SOUTH EAST EUROPE
Transnational Cooperation Programme

TRANSDANUBE

Programme co-funded by the EUROPEAN UNION

Sustainable Transport and Tourism along the Danube

www.transdanube.eu

PRE-FEASIBILITY STUDY FOR A MULTIMODAL NODE IN TULCEA

	WP 4 / Action 4.2
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	1.4/ 30.10.2014

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Document			Revision/Approval	
Version	**Date**	**Status**	**Date**	**Status**
1.4	30/10/2014	final		

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1. EXECUTIVE SUMMARY

This study aims to give directions about the feasibility and the possibilities of a multimodal node development that includes stations for all means of transportation from one city offering to passengers greater flexibility.

The development of the study included, according to related work packages 3, 4 and 6 of the project, communication and several consultations with the relevant and most important stakeholders: local public authorities, transport institutions and experts of the region, railway company, water and forestry management delegates, Danube Delta Biosphere Reserve Authority.

We have made several on-site visits to survey the existing routes and their current conditions and exploring the possibilities to develop Tulcea as a multimodal node, because it helps to streamline and make transport systems more efficient, contributing substantially to achieving the economic, social and environmental objectives from urban areas.

Public transport is far more effective than the use of private cars and its development massively contributes to achieving sustainability in the world's cities.

But to achieve this purpose, a public transport system must be financially convenient, fast, safe and clean.

Therefore, a new solution will have as main goal the identification of methods for the development of the most efficient multimodal node in Tulcea, to streamline the public transport system.

Financial and timing plans as well as decision making were made taking in mind the next financing of the European Union, as most of the financial background may come from this resource and frame.

2 PREAMBLE

Sustainable transport is an important part of the strategy of the European Union for the following years. Adaptation to the climate change, energy efficiency and economical trends all bring the decision-makers of the continent to support the ways of growing this part of the transport sector, in accordance with the energy and economical strategies of the European Union. In the following sections, we will count the most important programs and projects shaping this feasibility study and the area taken into consideration.

2.1 The SEE Program

The SEE Transnational Programme supports projects which have a clear transnational focus, high quality partnerships and with appropriate transferable outputs/outcomes.

The SEE Programme is fully integrated within the Objective 3 of the Cohesion Policy, strongly concentrated on the achievement of the Lisbon and Gothenburg objectives. Therefore, projects are approved which clearly consider the following aims:

- contribution to sustainable territorial development;
- leverage effect on investment, development perspectives and policy development;
- facilitation of innovation, entrepreneurship, knowledge economy and information society by concrete cooperation action and visible results (creation of new products, services, development of new markets and the improvement of human resources based on the principles of sustainability);
- contribution to integration by supporting balanced capacities for transnational territorial cooperation at all levels (systems building and governance).

The orientation on research, technology and innovation involves a significant entrepreneurial development aspect. Hence pure academic research activities cannot be supported under this programme.

Activities could include networking and exchange of information, but not as stand alone purely networking activities, as these are not supported.

Detailed information can be found on http://www.southeast-europe.net.

2.2 The TRANSDANUBE PROJECT

TRANSDANUBE is focusing on useful, applicable and transferable outputs, preparing investment and demonstrating the efficiency of the developed sustainable transport offers, methodologies and strategies decided at transnational level and of their reproducible character. Special emphasis will be given to visible outputs highlighting the benefits of soft mobility offers to the tourists and the regions.

According to the needs of the partners and the stage of the planning process, activities can be assigned to a matrix consisting of the means of transport (multimodal transport offers, bus, train, cycling and shipping/river lines) and the stage in the planning process (feasibility, realization concept and demonstration).

The regional action plans include a catalogue of feasible development measures to be implemented along with the activities of the TRANSDANUBE project. Feasibility studies verifies whether the proposed projects are well-founded and it is likely to meet the needs of its intended target groups / beneficiaries. The feasibility study for short-listed projects represents a compromise between simplicity, clarity and thoroughness. For the most suitable (in terms of their importance and reliability) projects, realization concepts (=business cases) including further information necessary for project financing (including tender documentation) were carried out.

For the development of the necessary sustainable transport offers the requirements of our target group, the tourists, always have to be taken into account. These are:

- Safe and reliable: Punctuality, no detours, port security
- Comfortable/convenience mobility/transport services taking into account specific customer needs of different target groups, e.g: accessible for the mobility impaired, easy interchanges, simple booking mobility (Ticketing and Reservation), attractive and targeted information system

- Attractive: Direct arrival and departure transport service, no long waiting times, but attractive waiting time reduction, attractive design of the infrastructure (stations, airports, transport)
- Socially equitable/affordable mobility: getting there and back again by sustainable means of transport has to be affordable in order to compete with private car usage.
- Sustainable: Environmental (CO2, ecological footprint, "carbon neutral vacation"), economic (tourism as a major source of income, at the same time decreasing subsidies for transport), as well as social (accessible for all)
- Information Availability: Mobility information already at planning a trip, on-site and at the right time and take into account modern communication media such as Internet, smartphone applications, e.g. with augmented reality information, Ipad, Google navigation, etc.
- It is an idealistic list for the development of new sustainable transport offers. Depending on the current situation and the existing possibilities minor deviations from those ideal conditions have to be accepted.
- It is the objective of the project to develop sustainable mobility along the Danube including train, bus, bike and shipping traffic to improve accessibility and facilitate the concept of sustainable tourism in the whole Danube region.

Activities being implemented by the partners differ in scope and the degree of detailedness. In order to guarantee the joint action implementation, the partners developed a common soft mobility vision, summarizing their approach for the development of sustainable mobility offers and packages in a common vision.

Based on this common vision, the partners developed or updated regional action plans for sustainable mobility development and implementation. These action plans are the guideline for action implementation in the project and beyond. The action plans are based on the State of the art analysis (including recommendations) developed in Act. 4.2 and follow the principles laid down in the common methodology (Act. 3.1).

The regional action plans represent the framework for the development of specific sustainable transport offers. Depending on the status quo of the sustainable transport system, the solutions to improve accessibility in the participating regions differ in scope and detailedness. The activities cover the whole range from basic feasibility studies to detailed business cases and demonstrations of selected pilot actions, always taking into account the commonly defined principles of sustainable mobility in the SEE region.

The experiences gained during the implementation of the activities on the transnational as well as on the regional level were summarized in manuals. These manuals guarantee the transferability of project outputs to other regions interested in further development and implementation of sustainable mobility offers.

3. TRENDS OF THE EUROPEAN UNION POLICIES ON INFRASTRUCTURE

3.1 "Connecting Europe" Mechanism

The new European Union policy on infrastructure will set a solid European transport network in all 28 member states to promote economic growth and competitiveness. This network will link the east and west and will replace the current patchwork of transport with a truly European network.

With this new infrastructure policy, EU transport funding tripled, reaching 26 billion euro for the period 2014-2020. At the same time, funding transport is focused to a new core network, strictly defined. The core network will be the backbone of transport in the single market of Europe. It will help remove bottlenecks, modernization, infrastructure and streamline cross border transport travellers and businesses across the EU. Implementation will be accelerated by the creation of nine major transport corridors that will bring together Member States and stakeholders, allowing concentration of scarce resources and results.

New central TEN-T network will be supported by a global network of regional and national routes, intended to supply the core network. The goal is to gradually by 2050, most of the citizens and businesses in Europe to be no more than 30 minutes away, as travel time, this global network.

It is expected that by 2050, that the freight will increase by 80% and passenger transport by 50%.

3.1.1. Why the actual need of a new reorientation of the strategy on infrastructure and investment?

In practice, there are five main issues to be addressed at EU level.

Firstly, because missing links, especially cross-border sections, are a major obstacle to the free movement of goods and passengers within and between Member States and between Member States and neighbouring countries.

Secondly, between and within Member States there is a considerable discrepancy in terms of quality and availability of infrastructure.

Thirdly, transport infrastructure is still fragmented. As regards making multi-modal connections, many of Europe's freight terminals, passenger stations, inland ports, seaports, airports and urban nodes is lacking in this respect. Since these nodes lack multimodal capabilities, multimodal transport potential and capacity to remove infrastructure bottlenecks and to complete missing links are underused.

Fourthly, investments in transport infrastructure should contribute to reaching the goals of reducing emissions of greenhouse gases from transport by 60%, by 2050.

And fifthly, in Member States rules and operational requirements still apply, especially in the field of interoperability, which significantly contributes to the creation of barriers and bottlenecks that affect transport infrastructure.

The new core network will connect 94 main European ports, rail and road links, 38 major airports with rail links with major cities, 15,000 km of railway lines upgraded for high-speed, 35-border projects to reduce bottlenecks.

3.1.2 New guidelines to accelerate investments

A major innovation of the new TEN-T network is the introduction of the nine central corridors in the core network. They are designed to help develop core network. Each corridor must include three modes, three Member States and two sections.

3.2 EU Strategy for the Danube Region – EUSDR

Priorities are set by the 4 main objectives of the Action Plan EUSDR:

(1) Improving connectivity Danube region by improving mobility and multi-modal transport, and by promoting culture and tourism and by inter-personal interaction;

(2) Improving the environment by conserving biodiversity, landscapes and air and soil quality; better management of environmental risks;

(3) Increasing prosperity in the Danube region through the development of information society through research, education and IT; by supporting competitiveness and development groups and fords; by investing in human resources and specialization;

(4) Strengthening the Danube region by setting-up institutions and inter-regional cooperation.

3.3 Vision Statement and Strategic Objectives for Delta region (2030)

According to the Vision Statement and Strategic Objectives for Delta region (2030), Danube Delta is a "living Delta" (an area where people live and work) with balanced, in terms of environment and community support; sustainable and healthy local economy - mainly based on nature and culture tourism; with an inclusive planning process (local, governments, businesses). The development of Tulcea as multimodal node is in line with the:

Strategic Objective 1: Preserving unique natural assets through environmental management guided by science and by giving local communities the power to become proactive guardians of this unique world heritage.

Strategic Objective 2: Develop a sustainable and green local economy, capitalizing on the advantages of the region, supported by improved services.

4 THE DESIGN OF MULTIMODAL TRANSPORT NETWORKS

Multimodal transport, using two or more modes of transport for a travel in which the transfer is necessary, seems an interesting approach to address transport accessibility in Tulcea, especially during the tourist season, and recurrent congestion impacting on the environment. Combining private transport and public transport, results in multimodal transport, a system that provides opportunities to capitalize on the strengths of various systems, thus avoiding the weaknesses of each of the forms of public transport. The requirements for such a multimodal transportation system, are high. Travellers should be aware of opportunities to change transport modes and related obvious benefits. Information about the possible variations of a journey, shall be quality information. Transfers between transport modes and services should be without long delays, setting new standards for the design of transfer nodes and temporal synchronization to result in optimal transport services. Multimodal transport systems require new organizational and financial arrangements between all actors involved. The fundamental component of a multimodal transport system consists in the integration of private transport networks, public transport and other transport services, which are part of the multimodal transport system, including transfer possibilities between these networks.

