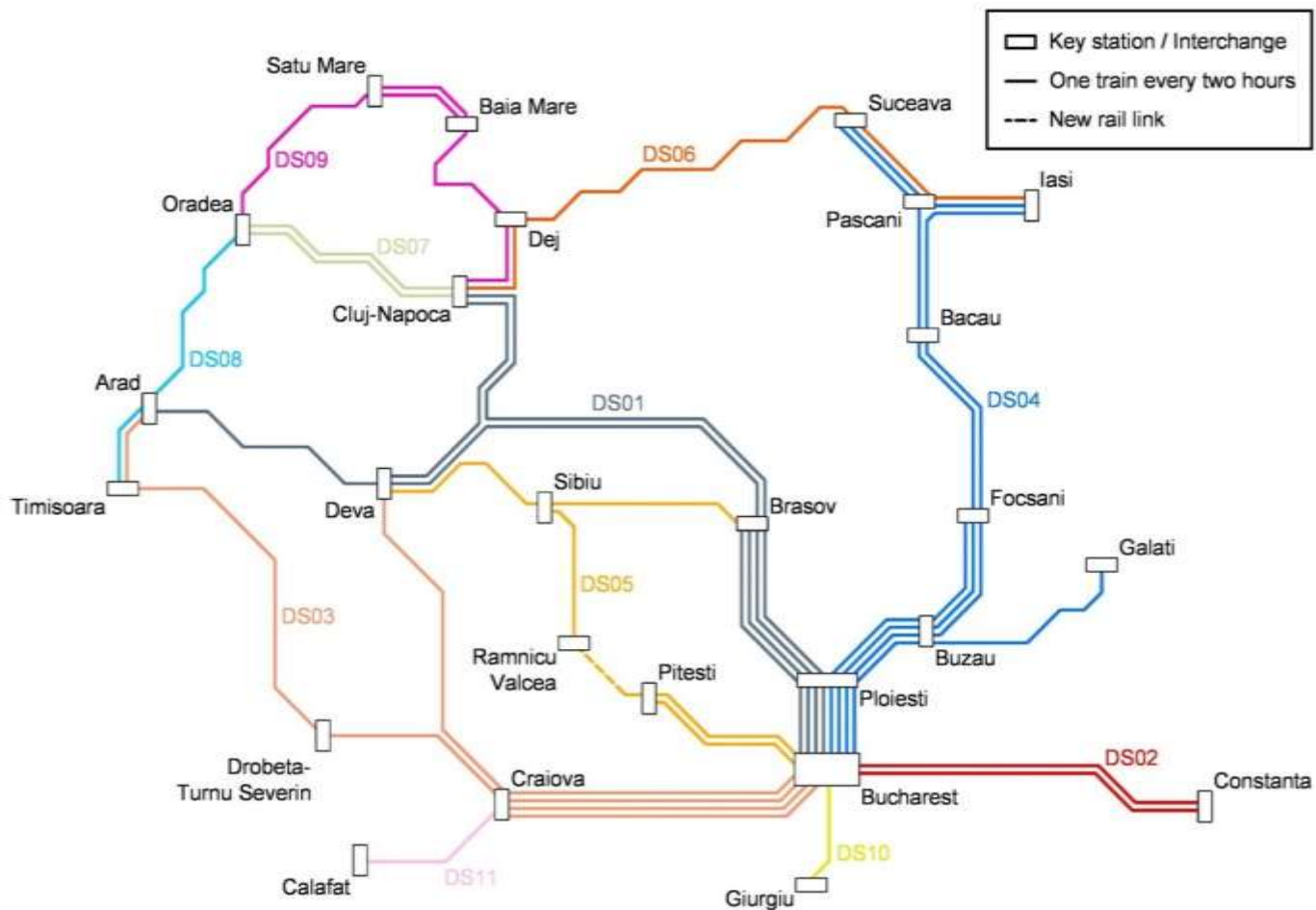
