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LOCATION SELECTION CRITERIA FOR THE SEA PASSENGER TERMINAL IN RELATION TO THE URBAN STRUCTURE OF THE TOWN

ABSTRACT

A typical Mediterranean town develops as a rule around its historical nucleus which may be longitudinally set parallel to the coastline or concentrated in the area of a minor or major peninsula or located in a bay. These towns are usually characterized by heavy build-up in the area of a wider town centre, insufficient traffic network and insufficient number of parking spaces, and finally a conflict between the urban structure and the terminals which aspire at tending to occupy the same space. The work analyzes the potential criteria that need to be respected in selecting the location of the sea terminal regarding its functioning in relation to the town and urban traffic. The comparison of certain indicators related to the maritime passenger traffic of eight bigger European ports of the Mediterranean, as well as in four major Croatian sea passenger ports, has been made. The objective of the work is to define the possible criteria of assessing the location of the passenger sea terminal and to develop the assessment method for each of the criteria.

KEY WORDS

sea passenger terminal, location selection criteria, Mediterranean town

1. INTRODUCTION

The analysis of passenger terminals location and defining of the location selection criteria for the passenger terminal in relation to the urban structure of the town is, in this work, based on the European Mediterranean type of town. The data for several towns, today's significant sea passenger ports in Italy, France, Spain, Greece and Croatia, have been analysed.

It can be said that a typical Mediterranean town expands, as a rule, around its historical core. It is not, however, easy to unambiguously define the beginning of creating urban Mediterranean towns because they (even if the term is narrowly used only for "Eu-

ropean Mediterranean" town) arise in different circumstances and different civilisation evolution epochs. However, for every more significant Mediterranean town – passenger ports on shores of the European Mediterranean part, it can be concluded, as a rule, that they arise as Medieval agglomerations, and very often even as antique (roman) towns passing through significant change in the inner structure during the Middle Ages. The Medieval town and antique town that changes in the Middle Ages in a so called "compressed town" is characterised, according to Milić [1], by squeezed high building as a result of defensive and economic circumstances in the Middle Ages.

A town structured in this way is hardly adjustable to the needs required by the society evolution in the next centuries. The town developed normally within the (medieval) fortress walls till the 17th (18th century), but then the industrial revolution imposed the usage of train as the means of transport and the town started to expand beyond the walls in order to meet the requirements for railway corridors.

Numerous towns, today bigger or smaller Mediterranean sea passenger ports, developed on the grounds of antique and medieval urban structures like (1): Trieste, Venice, Ravenna, Ancones, Bari, Genoa and Palermo in Italy, Marseille in France, Barcelona, Valencia, Malaga and Almerý in Spain and Split, Dubrovnik, Zadar and Rijeka, today main ports in Croatia.

In terms of space, the towns that developed in the mentioned circumstances had risen as fortresses on peninsulas (Zadar, Dubrovnik, Venice, ...) or within the walls of fortresses built at the seaside in the area primarily longitudinal and surrounded by mountains from the mainland side (Rijeka, Genoa, ...) or relatively spacious where the town developed even more in the mainland (Split, Barcelona, ...).

What can, in today's circumstances, be recognised as being common for all the towns of the European Mediterranean, including the mentioned ones - developed on the grounds of antique and medieval towns, is their complicated adjustment to the requirements of the modern town spatial arrangements, in particular satisfying the traffic demands. Modern town spatial arrangements include planned location of the most important town components (residential, working activities, educational, central functions, recreation and fun and other). The mentioned components are partly spatially connected to the historical town core which usually lacks space to meet the requirements of all the mentioned functions, and a particular problem is traffic organization in this zone.

Such being the case, any intervention is a very complex and demanding task, since the maritime passenger terminal with its facilities generates traffic in the area of the historical core or in its immediate surroundings. This work aims at defining all the possible criteria for the optimization of the terminal location selection with; above all, meeting the needs of traffic demands of the terminal itself, as well as its interpolation in the fully built town area.

2. MAJOR CHARACTERISTICS OF SEA PASSENGER TERMINALS IN THE CHOSEN EUROPEAN MEDITERRANEAN PORTS

Serving the needs of this work, the comparison of certain indicators related to the sea passenger traffic of eight bigger European ports in four countries of the Mediterranean, as well as in four major Croatian sea passenger ports, has been made. Nowadays, these towns are very active passenger ports of the Mediterranean: Trieste, Venice, Ravenna, Ancones, Bari and Genoa in Italy; Marseille in France; Barcelona and Valencia in Spain and Split, Dubrovnik, Zadar and Rijeka as major Croatian ports.