A truly multimodal transport system is wider than it might seem at first glance.

Given the complexity of transport services, networks involved, especially of the schedules departure - arrival and transfers, it is clear that accurate information is essential for the development of a multimodal transportation system. Travel personnel must have accurate information about departures, arrivals and while traveling, especially for trips that are rarely made. Transport services should be specific and should be synchronized to transfer between nodes. The transfer itself should be as short as possible, in terms of distance and time, and should preferably take place in an attractive environment. The new services are also possible through the development of personalized service, door-to-door trips, such as catalogue transport for disabled people.

It is clear that a substantial research effort is needed to determine how multimodal transport system should look like and how it can be done. What are the relevant elements in terms of passenger, what kind of organizational arrangements are needed, which is the best way to design a robust program and how to organize a comfortably transfer, made without long interruptions? Many of these frequently asked questions have one common point: it is assumed that there is a multimodal transportation network. But how should a multimodal transportation network look like and how such a network should be designed? Such projects will to be developed in future.

Most of the literature on the design of transport networks, considers only unimodal transport networks: an urban network, a regional network or a national network. Multimodal transport,

However, involves combinations between different modes of transport and services, and involves a hierarchical network on different levels, e.g. for access to most part of the trip and the way out, which are by definition highly interdependent. A key question, for example, is: What will be the impact of increased mobility on the characteristics of multimodal public transport system. Will this lead to the optimization of transport for tourists and locals? Should the locations of access to transport nodes be changed? To answer these questions for an integrated system, multimodal network design methodology must explicitly consider the relations between transport modes or services and between the levels of the network.

The main questions addressed in Tulcea's multimodal developing are:

- What is the role of multimodal mobility today and what is its future potential?
- Does is lead to an increase in the use of public transport and improves availability in Tulcea Municipality?
- What transport services must be included in a multimodal transportation system?
- The demand for transport services plays an important role in the development of multimodal transportation system?
- What factors and mechanisms determine the need to adopt different network levels for both private transport networks and line-compulsory public transport network, and how do these mechanism affect the concept of multimodal transport?
- Does multimodal transport influence the transportation network design? Will this result in diminished or denser public transport network diminished for example, will this result in a new hierarchy of the network levels, will introduce new levels of network or will only affect capacity requirements?

To answer these questions, new analytical models for different transport systems design are to be developed. The analytical framework is mainly based on economic objectives such as minimizing total costs and maximizing social welfare. In this generic framework, rules of relationships within and between different levels of the network can be various. Given these general rules, the impact of combining transport modes or services, can be established. In addition to the main means of public and private transport in the public transport network, an analysis is made, also considering the influence of multimodal transport on demand-driven transport systems, at the operational level, such as car rental and demand-response transportation services.

4.1 Social and scientific relevance

It examines the multimodal mobility systems and the design consequences in the transport network.

An evaluation of multimodal mobility system and its potential in the future is presented. It shows that although multimodal mobility system manages only 3% of all trips, it is important for accessing urban centers and suburban trips.

Multimodal transport may be more important in the future.

Multimodal transportation network design problem will be analyzed using the hierarchical transport networks. A unified framework based on well-known economic principles and description of travel behaviour. This frame is suitable for private transport and public transport services.

In addition, it allows making a systematic comparison of our levels of network structures.

The study shows that hierarchy transport networks is inevitable, because the natural efficiency, the principle in travel behaviour and economic decision-making.

When public transport services are concerned, analytic network design will consider models which allow a systematic comparison between networks and hierarchical levels in urban public transport networks, services - express, trunk-feeder systems and the systems.

Special attention is paid to influence of the pattern of demand and relationship with the hierarchy of spatial structures.

4.2 Multimodal Transport

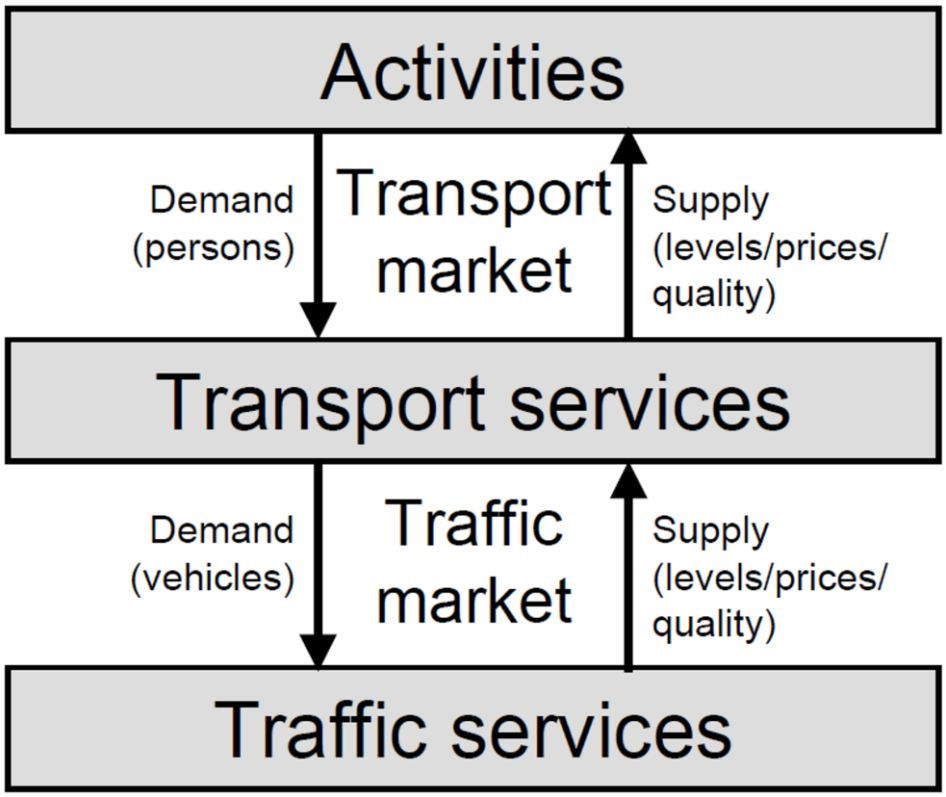
It starts from an analysis of multimodal transport phenomenon itself.

The analysis begins with the question: what is meant by multimodal transport, what are the characteristics of multimodal mobility today is the potential for a future trip enjoying multimodal system?

It has been shown that multimodal transport system is a niche on transport market, which play a substantial role for specific types of travel.

4.2.1 Multimodal transport and the layer model

The layer model provides a framework for analyzing the transport system. The base model consists of three layers, activities and transport services and traffic services and two markets between them;



(figure 2 - 1):

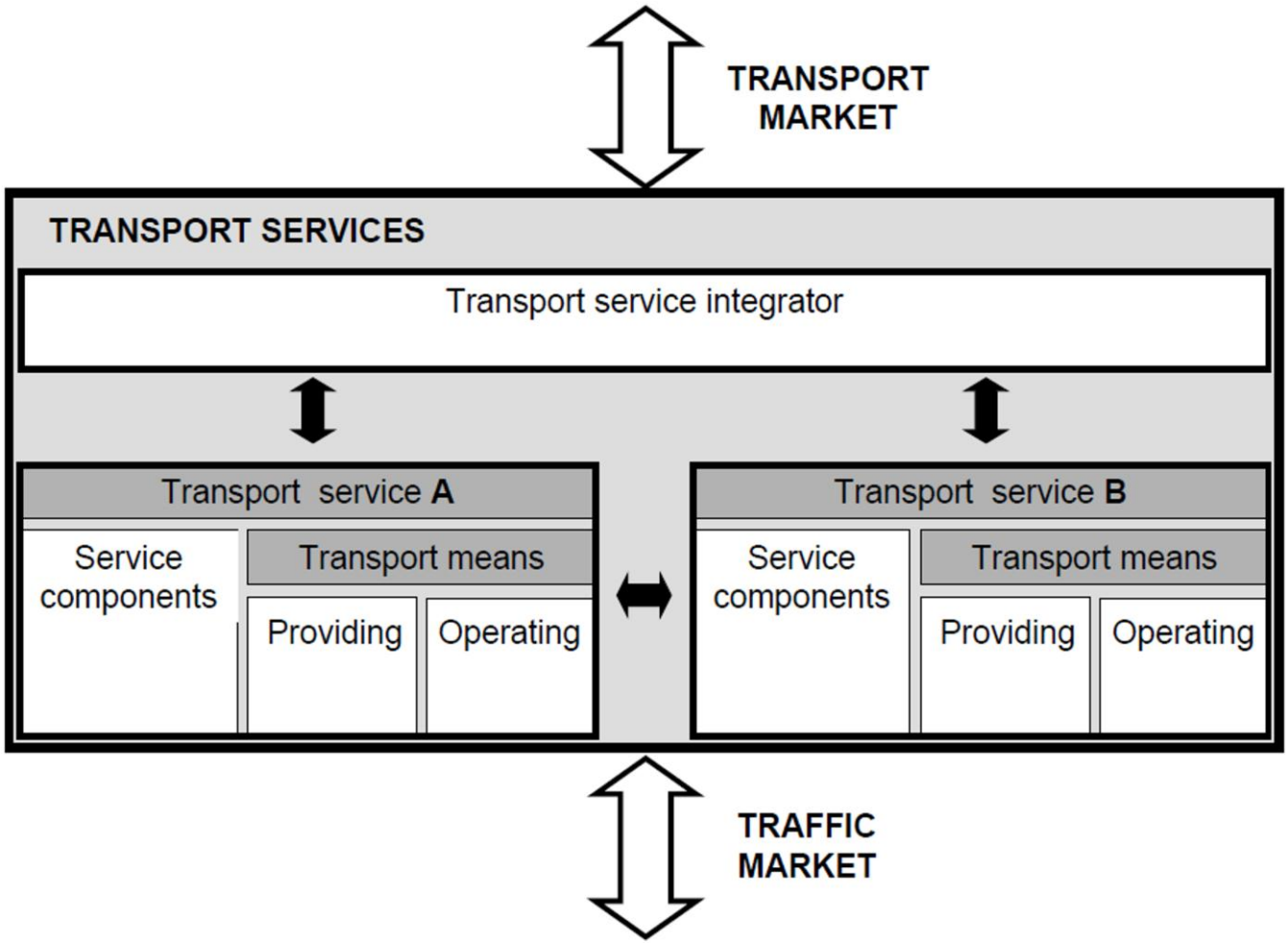
1. The transport market between the activities and transport services;
2. Traffic market between transport services and traffic services.

Multimodal transport is related to the second layer: transport services. The transport services determine the quality of the whole door-to door journey, which is influenced by the vehicle, network and service attributes. Transportation services include private transport and public transport. Differences between different transport services depend on the characteristics of all three components and are responsible for the quality of components.