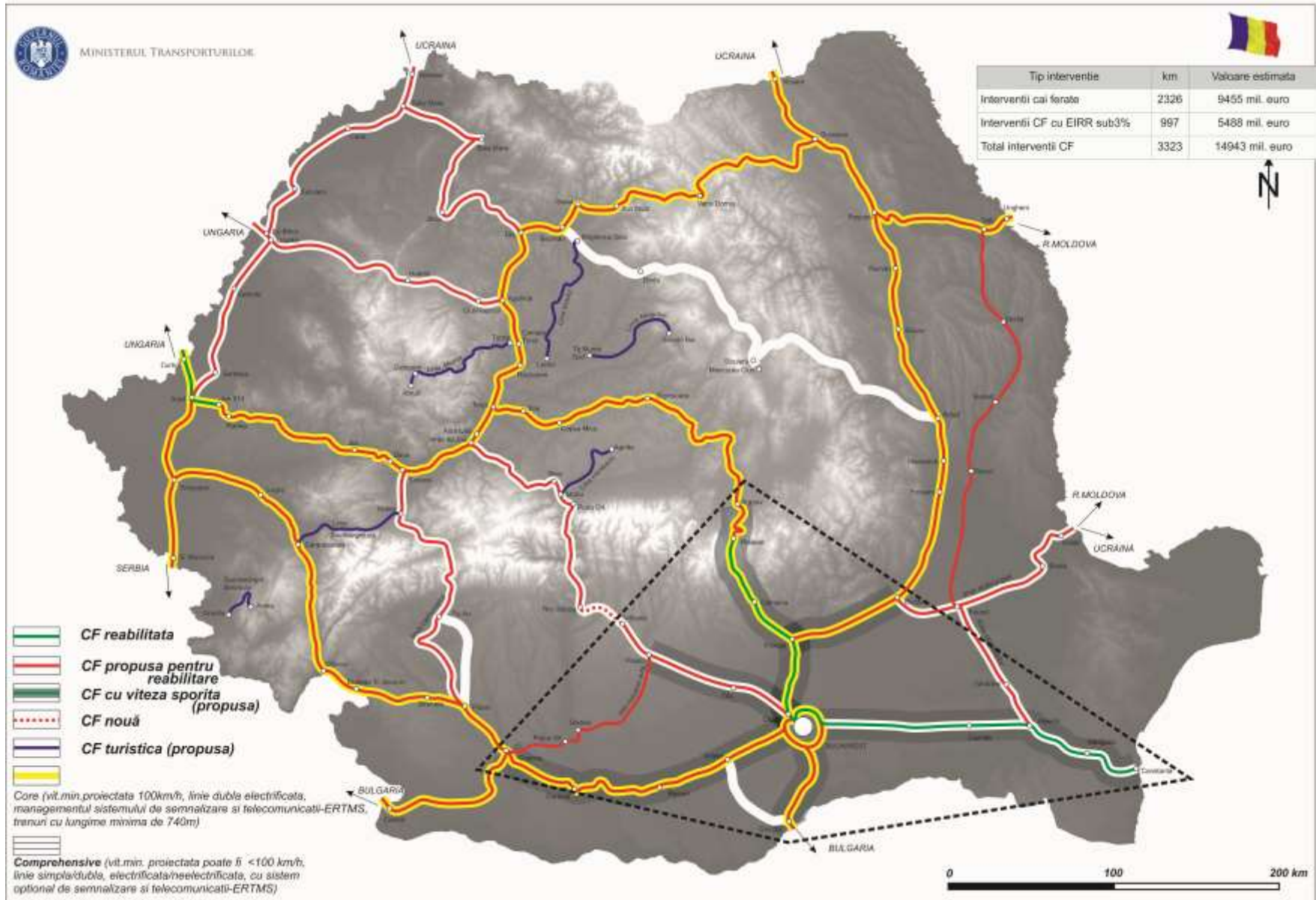