While doing the research on the sea passenger terminals in the already mentioned countries, the demographic data (number of citizens), and traffic indicators (number of passengers according to the traffic category, area for the vehicles waiting to embark) and location elements (distance between the terminal and the town centre, as well as from other traffic terminals) have been analysed. (Table 1)

While analysing the sea passenger terminals in relation to the total number of passengers on cruises and on passenger ships, as well as on ferries, it is possible to categorize (the above mentioned) ports in three categories:

1. ferry ports or mostly ferry ports (hereinafter: Terminal FP);

2. cruiser ports or mostly cruiser ports (hereinafter: Terminal CP);

3. ports where the relation of number of passengers on cruisers and on ferries is almost the same, or, every one of them is relatively big and not insignificant (hereinafter: Terminal FP/CP).

The total number of passengers in a sea passenger terminal does not depend on the size of the town (citizens make very small percentage of passengers) but on its geographical position and tourist importance.

Considering the town position in its region or country, as well as its tourist and historical importance, one can conclude that the towns, whose geographical position provides departing (and arriving to) for a Mediterranean tourist destination, have developed into ports with FP Terminals. The examples of such ports are Ancones, Bari, Genoa, Piraeus, Rijeka, Zadar and Split. On the contrary, the towns whose historical and tourist importance attract many passengers on cruisers and passenger ships, have developed into ports with CP Terminals. Valencia and Dubrovnik are the best examples of such ports. Venice, Marseille and Barcelona attract their passengers with their geographical position, historical and tourist importance. Furthermore, 70% of passengers visiting Venice and Marseille on cruisers and passenger ships, as well as on ferries, are not irrelevant, so, these two towns make the third type of ports.

It can be noticed that smaller towns (up to 300,000 inhabitants), with FP Terminal, have their sea passenger terminals situated in their very centre. The best examples are our ports Rijeka, Zadar and Split whose terminals are situated in the old historical core or near it. On the contrary, bigger towns (more than 300,000 inhabitants) have terminals out of the town centre (up to 4 km). One of the possible conclusions is that bigger towns are overburdened with traffic problems to the point that they tend to dislocate all contents not necessary for the normal functioning, to areas less attractive for their inhabitants, but easily accessible by traffic, in the whole town zone. The examples of such ports are Bari and Genoa. Ports with CP Terminal (Valencia and Dubrovnik) have their terminals out of the town centre. The reason for that is, probably, the fact that cruisers cannot enter the very centre of a town, which, in case of Dubrovnik, is a protected monument area.

If a smaller town is in question (Venice) FP/CP terminals are usually situated in the very town centre. However, bigger towns have their terminals situated out of the town centre (Barcelona) but only if a greater number of passengers on ferries are in question. Furthermore, if a greater number of passengers on cruisers and passenger ships are in question, the terminal is usually situated in the town centre. Such an example is Marseille in France with about 800,000 inhabitants.

If we take into consideration the fact that ports (that is, towns) are not, sometimes, the final destinations of passengers arriving by ships, we can conclude that the connections between the sea passenger terminals and other traffic terminals (railway station, airport) are extremely important.

The distance from the railway station, in ports with CP or FP/CP terminal, is usually 4 km, and from the airport (because of the nature of that traffic) 25 km. In most cases, there are, so called, shuttle bus lines that ensure the passenger transport between these two terminals. The distance between the sea passenger terminal, in the ports with FP terminal, and the railway station or the airport, is less important since we are dealing here with passengers on ferries arriving by car.

One can notice that all the analysed passengers ports, except the Croatian ones (with the exception of Dubrovnik), have in their zone a reserved area for the vehicles waiting to embark. This is very important for the ports with FP terminal in their very centre (Ancones, Rijeka, Zadar and Split), since the lack of the parking area can lead to the occupation of the already small number of parking places in the town centre, and it can lead to the accumulation of vehicles

on the streets, resulting in the reduction of street capacity.

It is possible to solve this problem by locating the FP terminal out of the town centre (Bari, Genoa; Piraeus), because in that case, the port zone is wider, spacious and not fully completed, thus leaving a lot of space to park the vehicles.