In terms of public transport, the concept of a transport service is quite clear. The public transport company determines almost all of the transport service: vehicle type, network services, lines and timetables and service attributes, such as the availability of travel information, travel costs and quality of services offered. Only the available network infrastructure for network services is not primarily determined by the public transport company. If private transport such as private car, however, the concept of a transport service is less clear. The main idea is that the driver provides transportation for himself: the driver as services provider and they are one and the same person.

As public transport company, the driver determines the quality of the vehicle and service while traveling, while authorities determine the quality of the network used.

Multimodal transport means that more than one transport service is used to make a trip, the combination of private transport and public transport services or combination of public transport services. This can be illustrated if transport layer service is divided into the following items. (see figure 2-2):



The transport service integrator that decide or help to decide which transport services are used for a specific trip transportation. This could be a transport service resulting in unique transport - a unimodal trip or a combination of transport leading to multimodal trip.

Transport services are competing and working together. The role of integrator of transport is usually carried by the passenger himself, but also can be performed by a third party, such as a trip through travel agent or tour-company.

- Transport services alone or the value of the transport service such as urban transport, national or regional public transport services and private transport services as private car transport and bicycle, which determine travel time and travel costs. Transport services consist of components and transport service means that are provided and operated;
- Included services that include all components not related to transport such as public transport services: service network, tickets, and providing information. If private transport the traveller himself takes care of these issues;
- Transport means vehicles used to provide transport. It should be provided and should be operated for specific services;
- Operation of transport means, under driver care and that could be performed by each traveller himself, a fellow traveller or professional driver;

- Provision of means of transport that can be made by the passenger, a rental service or a public transport company. For a certain part of the journey providing transportation could include parking for private vehicles or so-called empty trips in case of taxi service.
- The key elements for layer transport services are thus the transport provided by integrated transport service, service components, providing transportation means. For both, unimodal and multimodal trips, different parts could perform all these elements.

  It can vary between one party, taking care of all elements and a party, different for each element.

	Integrative transport services	**Component services**	**Transport providers**	**Transport operators**
Unimodal transport Private transport (motorcars) Buses Public transport	Passengers – Tourists/ Car drivers Passengers	Passengers Car drivers Public Transport Company / Public Information / Sell points	Passengers Car drivers Public Transport Company	Passengers Car drivers Public Transport Company
Transport multimodal Private cars /bycicles	Passengers Tourism Agency	Passengers CFR Passengers Bus drivers	Passengers CFR Passengers Bus drivers	Passengers CFR Passengers Bus drivers TAXI services Rental services

Table 2-1

This more detailed description of transport services clearly shows three types of multimodal transport. First, the role of transport integrator becomes more evident. Combination of transport services requires at least very good information on transport services that are available. In addition, dedicated arrangements may be necessary to ensure a comfortable ride. Secondly, multimodal transport services for passengers requiring transfer services between different transport services, either as private or public transport services. This involves a change in the nature of the trip, which could have a negative impact on multimodal transport attractiveness.

In addition, since each transport service involves coordination between different parties, it could become a critical element. Thirdly, the service providing means of transport could be an interesting element in the case in which a passenger does not dispose of an available vehicle, especially in the most important part of the journey.

4.2.2 Definitions

Definition of multimodal transport in this vision is that two or more different ways are used for a single trip between which the traveller must make a transfer.

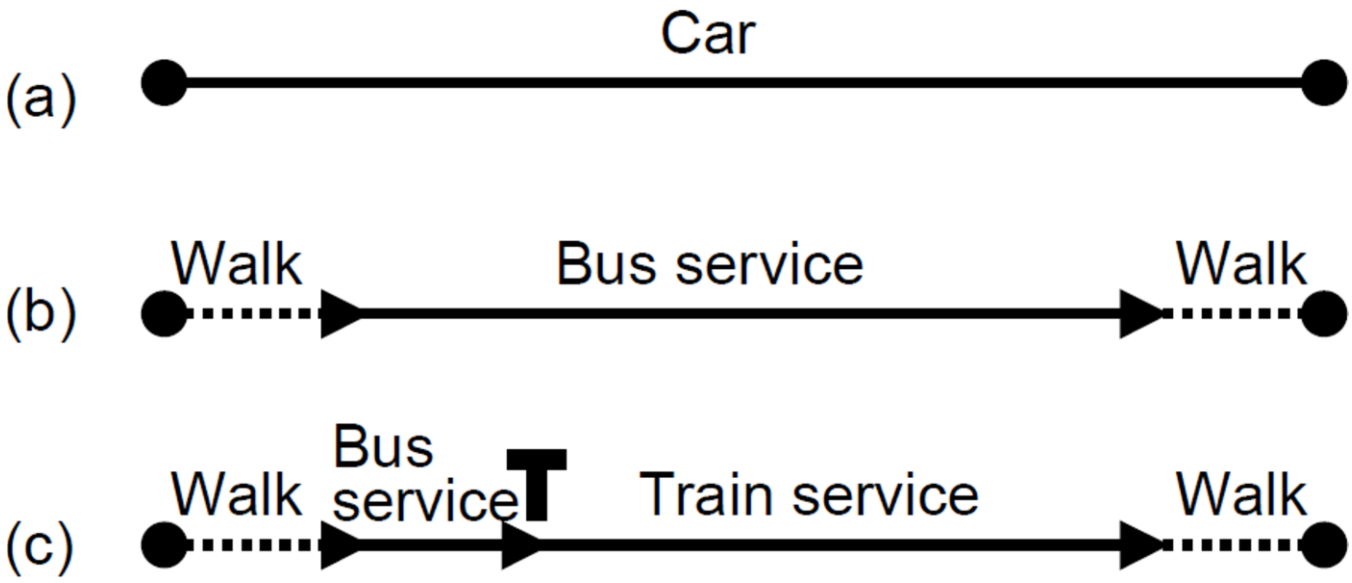


Figure 2-3

A mode may be defined by the type of vehicle or transport function.

The part of trip involving the use of a single mode is called a leg.

Typical examples are a cycling trip in which bicycle is used to access the railway or a trip in which a city bus is used for a leg between the railway station and the final destination.

The opposite of a multimodal journey is a unimodal trip so are the trips used only a single mode of transport, which is a private car, or automobile regional transport or regional train.

Although this definition seems to be pretty simple, it has the following four aspects:

1. Transfers;

2. Modes and transportation services;

3. Trips tours instead;

4. The role of walking.

Transfers are an essential part of a multimodal trip. To use two or more travel modes or to change modes at transfer nodes. However, transfers are also a common phenomenon in public transport networks unimodal definition of transfers should be more specific.

The term transfer is used for intermodal transfers.

This is the transfer where travellers change networks or modes of transport.

The inclusion of transport services is essential because it is entails that a transfer from a transport service network to another network transport services with other features is, also an intermodal transfer.

A typical example is the transfer from a regional bus for city bus.

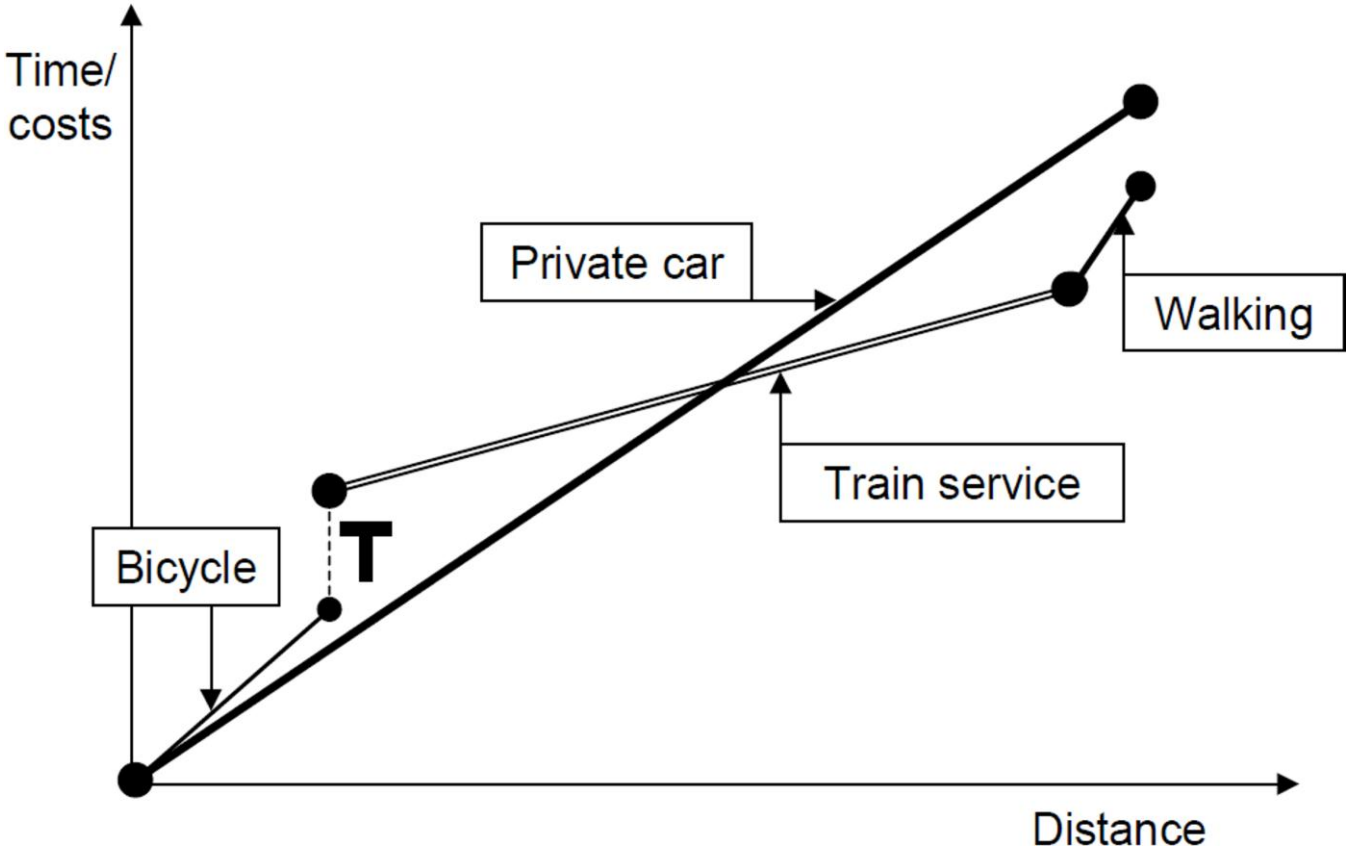
A shuttle service between transport and urban bus network is then defined as intramodal transfer.

Intermodal transfers are special because they deal with different types of networks, which are designed separately by different operators and authorities, while for intra-modal transfers, usually one of the organizations deal with these issues.