Figure 10.3 Rail Investments for the Master Plan



10.4 Ports and Waterways Implementation Programme

10.4.1 Table 10.7 Sets out the current status of the recommended projects for Ports and Waterways.

Table 10.7 Current Status of Master Plan Ports and Waterways Projects in the Master Plan

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Maintenance	W3	Invest in ice breaking facilities including replacing Perseus	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W4	Increase maintenance budgets to match consistently across borders and implementing Danube maintenance	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W5	Authorities to be flexible in opening times/days so that facilities such as customs, booking offices and terminals are available if demand exists.	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W6	Adopt a commercial attitude and review port charges to operators to ensure water freight is competitive	MT / Port Authorities	n/a	n/a	n/a
Maintenance	W7	Romania to work with Danube countries to agree operational plans	MT / Port Authorities	n/a	n/a	n/a
Maintenance	W8	Review port and customs administration procedures and rationalise and improve communication	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W9	Establish suitable training for the needs of the naval sector	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W10	Industry to use modern and integrated systems for customs, navigation, regulation and administration	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W11	Develop a safety plan including training to reduce accidents	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W12	Enhance security to reduce thefts from vessels and port facilities at Ports on the Primary Economic Network	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W13	Reduce emissions from naval activity by adopting best practice: enforce EU regulations regarding emissions by non-EU vessels	MT / Port Authorities	n/a	n/a	n/a
Safety & Security	W14	Safeguard land and facilities at minor and underutilised ports	MT / Port Authorities	n/a	n/a	n/a
Safety & Security	W15	Improve immediate local and internal road/rail connections	MT / Port Authorities	n/a	n/a	n/a
Management & Operations	W16	Transfer rail infrastructure ownership within ports to port authorities	CFR SA	n/a	n/a	n/a

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Rehabilitation	P-GL-S	Galati Port	CN APDM SA Galati	74.0	17.6	Feasibility Study available
Rehabilitation	P-GR-S	Giurgiu Port	CN APDF SA Giurgiu	51.7	4.3	Feasibility Study required
Rehabilitation	P-DBOV-S	Orsova/Drobeta	CN APDF SA Giurgiu	50.9	25.1	Feasibility Study required
Rehabilitation	P-OT-S	Oltenita Port	CN APDM SA Galati	50.0	5.6	Feasibility Study required
Rehabilitation	P-DB-S	Drobeta Turnu Severin Port	CN APDF SA Giurgiu	49.4	17.3	Feasibility Study required
Rehabilitation	P-CV-S	Cernavoda Port	CN APDM SA Galati	48.9	6.9	Feasibility Study required
Rehabilitation	P-OV-S	Orsova Port	CN APDF SA Giurgiu	42.4	7.8	Feasibility Study required
Rehabilitation	P-CB-S	Corabia Port	CN APDF SA Giurgiu	32.8	4.5	Feasibility Study required
Rehabilitation	W1	Improving the navigability on the joint Romanian-Bulgarian sector of the Danube	RA AFDJ Galati	30.9	206.7	Tender for FS on-going
Rehabilitation	P-All-S	Sulina Channel Improvements	RA AFDJ Galati	30.4	20.0	Tender for FS on-going
Rehabilitation	P-CO-S	Constanta Port	CN APM SA Constanta	29.5	351.1	Feasibility Study available but needs revising
Rehabilitation	P-CF-S	Calafat Port	CN APDF SA Giurgiu	24.0	19.7	Feasibility Study required
Rehabilitation	P-MV-S	Moldova Veche Port	CN APDF SA Giurgiu	17.2	3.7	Feasibility Study required
Rehabilitation	P-TL-S	Tulcea Port	CN APDM SA Galati	14.0	16.0	Tender for FS on-going
New infrastructure	W36	Bucharest to Danube Canal Connection	CN ACN SA	10.0	1500.8	Feasibility Study available (yr 2010) but needs revising
Rehabilitation	P-BS-S	Basarabi Port	CN ACN SA	4.0	5.6	Feasibility Study required

10.4.2 Table 10.8 Gives the funding source and programme for the implementation of these projects.

Table 10.8 Detailed implementation calendar for ports and waterways projects

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
W3	Invest in ice breaking facilities including replacing Perseus			National Budget		2015
W4	Increase maintenance budgets to match consistently across borders and implementing Danube maintenance			National Budget		Starting year 2015
W5	Authorities to be flexible in opening times/days so that facilities such as customs, booking offices and terminals are available if demand exists.			National Budget		Starting year 2015
W6	Adopt a commercial attitude and review port charges to operators to ensure water freight is competitive			National Budget		Starting year 2015
W7	Romania to work with Danube countries to agree operational plans			National Budget		Starting year 2015
W8	Review port and customs administration procedures and rationalise and improve communication			National Budget		Starting year 2015
W9	Establish suitable training for the needs of the naval sector			National Budget		Starting year 2015
W10	Industry to use modern and integrated systems for customs, navigation, regulation and administration			National Budget		Starting year 2015
W11	Develop a safety plan including training to reduce accidents			National Budget		Starting year 2015
W12	Enhance security to reduce thefts from vessels and port facilities at Ports on the Primary Economic Network			National Budget		Starting year 2015
W13	Reduce emissions from naval activity by adopting best practice: enforce EU regulations regarding emissions by non-EU vessels			National Budget		Starting year 2015
W14	Safeguard land and facilities at minor and underutilised ports			National Budget		Starting year 2015
W15	Improve immediate local and internal road/rail connections			National Budget		Starting year 2015
W16	Transfer rail infrastructure ownership within ports to port authorities			National Budget		Starting year 2015
P-GL-S	Galati Port	17.6	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-GR-S	Giurgiu Port	4.3	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-DBOV-S	Orsova/Drobeta	25.1	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-OT-S	Oltenita Port	5.6	Comprehensive TEN-T link	ERDF	2015	2014-2020
P-DB-S	Drobeta Turnu Severin Port	17.3	Core TEN-T link	Cohesion Fund	2015	2014-2020