A transfer involves additional travel time and / or travel costs while the distance is not covered, the transfer itself has serious consequences for transport services included a multimodal trip. To be attractive compared to unimodal transport service, speed or cost of transport services in a multimodal trip should compensate the delay and inconvenience of transfer, as illustrated in Figure 2-4.

Multimodal transport services require fast or cheap transport services.

Modes and shipping services are terms that are closely related and both have different meanings. A typical example of use of the module is within the chosen mode, in which the traveller choose between bike, car, boat on water and public transport is modelled. In this context the type of transport chosen is usually associated with vehicle use. In the case of public transport, however, the mode is selected, the term is related to the service characteristics and not specifically to the types of vehicles, bus, water boat and train.

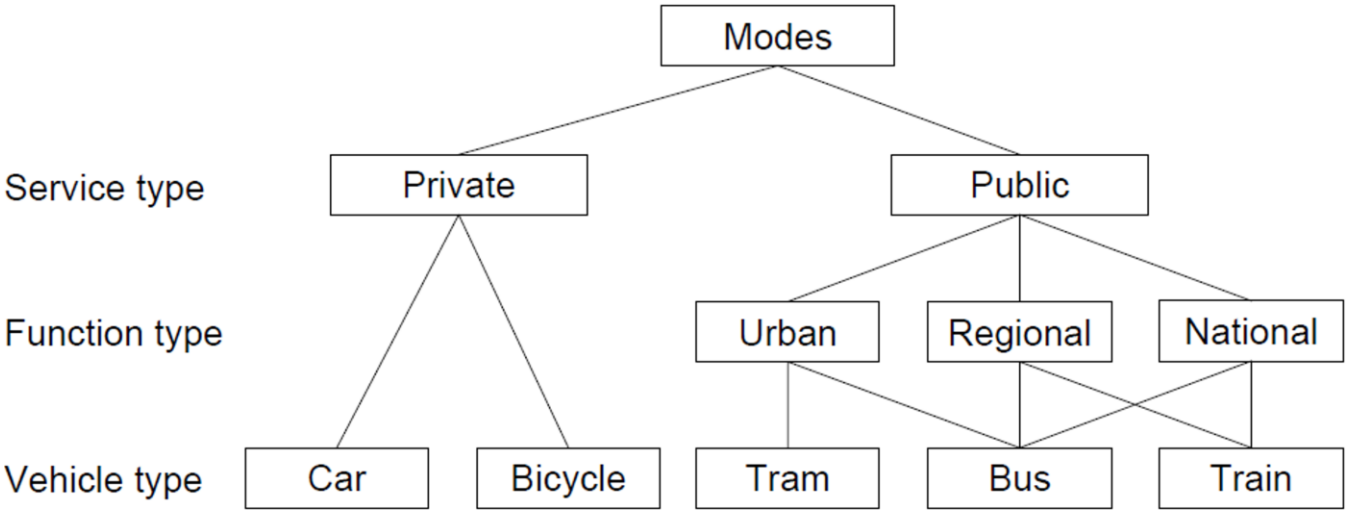


So, service modes can be distinguished, namely the distinction is made between private and public modes and vehicle modes, which may be private vehicles, such as bicycles and private cars, public buses and trams. Since multimodal transport is strongly related to transport services in terms of mode, it is usually related to service modes.

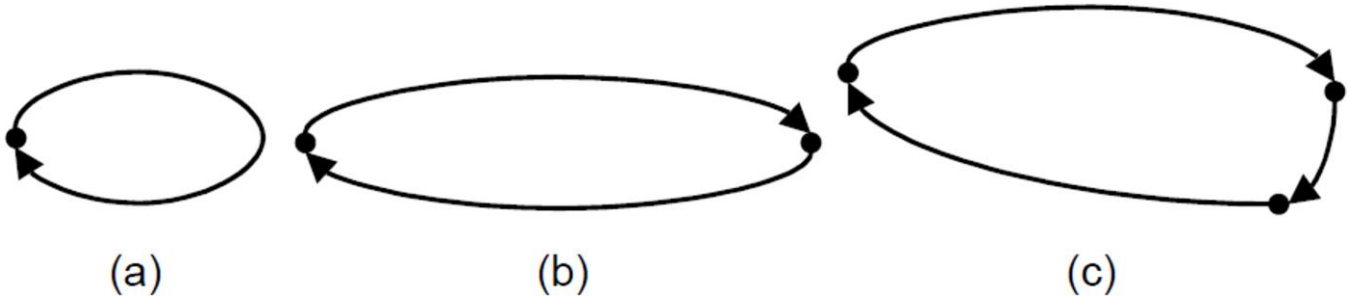
Vehicle modes are thus of secondary importance. In addition, it should be noted, that in terms of public transport there can be different types of different transport with different characteristics in terms of accessibility, speed, frequency, fares and vehicles used.

These features are often strongly related to functional network of different levels, which are public transport, regional and national networks. The multimodal transport, thus refer to transfers between private transport modes, and public transport services and between the operation of various types of public transport services.

This distinction between modes types is illustrated in Figure 2-5.



The definition of multimodal transport should ideally be based on tours (see Figure 2-6)



There is, however, a difference between a multimodal trip and a multimodal tour. A tour in which bus is used in the first trip, and in which the return trip is made as car passenger, consists of two unimodal trips.

Although such a tour might be called a multimodal tour (see Figure 2-7), it is clear from this example that a multimodal tour is unlike a multimodal trip where two or more modes are used in a single trip. Both concepts, multimodal tours and multimodal trips, have their own characteristics. Multimodal transport network design is strongly related to multimodal trips. Tours become essential in describing travellers' behaviour.

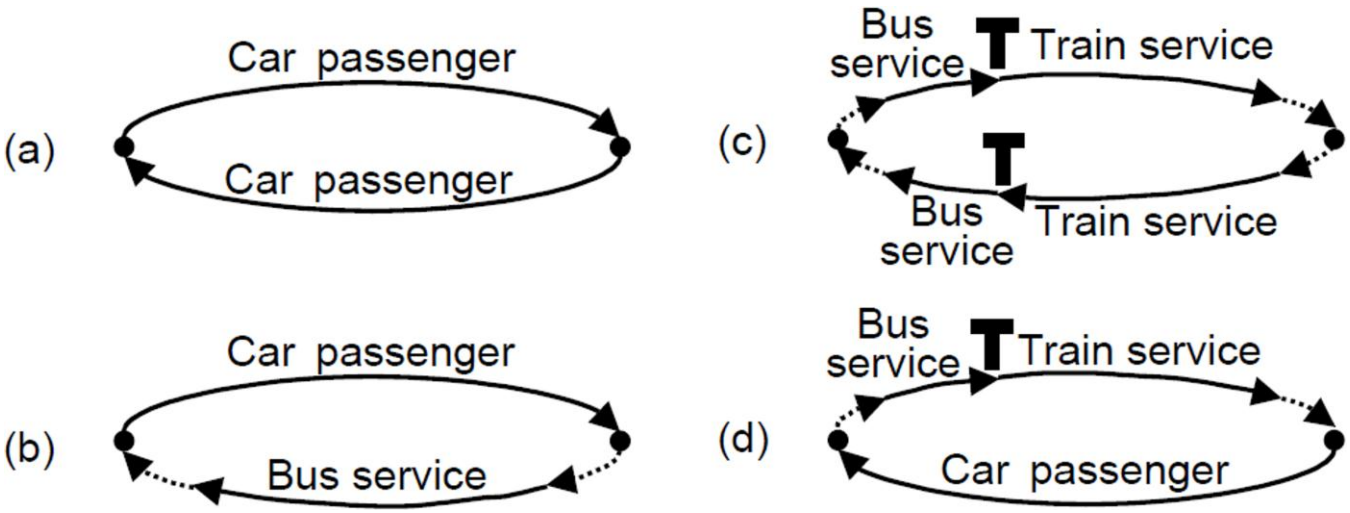


Figure 2-7: Examples of unimodal and multimodal tours:

(a) unimodal tour consisting of 2 unimodal trips

(b) multimodal tour consisting of 2 unimodal trips

(c) multimodal tour consisting of 2 multimodal trips

(d) multimodal tour consisting of a multimodal and a unimodal trip

Walking is nearly always part of a trip. This is obvious in the case travellers have to walk to and from the stops of the public transport system, but using the car also requires walking to and from the parking place, although these distances might be short. Walking can thus be considered as a universal component at the start and the end of any trip, and is therefore not considered as a separate mode in the definition of a multimodal trip.

Travellers who walk to the bus stop, ride the bus, and walk from the stop to their destination thus make a unimodal trip. In the case that a bicycle is used to access the bus system, however, the trip will be defined as a multimodal trip in which two services and two modes are used. The only exception to this rule is when walking can be seen as the main mode of the trip, that is, when walking is the mode used to cover the largest distance of the trip. This might occur if travellers use a bicycle or a car to access a shopping centre or a recreational area such as a park. The distance walked might then exceed the total distance covered by bicycle or car.

5 THE ANALYSIS OF THE LOCAL MULTIMODAL TRANSPORT DEVELOPMENT CONTEXT AT TULCEA - GATEWAY TO THE DANUBE DELTA

5.1 Infrastructure and Related Services

5.1.1 Urban transport in Tulcea

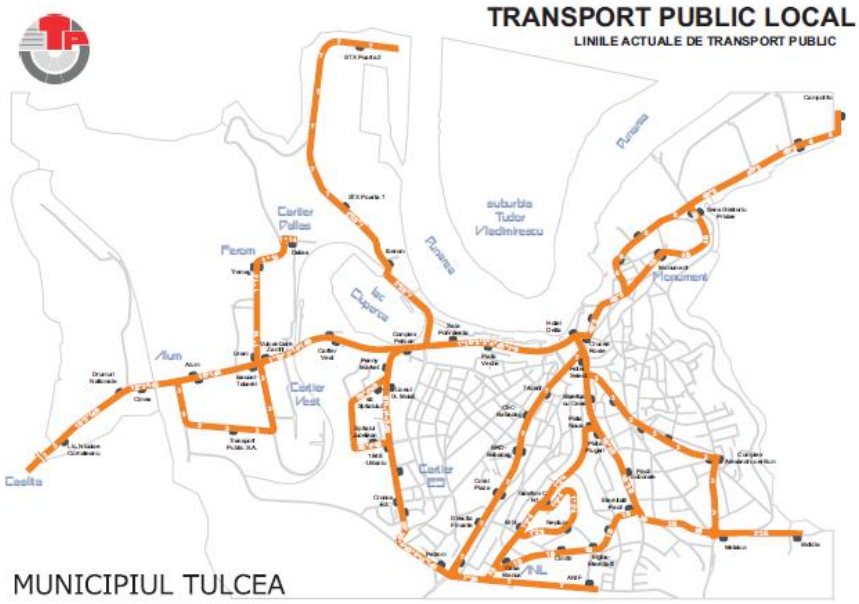
Local transport is managed by Transport Public, a public company subordinated to the Town Hall, which operates 27 small and medium-sized buses, six of which are based LP gas. Most of the buses are in use for 15 years and only some are equipped with engines that meet European emissions standards. The company provides daily transport by ship to Tudor Vladimirescu locality, situated on the other side of the Danube.