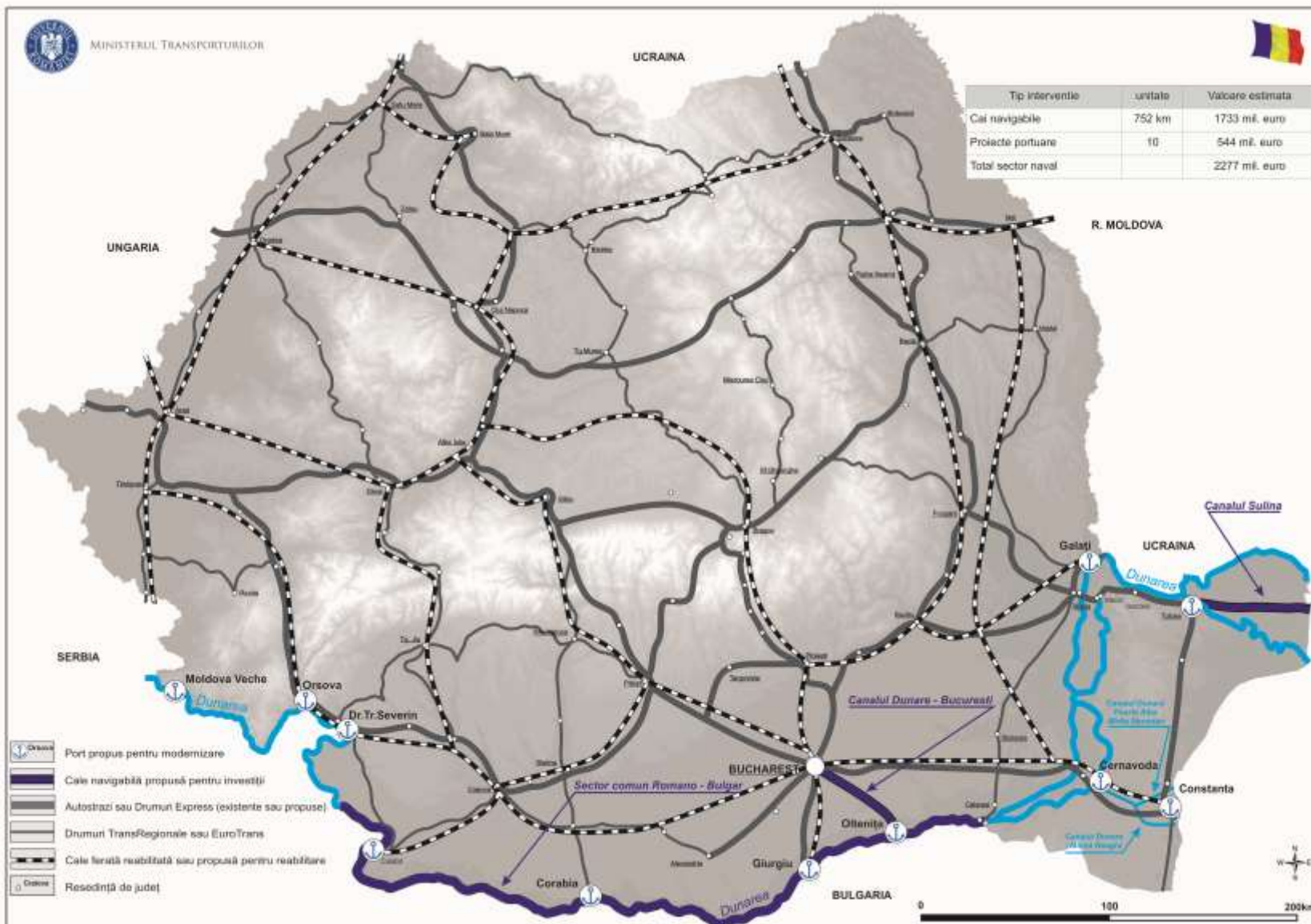
Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
P-CV-S	Cernavoda Port	6.9	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-OV-S	Orsova Port	7.8	Comprehensive TEN-T link	ERDF	2015	2014-2020
P-CB-S	Corabia Port	4.5	Other links	National Budget	2015	2014-2020
W1	Improving the navigability on the joint Romanian-Bulgarian sector of the Danube	206.7	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-All-S	Sulina Channel Improvements	20.0	Core TEN-T link	Cohesion Fund	2015	2014-2020
P-CO-S	Constanta Port	351.1	Core TEN-T link	Cohesion Fund	2018	2021-2030
P-CF-S	Calafat Port	19.7	Core TEN-T link	Cohesion Fund	2018	2021-2030
P-MV-S	Moldova Veche Port	3.7	Comprehensive TEN-T link	ERDF	2018	2021-2030
P-TL-S	Tulcea Port	16.0	Comprehensive TEN-T link	ERDF	2015	2014-2020
P-BS-S	Basarabi Port	5.6	Other links	ERDF	2018	2021-2030
W36	Bucharest to Danube Canal Connection	1,500.8	Core TEN-T link	CEF	2020	After 2025

10.4.3 A summary of the sources of funding for the naval investments is given below.

Table 10.9 Distribution of total naval investments by funding source and period (mill EUR)

Funding Source	Period	Investment
Cohesion Fund	2014-2020	298.1
	2021-2030	1,871.6
ERDF	2014-2020	29.4
	2021-2030	9.2
National Budget	2014-2020	4.5
	2021-2030	
Private Funds	2014-2020	
	2021-2030	
Total 2014-2020		331.9
Total 2021-2030		1,880.9