Of the 12 bus routes in the city, only very few are actually effective. Often, most of the buses carrying only a few passengers. The buses are equipped with GPS and electronic billboards in some bus stops, which display information about bus timetables, routes etc. Tulcea is one of the few cities in Romania that have implemented e-ticketing system. The number of users of public transport has decreased in recent years, and that's because people use their cars much or returned to walking.

With a power consumption of 0.45 MJ per passenger kilometer, public transport in Tulcea needs more energy than other cities in Romania. Two of the causes of high energy consumption could be inefficiency bus routes and high fuel consumption on some buses.

Figure nr. 1 Track 3

The city is under full process of modernization of the bus fleet by purchasing three new vehicles. Tulcea has no information on the moving of the inhabitants, because the city does not have complete data on how many people go daily by bus or how many people walk or go by bike or how many people commute by personal cars.



In Tulcea, there are about 30,000 cars, but the number of vehicles increases during the summer when tourists come to town, a situation that burdens the few public and private parking areas available in the city. Private transport operates similar to the growth poles in Romania, with 2.22 MJ per passenger kilometre.

Interactive map

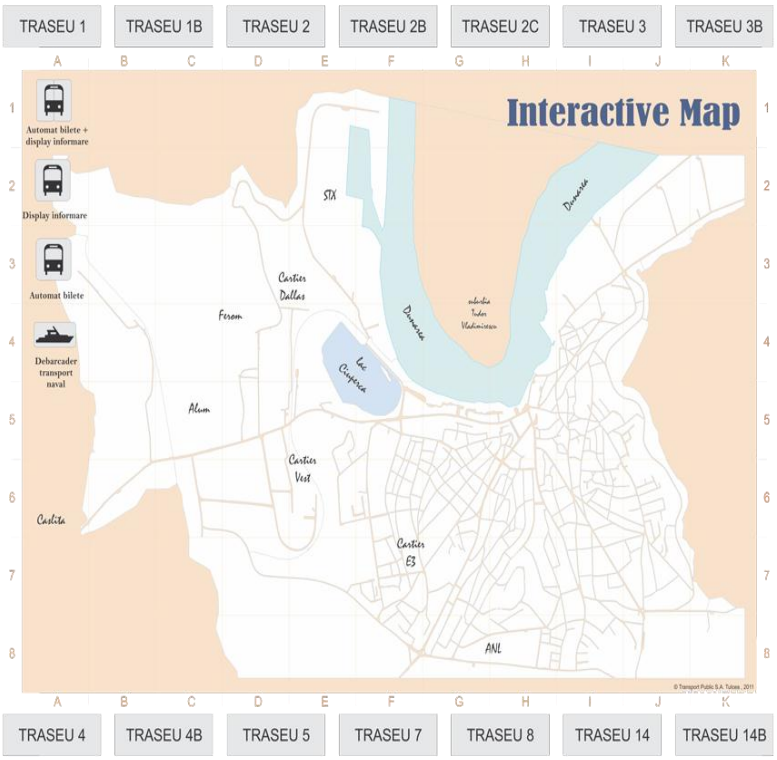


Figure nr.2 Interactive map of public transport in Tulcea city

5.1.2 Transport in Tulcea county and access /connectivity

The Delta is an area of natural beauty that has the advantage of a network of waterways able to provide a natural transport system. The area aims to promote tourism potential, fisheries and trade, and an efficient transport system is a key element in achieving this objective.

An efficient transport system should first unite with the rest of the Danube Delta, Romania and its neighbouring countries.

This should be done by a combination of improved infrastructure with an institutional environment that promotes the transport operation, multi-modal transport and trade.

Secondly, social and economic access to services essential for people living in the Delta must improve throughout the year. This can be achieved by improving infrastructure with low costs that are specific and meet the minimum requirements concerning the provision of public transport services.

Most of the study area includes the Danube Delta, with its countless waterways offer potential for a natural transport system and at the same time is a challenge to provide an efficient transport system. The population is reduced, which results in the inefficiency interventions, in terms of costs. In general, the transmission system is in poor condition, with limitations both in terms of internal accessibility and connectivity with the rest of the region and the country. This section addresses both the availability and connectivity and physical infrastructure requirements and the need for transport services. Regarding the demand for transport in the Delta, such demand will be determined by a number of key factors, including tourism, industry, fishing, bulk cargo and transport daily to residents of the Delta.

5.2 Water Transport - Bulk freight movements

Tulcea County has an important natural transportation system through three main transport channels and the other connecting channels. The main transport channel length of 175 km, which is part of the Rhine - Danube corridor from Sulina to Braila was built and improved over time. In recent years, the EU has financed the dredging works to maintain a depth of 7.5 meters to allow seagoing vessels of 30,000 DWT to use this channel to Braila. In 2012, 1,467 ships used the canal carrying about 2.4 million tonne of cargo. Most were under 6,000 DWT vessels and approximately 15% were over this ability.

Ports are in principle better placed to serve the transportation needs both in Romania and neighbouring countries. The main ports on the Danube in this area are those of Tulcea, Galati and Braila. There are development plans for these ports that have in view the improvement inter-modal connections and development of logistics platforms needed to improve road transport in the surrounding areas. There is also potential, especially in Tulcea, to develop port for recreational activities, including cruise ships and pleasure crafts. However many of these ports are in poor condition and feasibility of the idea of being rehabilitated should be studied. Table 7 contains an overview of the characteristics of these ports.

Table: Transfers in Tons (thousands) for port facilities

Port	No. Of berths	Vertical lenght/inclined quays (m)	Port transfer in tonss(thousands)		
			2010	2011	2012
Tulcea ports	41	330/2225	2.400	2.340	2.220
Galati ports	56	4675/2390	6.351	5.134	3.989
Braila	25	797/2506	2.977	3.073	2.172

5.3 Accessibility in the core Delta

The core Delta provides a valuable local waterways (616 km) for its inhabitants. Many residents have private boats and there are subsidized public services in the area, provided by SC Navrom Delta Tulcea SA, a privatized company. Tulcea County maintains a 2% share ownership. The company provides services to 256 km of waterways on five separate routes, and for many residents of the Delta is the only means of transport regularly. When waterways are frozen, these services can be non-operating, and in case of medical emergencies, the use the helicopter is the only rescue mean for some communities (there is a helicopter in Tulcea for this purpose).

	Fast craft		Regular craft		Total	
	No. of passengers		No. of passengers		No. of passengers	
Ferry line	during peack hours	Off-peack hours	during peack hours	Off-peack hours	during peack hours	Off-peack hours
Tulcea -Sulina	52272	23760	39600	54000	91872	77760
Tulcea – Sf.Gheorghe	17424	23760	26400	18000	43824	41760
Tulcea-Periprava	17424	23760	13200	9000	16896	19200
Crisan – Mila 23			16896	19200	16896	19200
Crisan-Caraorman			2904	3300	2904	3300
Total	87120	71280	990000	103500	186120	174780

The waterways offer a key "attraction" for tourists who are interested in fishing and to experience the unique environment of the Delta. There is a considerable cruise ship industry for those traveling on the Danube. The statistics for 2013 show a total of 164 vessels bringing 21,700 passengers in the area. There are a number of key constraints that will be addressed both to promote tourism and to improve local connectivity. These include dredging and cleaning the Delta waterways and providing improved berthing facilities especially in Tulcea and Sulina.

5.4 Danube Delta ship traffic chart

Navromdelta Ships Traffic Graph

VALID FROM **15t6 SEPTEMBER 2014 – 01st MAy 2015**

Depending on passenger traffic, driving SC Navrom Delta reserves the right to replace the ship with another ship graphite appropriate

No phone or on-line reservations!

TULCEA-SULINA 13:30

Ship type	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	Regular ship	Catamaran	Regular ship	Catamaran	Regular ship	Catamaran	-
Freight	M		M		M		

SULINA- TULCEA 07:00

Ship type	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	Catamaran	Regular ship	Catamaran	Regular ship	Catamaran	-	Regular ship

TULCEA-PERIPRAVA 13:30

Ship type	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	Catamaran	-	Catamaran	-	Regular ship	-	-
Freight					M		

PERIPRAVA -TULCEA 06:00

Ship type	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	-	Catamaran		Catamaran	-	-	Regular ship

Ship type	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	Catamaran	-	Regular ship		Catamaran	-	-
Freight							

TULCEA-Sf.GHEORGHE 13:30

Sf.GHEORGHE- TULCEA 07:00

Freight	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday	Sunday
	-	Catamaran	-	Regular ship			Catamaran

CRISAN- CARORMAN and CRISAN - MILA 23

16:30 link from Regular ship from Tulcea to Crisan or

15:30 Link from semifast ship Catamaran from Tulcea to Crisan

Monday	Tuesday	Wednesday	Thrusday	Friday		

CARAORMAN-CRISAN; MILA 23- CRISAN

DEPARTURE HRS 06:30

	Tuesday	Wednesday	Thrusday	Friday		SUNDAY

Depending on passenger traffic, the staff of SC Navrom Delta reserves the right to replace the ship on the schedule with another appropriate ship

- **There is no phone or online calls reservation!**
- There is no phone or online calls reservation!
- Tickets are available from ticket on departure day, starting at 11:00
- Semi-fast vessels transporting goods not allowed
- Individual baggage exceeding 30kg / person is charged with 0,50lei / kg + VAT
- From 05/01/2013 freight rate is 0.50 euro / kg + VAT and freight loading rate is 0.50 euro / kg + VAT

5.5 Road transport

Within this section, the Delta's connection requirements with the rest of Romania and improving the accessibility in the Delta were analyzed. The length of the road network in Tulcea County is 1330 km, of which 325 km are national roads, 610 km are county roads and 395 km are earth roads. There is no accurate data available on their condition, but the general consensus is that the national network is in satisfactory condition and lower levels of the network (county and municipal roads) are in disrepair. Currently Tulcea County has a number of road links that provide a reasonable connection to the rest of the country. There are plans to improve this connection, by modernizing key link (Tulcea and Constanta road-Braila / Galati) and by upgrading the new transport corridor that would facilitate the international movement to neighbouring European countries (9 Rhine - Danube Corridor). A key constraint to ensure connection to the Delta area is the lack of permanent crossings over the Danube. Currently there are two permanent checkpoints at Harsova and Cernavoda – in the West -South West of Tulcea County and a link between Constanta and Ialomita counties with the Bucharest-Constanta motorway, but there are no crossing points in the North West part of the county for links to Braila and Galati counties. Currently, there are ongoing assessments regarding the feasibility of either a bridge to Braila, or a tunnel to Galati.

In the Delta's core there are some significant constraints on the construction of roads, both because of technological difficulties and because of the economic and environmental constraints. Residents have expressed the need for accessibility in all weather conditions to economic and social services in Tulcea. This must be balanced against environmental and financial feasibility of such projects.

5.6 Local and regional bus traffic charts

Minibus routes Braila – Tulcea ("Cozandra Com", Tel: +40749060384, departure from Braila Bus Station, arrival at Faleza Bus Station, 28A Portului Street, Tulcea. Course: Braila, Macin, Greci, Cerna, Horia, Tulcea):

- Daily - departure from Braila at 09:30 – arrival at Tulcea at 11:48
- Daily - departure from Braila at 11:00 – arrival at Tulcea at 13:48
- Daily - departure from Braila at 16:30 – arrival at Tulcea at 18:48
- Daily - departure from Braila at 17:30 – arrival at Tulcea at 19:48

Minibus routes Braila – Tulcea ("Trace Trans" Corporation, Tel: +40239619220 departure from "Atlas" Bus Station - 10 Siretului Street, Braila, arrival at Faleza Bus Station, 28A Portului Street, Tulcea. Course: Braila, Macin, Greci, Cerna, Horia, Tulcea):

- Daily - departure from Braila at 10:23 – arrival at Tulcea at 13:04

Minibus routes Tulcea - Braila ("Cozandra Com", Tel: +40749060384, departure from "Faleza" Bus Station, 28A Portului Street, Tulcea, arrival at Braila Bus Station. Course: Tulcea, Horia, Cerna, Greci, Macin, Braila)

- Daily - departure from Tulcea at 06:30 – arrival at Braila at 08:48
- Daily - departure from Tulcea at 08:00 – arrival at Braila at 10:18
- Daily - departure from Tulcea at 13:00 – arrival at Braila at 15:18
- Daily - departure from Tulcea at 14:00 – arrival at Braila at 16:18

Minibus routes Tulcea - Braila (Trace Trans Corporation, Tel: +40722602305 departure from Faleza Bus Station, 28A Portului Street, Tulcea, arrival at Autogara Atlas - Str. Siretului nr.10, Braila. Course: Tulcea, Horia, Cerna, Greci, Macin, Braila)

- Daily - departure from Tulcea at 09:45 – arrival at Braila at 12:36

Minibus routes Galati – Tulcea ("Trace Trans" Corporation, Tel: +40722602305 departure from "Dumitru" Bus Station, 58 Vultur Street, Galati, Tel: +40236412683, arrival at "Faleza" Bus Station, 28A Portului Street, Tulcea. Course: Galati, IC Bratianu, Garvan, Luncavita, Isaccea, Tulcea)

- Daily - departure from Galati at 16:40 – arrival at Tulcea at 18:30

Ferry crossing from Galati to IC Bratianu is possible each half hour, daily between 06:00 – 22:00 (1.5 lei/person) and from IC Bratianu to Tulcea there are minibus routes every hour, daily between 06:20 and 19:20, on the route IC Bratianu, Garvan, Luncavita, Isaccea, Tulcea. The distance between IC Bratianu and Tulcea is covered in 2 hours.

Minibus routes Tulcea - Galati ("Trace Trans" Corporation, Tel: +40722602305 departure from "Faleza" Bus Station, 28A Portului Street, Tulcea, arrival at Dumitru Bus Station, Str. Vultur Street, Galati, Tel: +40236412683. Course: Tulcea, Isaccea, Luncavita, Garvan, IC Bratianu, Galati)

- Daily - departure from Tulcea at 12:00 – arrival at Galati at 14:00

Buses from Expres Transport Macin Bus Station also travel to Carcaliu, Constanta, Focsani, I. C. Bratianu, Smardan, Ostrov, Rachelu, Vacareni, Tulcea etc.

Bucharest – Tulcea routes

Minibus routes:

- Augustina Bus Station

242A Calea Plevnei (across from Carrefour Orhideea), Bucharest, Romania

Tel: +4-0743-334.840 Schedule: 06:30 - 19:00

Departures		**Arrivals**	
Time	**To**	**From**	**Time**
07:00	Tulcea	Tulcea	**07:30**
09:00	Tulcea	Tulcea	**09:30**
11:00	Tulcea	Tulcea	**11:30**
12:30	Tulcea	Tulcea	**13:30**
14:00	Tulcea	Tulcea	**16:30**
16:00	Tulcea	Tulcea	**18:30**
17:30	Tulcea	Tulcea	**20:00**
19:00	Tulcea	Tulcea	**21:30**

TULCEA – BUCHAREST

Departures:
Departure times: 03:00; 05:00; 07:00; 09:00; 12:00; 14:00; 15:30; 17:00
Address: Tulcea Bus Station, Agency telephone: 0743.334.827, Tulcea Bus Station: telephone: 0240/ 513304
Price: 60 lei

Bucharest – Galati

Minibus routes Bucharest – Galati (GSM TRAM, Tel: +4-0743-333.011, +4-0743.333.099 departure from GSM Trans Bus Station (Baldovin Parcalabul)**,** arrival at Dumitru Bus Station, **58 Vultur Street, Galati,** Tel: +40236412683.

Departures		Arrivals	
Time	**To**	**From**	**Time**
07:00	Tulcea	Tulcea	**07:30**
09:00	Tulcea	Tulcea	**09:30**
11:00	Tulcea	Tulcea	**11:30**
12:30	Tulcea	Tulcea	**13:30**
14:00	Tulcea	Tulcea	**16:30**
16:00	Tulcea	Tulcea	**18:30**
17:30	Tulcea	Tulcea	**20:00**
19:00	Tulcea	Tulcea	**21:30**

Microbus routes linking localities in the county and also to Bucharest, Constanta and Braila regularly travel on national roads.

Buses from Expres Transport Macin Bus Station also travel to Carcaliu, Constanta, Focsani, I. C. Bratianu, Smardan, Ostrov, Rachelu, Vacareni, Tulcea etc.

5.7 Railway transport

There is a large stock of railway investment but the speed and frequency discourages its use. There is a simple non-electrified railway from Tulcea to the main railway Bucharest – Constanta through Medgidia, which provides the main railway link to the Delta. Currently, the travel times from Bucharest that includes the change of the electric locomotive with a diesel one in Medgidia, are much higher than on the road (about 5.5 to 3.5 hours by road). This makes it less attractive rail as a mode of transport, but if speed and frequency of the service would improve, this would provide an attractive alternative.

5.8 Romanian Railway Company - train traffic chart

Train	Bucharest N - Tulcea	Time	Time	Arrival
P 13961	Bucharest N	01:35	5:26	Medgidia
P 8653	Medgidia	7:21	10:40	Tulcea Freight
IC 583	Bucharest N	13:20	16:40	Medgidia
P 8655	Medgidia	16:44	19:56	Tulcea Freight
Train	Tulcea - Bucharest N	Time	Time	Arrival
IC 586	Tulcea City	05:39	10:26	Bucharest N
IC 588	Tulcea City	14:20	19:02	Bucharest N

5.9 Air transport

Tulcea airport currently handles very few passengers (2,000 per year), all of them coming using the charter services. Airport management believes there are opportunities to support cruise industry in the Delta, but airlines companies are reluctant at the moment to use the airport parking because of limited space for parking and return of the aircraft. For this reason, there are currently no scheduled flights. The airport seeks improvement in solving this problem, which will probably be enough to prepare the airport for scheduled flights.

Beginning with the March 2014, there is an airport at 15 km from Tulcea in Cataloi, Danube Delta airport.

Departures	Arrivals	Take-off	Landings	Flying days
Bucharest	Tulcea	10:00	10:35	Su
Bucharest	Tulcea	11:00	11:35	Tu , Fr
Tulcea	Bucharest	18:00	18:30	Su
Tulcea	Bucharest	18:30	19:00	Tu, Fr

6 KEY ENTITIES IN THE SECTOR AND THEIR CAPABILITY

Responsibilities related to network and its operation are generally clear. There are several agencies responsible for transportation network and services sector in the Delta, and the most important are highlighted in the table below. Based on initial assessment, key responsibilities related to the operation of the network are generally clear and agencies have the necessary qualifications to perform their functions. However, especially for road network, there is a lack of resources for proper maintenance of the network, and this is reflected in lower quality. There is also evidence that some of the waterways of the Delta do not have a proper maintenance, particularly in relation to periodic dredging works.

Many of the carriers whether in ports or transportation services are recently privatized companies; some, in a small share owned Tulcea County Administration. The extent to which these companies provide efficient services will be studied and also the scope for competition in service concession. For example, river transport company is a private company receiving a grant for the operation, but at this stage it is unclear whether this grant is received on a competitive basis.

Main Sector Entities responsible for managing the transport network

Entity responsible	Responsibilities
Roads	
National Company of Motorways and National Roads in Romania (CNADNR)	Construction and maintenance of national roads
Tulcea County	Construction and maintenance of national roads
Commmunes	Construction and maintenance of national roads
Inland Waterway	
River Administration of the Lower Danube Galati	Navigation and dredging on fregiht channel
Danube Delta Biosphere Reserve Authority	Dredging and navigation in the Reserve
National Company Maritime Ports Administration Galati on the Danube	Tulcea/Braila/Galati ports
SC Navrom Delta SA Tulcea	Opereaza servicii publice de transport cu bacul
Air transport	
Tulcea County Council	Manages Tulcea airport
Railway transport	Operates through CFR Infrastructure, National Society of Railway Freight Transport "CFR Marfa",, CFR Calatori”

7 SWOT ANALYSIS

SWOT Analysis Transport in Tulcea	
Strengths	**Weaknesses**
Destinations by natural areas and outdoor activities will generate demand for transport; - Natural system of waterways that can form the basis for the transportation network - Existing shipping channel Sulina - Tulcea is part of Rhine – Danube Corridor 9; seagoing vessels may result in Braila - There is a network of ports in the region, with significant capacity well studied.	Low population densities limit constant demand for transport to / in the Delta - Ensure ground infrastructure is expensive because of land and low population to be served - Accessibility Delta area is poor and isolated communities can be during winter season - Lack of crossing points over the Danube reduce connectivity with the rest of Romania and neighboring countries - The local road network is in poor condition and require substantial upgrades - Poor condition of limited ports landing operations
Opportunities	**Threats**
Tulcea port provides an ideal environment for the development of multi-modal transport - Reduced travel times by Delta will stimulate growth in tourism - Some infrastructure improvements can be achieved at relatively low cost. For example, low-cost roads in the Delta to improve accessibility and increase parking space at the airport for aircraft - Both the tourism industry and the logistics are suitable for private sector participation	Competition with Constanta is fierce as the seaport enjoys better access, airport and railway connections - The population is declining in the Delta and qualified persons seeking employment elsewhere - Competition is intense national financial resources and lack of an integrated plan for transport in the delta could limit access to these resources - Role of Sulina in shipping will become increasingly marginalized with the free movement of EU vessels.