Figure 10.4 Master Plan Ports and Waterways Projects



10.5 Aviation Projects Implementation Plan

10.5.1 Table 10.10 Sets out the current status of the aviation projects recommended in the Master Plan.

Table 10.10: Description and status of the interventions in the air sector

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
Management & Operations		Upgrading the lighting systems and purchase of de-icing equipments in certain airports				
Management & Operations		Improve communications between airport management and local authorities				
Rehabilitation	A8	Oradea	Local Authorities	43.9	1.2	Feasibility Study required
Rehabilitation	A12	Targu Mures	Local Authorities	40.0	15.6	Feasibility Study required
Rehabilitation	A6	Craiova	Local Authorities	36.4	17.3	Feasibility Study required
Rehabilitation	A10	Sibiu	Local Authorities	30.8	49.8	Feasibility Study required
Rehabilitation	A11	Suceava	Local Authorities	26.4	4.0	Feasibility Study required
Rehabilitation	A5	Constanta	Local Authorities	20.6	8.2	Feasibility Study required
Rehabilitation	A7	Iasi	Local Authorities	12.8	10.8	Feasibility Study required
Rehabilitation	A13	Timisoara	Local Authorities	10.8	76.5	Feasibility Study required
Rehabilitation	A2	Baia Mare	Local Authorities	7.0	2.3	Feasibility Study required
Rehabilitation	A1	Bacau	Local Authorities	6.1	85.1	Feasibility Study required
Rehabilitation	A4	Cluj	Local Authorities	3.2	38.1	Feasibility Study required
Rehabilitation	A16	Tulcea	Local Authorities	0.0	15.4	Feasibility Study required
Rehabilitation	A9	Satu Mare	Local Authorities	-8.8	0.8	Feasibility Study required

10.5.2 Table 10.11 summarises the funding sources for these projects

Table 10.11 Distribution of total air investments by funding source and period (mill EUR)

Funding Source	Period	Investment
Cohesion Fund	2014-2020	
	2021-2030	
ERDF	2014-2020	185.8
	2021-2030	139.4
National Budget	2014-2020	
	2021-2030	
Private Funds	2014-2020	
	2021-2030	
Total 2014-2020		185.8
Total 2021-2030		139.4

10.5.3 Table 10.12 Sets out the detailed implementation programme for these projects

Table 10.12: Detailed implementation plan for the interventions in the air sector

Code	Project	Cost (mill EUR, undisc. 2014 prices, VAT excluded)	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
	Upgrading the lighting systems and purchase of de-icing equipments in certain airports			National Budget		2015-2016
	Improve communications between airport management and local authorities			National Budget		Starting year 2015
A8	Oradea	1.2	Comprehensive TEN-T link	ERDF	2015	2014-2020
A12	Targu Mures	15.6	Other links	ERDF	2015	2014-2020
A6	Craiova	17.3	Comprehensive TEN-T link	ERDF	2015	2014-2020
A10	Sibiu	49.8	Comprehensive TEN-T link	ERDF	2015	2014-2020
A11	Suceava	4.0	Comprehensive TEN-T link	ERDF	2015	2014-2020
A5	Constanta	8.2	Comprehensive TEN-T link	ERDF	2015	2014-2020
A7	Iasi	10.8	Comprehensive TEN-T link	ERDF	2015	2014-2020
A13	Timisoara	76.5	Core TEN-T link	ERDF	2015	2014-2020
A2	Baia Mare	2.3	Comprehensive TEN-T link	ERDF	2015	2014-2020
A1	Bacau	85.1	Comprehensive TEN-T link	ERDF	2020	2021-2030
A4	Cluj	38.1	Comprehensive TEN-T link	ERDF	2020	2021-2030
A16	Tulcea	15.4	Comprehensive TEN-T link	ERDF	2020	2021-2030
A9	Satu Mare	0.8	Other links	ERDF	2020	2021-2030