8 ISSUES / CONSTRAINTS

There are challenges in providing efficient transport in the Delta because of the relatively low population density and the natural environment. These issues limit the economic efficiency of any investment, since the cost interventions can be large compared to the number of people served. However, the location of the Delta, with the Danube as a natural transport system, makes it one of the attractive potential for regional trade and certainly attractive for tourists.

Transport development should be based on a vision for the Delta. This vision must take into account both the transport problems in the Delta and connections to the rest of Romania and the region. There is certainly a long list of proposed investments for Delta by TCC will be evaluated based on timely strategic vision for the Delta. Any investment at national level will be incorporated into the General Transport Master Plan, which is currently developed by the Ministry of Transport.

Also, funding for the sector will be addressed, both in terms of new investments and maintenance of existing networks. Both will be increased to develop a network of long-term sustainable transport. To successfully use EU funds is important that the investment is part of a coherent development strategy that they can be implemented. County Council should consider attracting private

funds, particularly tourism related activities (eg. Improved berthing facilities) and ports sector (transactions).

8.1 Potential regulatory policies and issues to be addressed

There is an opportunity of involving on a larger scale the private sector in transport sector operations (eg. ports, ferries, multi-modal operations). We can also take into consideration the public-private partnerships (PPP) for certain types of infrastructure, as well as marinas for private boats and tourism. To realize the potential of the private sector, there should be a county-wide policy to promote private sector participation and to ensure proper regulatory framework.

There are some issues related to property and land infrastructure that will be addressed to ensure accessibility to the Delta. For example, some dams that are currently used by locals for road transport are privately owned or held by entities not responsible for providing transportation. It will also be important to ensure good coordination between the various stakeholders, which is particularly important in addressing multi-modal transport operations.

8.2 Conclusions

There are two major objectives for transport development in the area:

Firstly, the transportation systems that connect effectively Tulcea county with the rest of Romania and neighbouring countries should be modernized. These transport systems will require improved infrastructure and promotion of transport operations, multi-modal transport and trade. This is the objective of "connectivity".

Secondly, for people living in the Delta, it must be improved the accessibility to the important social and economic services. This can be achieved through low-cost infrastructure improvements that and minimum provision of public transport services. That is the objective of "accessibility".

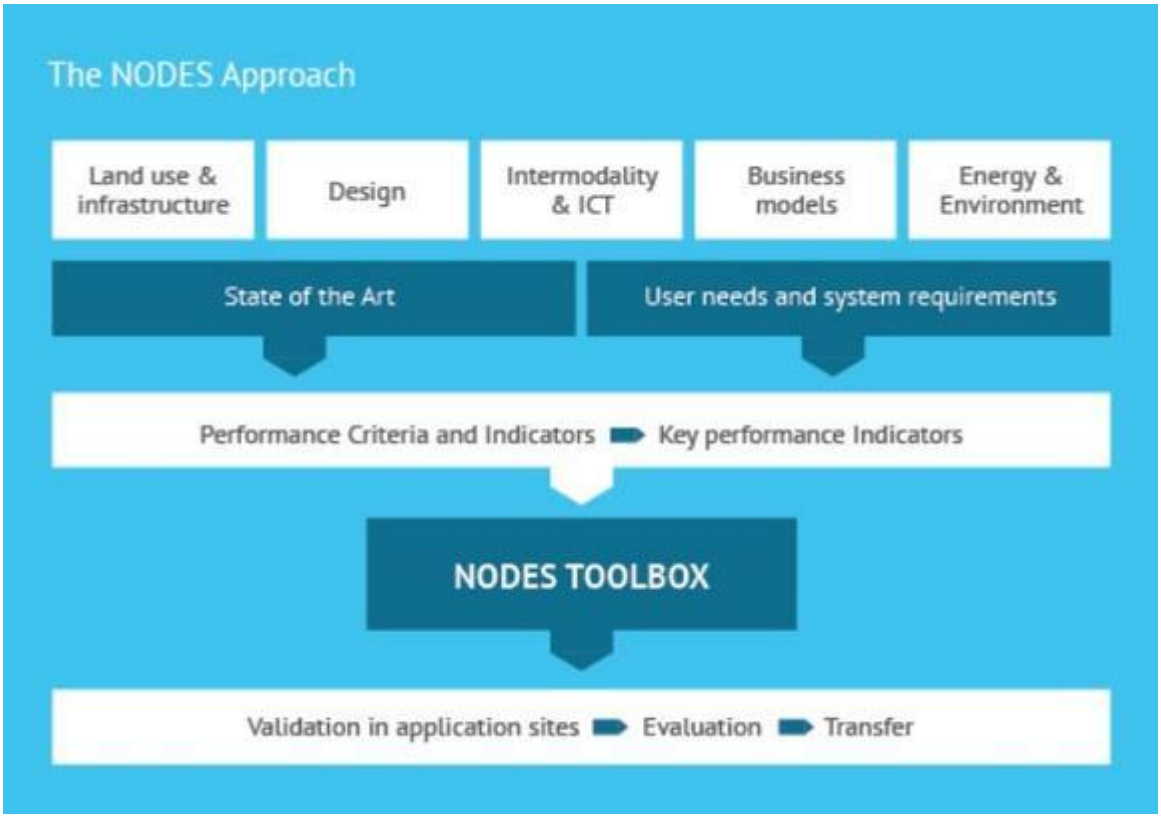
Both new investment and maintenance and management of existing infrastructure must be addressed. Identifying sources of funding will be a key element and in this respect, opportunities for private sector funding for certain types of infrastructure should be explored. The establishment of specific sector institutions and promoting ways of planning approaches will also be important.

9 DEVELOPMENT OF THE TULCEA CITY AS MULTIMODAL NODE

The concept of multimodal transport, multimodal mobility today and the future potential of multimodal mobility, must be developed.

Since multimodal transport is mostly related with transport services, the description of this layer is extended by distinguishing the following elements:

- Transport service integrator;
- Transport service, consisting of service components and transport means;
- Transport means, which have to be provided for and which have to be operated.



The main characteristic of multimodal transport node of Tulcea is that more than one transport service is used for a trip and that transfers between transport services are thus an essential element of multimodal transport. The presence of one or more transfers sets standards for the transport services used in a trip: the disutility of a transfer should be compensated for by the characteristics of main transport service used.

The main factors that determine a multimodal node of Tulcea trip' making are:

• Trip length, multimodal transport nod is more suited for longer trips;

• Destination area type, multimodal trips are oriented to the Danube Delta Biosphere Reserve, Macin Mountains National Parc, Black Sea - Constanta, Galati, Braila and Bucharest the capital city.

• Trip purpose, more than 50% of the trips have work or education as a trip purpose.

For trips in which these factors are combined the share of multimodal mobility increases substantially.

For interurban trips to and from the main cities the share of multimodal transport is about 20%.

Multimodal transport thus already fills the roles that were expected.

Multimodal transport concerns long distance trips between 10 and 100 kilometres and is especially important for trips to the main cities and to the protected area like DDBR and MMNA.PIT

Given the outcomes of a variety of analyses, the main conclusion is that multimodal transport node of Tulcea , does not require significant restructuring of transport networks.

The explanation for this conclusion is that properly structured transport networks, that is private transport and multilevel line-bound public transport networks, on themselves are already well suited for serving multimodal travel demand. The emphasis in this conclusion is on the word properly.

Clear rules have been established that determine hierarchy in both private transport and line-bound public transport networks, and thus also in multimodal transport networks. Ignoring these basic rules leads to poorer performance of all networks involved.

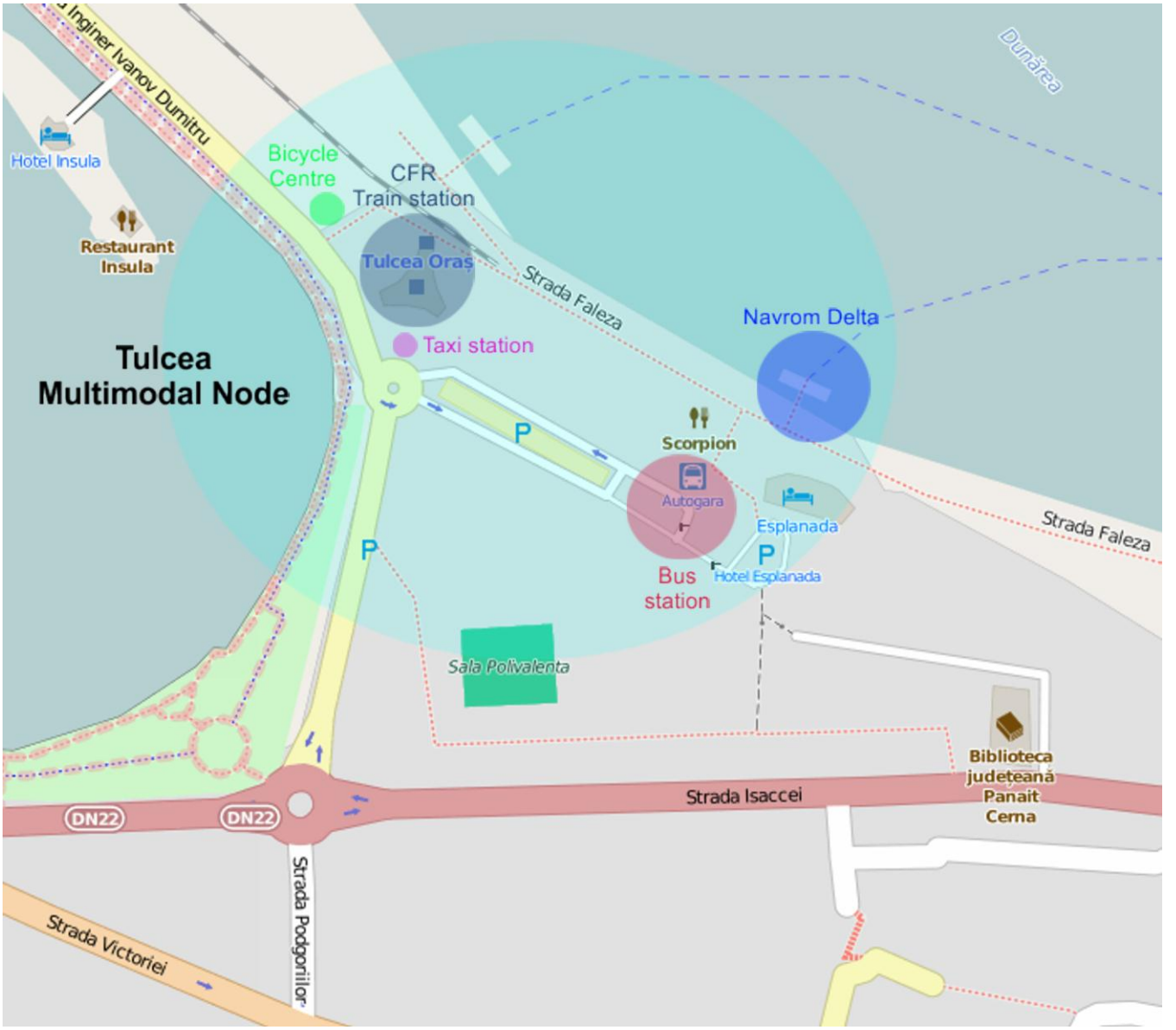
Furthermore, the level of demand for multimodal transport nod is now, and is likely to remain, too small to justify changes in unimodal transport network structures.

The conclusion is that an efficient multimodal transport system requires properly designed transport networks, reduces the multimodal network design problem to the allocation of transfer nodes.

The attractiveness of multimodal travel thus depends more on the quality of the transport services offered than on newly designed transport networks.

The quality of the transfer nodes, the transport services themselves, the availability of information and all kinds of financial aspects are decisive. Stimulating multimodal mobility does not require a new grand design for the transport system, but benefits more from doing little things properly.

Multimodal transport is essential for the accessibility of Tulcea centre and for the profitability of higher-level public transport services. Actors who are responsible for these two issues, should take the lead in the development of multimodal transport services and facilities.


Ingineer Ivanov Dumitru
Dunărea
Hotel Insula
Bicycle Centre
CFR Train station
Restaurant Insula
Tulcea Oras
Strada Faleza
Navrom Delta
Taxi station
Tulcea Multimodal Node
P
Scorpion
Autogara
Esplanada
Strada Faleza
P
Bus station
Hotel Esplanada
Sala Polivalenta
Biblioteca judeteană Panait Cerna
DN22
DN22
Strada Isaccei
Strada Podgoriilor
Strada Victoriei

9.1INVESTIGATION OF POSSIBLE SOLUTIONS

9.1.1.Tulcea communication paths

These paths provide the full range of transport (road, rail, river, sea, air). Currently, Tulcea county has a number of road links that provide reasonable access to and from the rest of the country. There are plans to improve such access by upgrading key corridors (such as road Tulcea-Constanta - Braila/Galati) and by opening new corridors that would facilitate the international movement and from the neighbouring European countries (the so-called Aisle 9 Rhine - Danube).

We have taken the first steps in elaborating the project which would connect the historic Moldova to the Seaside, objective discussed in the Lower Danube Euroregion, between partners from Braila - Galati - Tulcea. Achieving this regional project - in order to ensure the sustainable development of Tulcea county, and to enhance the potential and its natural resources – represents a growth opportunity and access to important corridors of road and inland waterway. Following an analysis in terms of socio-economic situation both in Tulcea County and neighbouring counties (Galati, Braila and Constanta) it has been found that the proposed measures would also support solving the needs of those counties, providing the development of the entire region. The entire South-East Region of Romania may become a potential area of high traffic, both for goods and for people.

Regarding the wetlands in the area including Delta area, there are significant constraints for the construction of roads, both because of physical difficulties and because of economic and environmental constraints. Residents have expressed the need for accessibility in terms of economic and social services in the city of Tulcea, regardless of season. This must be balanced against environmental and financial feasibility of such projects.

A key constraint in achieving improved connections in the Danube Delta is the lack of permanent crossings over the Danube. Currently, there are two crossing points available to Harsova and Cernavoda in West - South West of the county for the connection with Constanta county and the Bucharest-Constanta motorway, but not crossing points in North West County for links to Braila and Galati. In this moment, there are ongoing studies exploring the feasibility of a bridge to Braila, or a tunnel to Galati.

9.1.2Improving the road network

According to information provided by the County Council - Investment, European Funds and Project Management Department, at county level, transportation network length totalizing 1,327 km of national, county and municipal roads, of which 527 km are upgraded. The total length of public roads in the years 2010-2013 reached 1,327 km in comparison to 1,335 km between 2008 -2010 thanks to the decreasing number of roads from 327 km in 2010 to 323 km in 2013, but also to decreasing the length of county and municipal roads of 1,008 km in 2008-2010, at 1,004 km in between 2010-2013. This change made public road density per 100 km^2 of territory to decrease from 15.7 kilometers in 2008 to 15.6 km in 2013.

9.1.3Improving the Railway Network

As regards railways, in Tulcea county, there are standard gauge lines. At the moment, the travel times from Bucharest that includes the change of the electric locomotive with a diesel one in Medgidia, are much higher than on the road (about 5.5 to 3.5 hours by road). This makes it less attractive rail as a mode of transport, but if speed and frequency of the service would improve, this would provide an attractive alternative.

Railway Company "CFR" SA intends to include in its strategy of development of modernization and electrification works aiming 812 Medgidia - Tulcea railway line in order to speed up the movement of trains and increasing the maximum tonnage.

The total length of railway network at Tulcea county level is 103 km non-electrified lines. The main itinerary is: Tulcea – Medgidia fast train; the most important stations in the county are: Tulcea, Babadag, Baia Dobrogea.

9.1.4Maintaining the network of waterways to standards imposed by regulations

On the inland waterways, Romania has a total of 30 ports and loading centers. Of these, those which are part of the TEN network are Braila and Galati ports, Tulcea and Sulina being river-sea ports.

Tulcea County has an important transport system through the main transport channels and connection waterways. The main transport channel of 175 km, which is part of the Rhine - Danube corridor from Sulina to Braila was built and improved over time. Lately, the European Union financed the dredging works to maintain a depth of 7.5 meters, enabling maritime vessels of 30,000 DWT to use this channel to Braila. In 2012, 1,467 ships used the canal, carrying about 2.4 million tons of cargo. Most vessels were under 6,000 DWT, and approximately 15% were over that weight.

The main ports in Tulcea Municipality are: IAMC port, the industrial port, the commercial port and the passenger port, as follows:

- IAMC is located at km 37 on the right bank of the Danube and is intended as ballast and quarry products port,

- the industrial port is located at km 39 on the right bank of the Danube,

- the commercial Port is located at km 38 on the right bank of the Danube,

- the passenger port is located 38-39 km on the right bank of the Danube and is intended to carry passengers to and from Galati, Chilia, Sulina, Sf. Gheorghe, Ismail (Ukraine).

Water transport of passengers and freight is extremely important in the county's economy, if we consider that more than half of its area is covered by the Danube Delta, an area particularly important in terms of tourism potential. Unfortunately, the majority of vessels operating in the county are obsolete ships, built in the 1970s and intensive fuels consumers ("Banat", "VRANCEA", "Moldova" and "MEHEDINTI" of 300 passengers, "MIRCESTI" and "MARAMURES "of 150 people," COTNARI "60 seats and" FIENI "30 seats) with a low speed and low maneuverability. They are owned by SC NAVROM Tulcea SA, which acquired two modern catamarans, of 200 seats, operating on Tulcea-Sulina, Tulcea - Chilia, Tulcea - Periprava Tulcea and Sf. Gheorghe route, every two days. There are also several motor boats of 60 seats, which travel daily to Sulina, Chilia and Sf. Gheorghe, owned by three commercial entities: SC BASNAV TUR SRL, SC TOTAL SRL and SC DIANA SHIPPING SRL.

Possibilities shipping for Tulcea county:

Regular routes

Tulcea – Sulina – (3 h)

Tulcea – Chilia Veche – Periprava (4,50 h)

Tulcea – Sfantu Gheorghe (6h)

Fast ships

Tulcea – Sulina – (1,50 h)

Tulcea – Sfantu Gheorghe (2h).

9.1.5Improving the Airline network

Although Tulcea Airport has potential in terms of the response to the increasing demand aiming at increasing tourist traffic in the Danube Delta (88,000 tourists were accommodated in tourist facilities in 2012) until 2014 it functioned only as airport for scheduled flights.

The 'Delta' Tulcea Airport is located 3 km south of Cataloi and approximately 15 km of Tulcea. The terminal has a capacity of 120 passengers per hour and VIP room for 20 passengers.

Tulcea County Council carries out important modernization investments, supporting Autonomous Administration in accessing European funds to be used to extend the runway, for the expansion of the boarding – unloading platform, for current repairs and other maintenance and expansion. If last year the airport had a passenger traffic of 1887 passengers, in the future this traffic will increase and the airport can be used as tourist transport vector for visitors interested in North Dobrogea area, and on the other hand, cargo area, which will be supplied goods, mostly perishable, which in this way could be transported in a much shorter time to destinations in Europe.

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11. OVERALL CONCLUSIONS

Design of transport networks requires adequate knowledge of all costs involved and of travel behaviour.

In this thesis, many assumptions have been made on the costs of infrastructure and operation as well as on travel behaviour, using existing data where possible.

This study focused on transport network design, using optimisation techniques to find a balance between traveller's interests and investors or operators interests.

Multimodal transport node of Tulcea, however, is shown to be important for the accessibility of economically important centres and for increasing the tourism attractiveness.

The question is whether the benefits resulting from this improved accessibility should also be incorporated into the analysis, or whether the general economic concept of consumer surplus provides sufficient insight into the size and nature of those benefits.

For the costs involved in transport services and transport networks a broad range of values has been found, especially for the investment costs, while in public transport operational costs are often regarded as classified information.

Since the models used in this thesis all have relatively flat objective functions, deviations from the values assumed would not seriously influence the conclusions presented here. For more detailed network analyses, however, more detailed knowledge of the costs involved is necessary.

Good assessments of the costs of new infrastructure or operating public transport services might be critical for the decision whether or not to develop transport facilities.

The phenomenon of a broad range of possible values also applies to the parameters used to describe travel behaviour. Furthermore, it was found that there is virtually no knowledge of the willingness to transfer in a multimodal trip.

Just as was noted when discussing the need for a better assessment of the costs involved, the relatively flatness of the objective functions makes the main conclusions quite robust with respect to changes in the values that were assumed, while for actual decisions a more detailed description is essential. This is especially true if relatively rare or new combinations of modes are considered.

Examples are the combination of bicycles and lower-level public transport networks, and the role of demand responsive transport systems in a multimodal transport system.

After all, the more detailed the decision that is considered, the more detailed the model that is needed, and the greater the importance of more details.

Finally, the pre-feasibility study focused to achieve five important points: multimodal integration of urban nodes; establishing a system that will improve the travel experience by public transport; integration of several types of vehicles in the areas that nodes will be positioned into and the implementation of intelligent systems in the respective centers; the development of business models that provide the financing for such projects in all cities of the European Union; implementation of transfer stations between different modes of transport which have the lowest possible impact on the environment.

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