10.5.4 The locations of the air projects are shown at the end of the next section

10.6 Intermodal Transport Projects

10.6.1 Table 10.13 shows the status of the aviation projects.

Table 10.13 Description and status of the intermodal proposed interventions

Type of Intervention	Code	Project	Implementing Authority	MCA Score EES Scenario	Cost	Project Maturity
		Establish a contract between infrastructure provider and train operators which requires compensation for delays and dedicated measures implemented by CFR Infrastructure	MT / CFR SA / CFR Marfa	n/a	n/a	n/a
		Increase efficiency of operations by adopting best practices and privatization of facilities	MT / CFR SA / CFR Marfa	n/a	n/a	n/a
		Remove uncertainty over the future of CFR Marfa and privatize as soon as possible	MT	n/a	n/a	n/a
New infrastructure	I-BU-S	Bucuresti IMT	Private Companies	80.0	18.0	Feasibility Study required
New infrastructure	I-TM-S	Timisoara IMT	Private Companies	39.1	18.0	Feasibility Study required
New infrastructure	I-CR-S	Craiova IMT	Private Companies	39.1	18.0	Feasibility Study required
New infrastructure	I-SU-S	Suceava IMT	Private Companies	37.9	18.0	Feasibility Study required
New infrastructure	I-BC-S	Bacau IMT	Private Companies	37.9	18.0	Feasibility Study required
New infrastructure	I-CJ-S	Cluj-Napoca IMT	Private Companies	37.4	18.0	Feasibility Study required
New infrastructure	I-DB-S	Drobeta Turnu Severin IMT	Private Companies	33.5	8.0	Feasibility Study required
New infrastructure	I-GL-S	Galati IMT	Private Companies	30.0	23.0	Feasibility Study required
New infrastructure	I-GR-S	Giurgiu IMT	Private Companies	30.0	10.0	Feasibility Study required
New infrastructure	I-TU-S	Turda IMT	Private Companies	30.0	18.0	Feasibility Study required
New infrastructure	I-IS-S	Iasi IMT	Private Companies	24.0	18.0	Feasibility Study required
New infrastructure	I-OR-S	Oradea IMT	Private Companies	20.0	18.0	Feasibility Study required

10.6.2 Table 10.14 sets out the implementation programme for the aviation projects.

Table 10.14 Detailed implementation plan for the intermodal investments

Code	Project	Cost	Relation to TEN-T Network	Funding Source	Start year for FS	Calendar of Implementation
	Establish a contract between infrastructure provider and train operators which requires compensation for delays and dedicated measures implemented by CFR Infrastructure			National Budget		Starting year 2015
	Increase efficiency of operations by adopting best practices and privatization of facilities			National Budget		Starting year 2015
	Remove uncertainty over the future of CFR Marfa and privatize as soon as possible			National Budget		Starting year 2015
I-BU-S	Bucuresti IMT	18.0	Core TEN-T link	Private Funds	2015	2014-2020
I-TM-S	Timisoara IMT	18.0	Core TEN-T link	Private Funds	2015	2014-2020
I-CR-S	Craiova IMT	18.0	Core TEN-T link	Private Funds	2015	2014-2020
I-SU-S	Suceava IMT	18.0	Core TEN-T link	Private Funds	2015	2014-2020
I-BC-S	Bacau IMT	18.0	Core TEN-T link	Private Funds	2018	2021-2030
I-CJ-S	Cluj-Napoca IMT	18.0	Core TEN-T link	Private Funds	2018	2021-2030
I-DB-S	Drobeta Turnu Severin IMT	8.0	Core TEN-T link	Private Funds	2018	2021-2030
I-GL-S	Galati IMT	23.0	Core TEN-T link	Private Funds	2018	2021-2030
I-GR-S	Giurgiu IMT	10.0	Core TEN-T link	Private Funds	2018	2021-2030
I-TU-S	Turda IMT	18.0	Core TEN-T link	Private Funds	2018	2021-2030
I-IS-S	Iasi IMT	18.0	Core TEN-T link	Private Funds	2018	2021-2030
I-OR-S	Oradea IMT	18.0	Comprehensive TEN-T link	Private Funds	2018	2021-2030

10.6.3 A summary of the funding sources for aviation projects is given in Table 10.15

Table 10.15 Distribution of total intermodal investments by funding source and period (mill EUR)

Funding Source	Period	Investment
Cohesion Fund	2014-2020	
	2021-2030	
ERDF	2014-2020	
	2021-2030	
National Budget	2014-2020	
	2021-2030	
Private Funds	2014-2020	72.0
	2021-2030	131.0
Total 2014-2020		72.0
Total 2021-2030		131.0

10.6.4 The locations of the Aviation, Ports and Waterways projects recommended in the Master Plan are shown on Figure 10.5

Figure 10.5 Aviation, Ports and Waterways Projects Recommended in the Master Plan