The towns, which have located their sea passenger terminals in the very centre, meet another, bigger problem, which is the access to the terminal from the main roads, state roads and motorways. In such ports (Venice, Ancones, Marseille, Rijeka, Zadar and Split) vehicles departing from or arriving to the sea passenger terminal can use only overcrowded town roads in order to reach the motorway. Such roads are usually 15 km long. Ports with terminals out of the town centre (Athens, Barcelona, Bari, Genoa, Valencia and Dubrovnik) have solved this problem by fast town roads or by motorways, thus enabling the passengers which continue their journey by ferry, to avoid the town centre. Such criterion is very important for the FP terminals. Both described location concepts of the sea passenger terminals have their advantages and disadvantages. Furthermore, one can detect all the possi-

Table 1 - Demography, traffic indicators and location elements for major Mediterranean ports
[2][3][4][5][6][7][8][9][10][11][12][13]

City (port)	Population	Location of sea passenger terminal	Distance from sea passenger terminal to the airport	Distance from sea passenger terminal to the railway station	Distance from sea passenger terminal to the highway	Total passenger traffic (2004)	Total cruise passenger traffic (2004)	Total ferry passenger traffic (2004)	Car valet parking
Venezia	270,000	city center	15 km	500 m	15 km	929,478	677,976	251,502	Yes
Ancona	101,000	city center	12 km	2 km		1,412,905	4,949	1,407,956	Yes
Bari	314,000	outside city center (800 m)	7 km	1 km	5 km	1,339,464	262,888	1,076,576	Yes
Genoa	605,000	outside city center (1 km)	5 km	400 m		3,038,000	310,000	2,728,000	Yes
Marseille	800,000	city center	20 km			2,398,114	1,873,580	524,534	Yes
Barcelona	1,600,000	outside city center (4 km)	7 km	4 km		1,968,193	1,021,405	946,788	Yes
Valenzia	800,000	outside city center (4 km)	11 km	4 km		374,905 (2003.g.)	314,675 (2003.g.)	60,230 (2003.g.)	Yes
Athens (Piraeus)	1,221,000	outside city (9 km)		9 km		8,057,118	407,723	7,649,395	Yes
Rijeka	200,000	city center	25 km	1 km	5 km				No
Zadar	70,000	city center	12 km	2 km	15 km	97,000	9,000	89,000	No
Split	190,000	city center	20 km	100 m		3,183,743	794,090	2,389,653	No
Dubrovnik	32,000	outside city center (2 km)	15 km			588,334	457,334	131,000	Yes

ble criteria for the analysis of the terminal location in relation to the town urban structure. The location of terminals out of the town centre has its advantages, but its presence in the town centre has its indisputable value (or if it is situated at a location where you can reach it on foot), especially when referring to Marseille, Venice, Zadar or other very interesting Mediterranean towns.

It has already been mentioned in the introductory unit that the historical Mediterranean (European) towns are characterised by the fully built area in the town centre, by the lack of roads and parking places, as well as by the conflict between the urban structure and the terminal, both pertaining to the same space. We can also talk about the pedestrian inaccessibility to the coastal zone because the coastal part of the town is in the function of motor traffic.

To locate the sea passenger terminal inside the town centre and under the above described circumstances represents a problem in relation to its interaction with the land traffic and in relation to the town traffic functioning as well. If there are spatial possibilities for terminals dislocation out of the town centre, from this point of view, the passenger terminal location has to be analysed parallel with the analysis of the conditions of the local waters for the acceptance of the expected sea traffic. Afterwards, the optimal solution has to be chosen. The problem of the criteria selection arises even when the location has been chosen, and when one has to choose the optimal solution out of the variant one.

3.1. Possible location selection criteria for the sea passenger terminal

Criteria which should be taken into consideration in terminal location selection can be divided into the following main groups with a remark that for the traffic criteria for terminal location selection certain sub-criteria have been defined:

1. Criteria related to the relevant local waters maritime conditions (analysis of the contact point between the land and the sea, accessibility and optimality of the seaway, conditions for taking in ships in a wider sense, sea depth, the size of potential maritime zone, water protection in the port zone and others) – for all types of terminals.
2. Criteria of the sea traffic (structure of expected traffic and expected traffic intensity). For FP terminals, with CP terminals one should distinguish whether it is an embarkation/disembarkation port or a transitory port.
3. Criteria connected with terminal location conditions from architectonic - town-planning and ambient town characteristics aspect and value protec-

tion of the built urban town structure – for all types of terminals.

4. Criteria connected with accessibility of land traffic routes to the terminal area
 - In consideration of this criteria sub criteria should include: length and category of the road connecting the terminal with the land road net, directness of traffic, geometrical elements of accessing roads, and other, depending on the location conditions,
 - For location evaluation of embarkation/disembarkation CP terminals the sub-criteria should be: distance from all kinds of traffic terminals (bus, railway, air) and the quality of realized connections.
5. Criteria connected with retention areas for vehicle parking before the embarkation on the terminal – for FP terminals
 - Through sub criteria should be valued: conditions for passenger cars parking before the embarkation, conditions for parking buses before the embarkation, conditions for parking freight cars before the embarkation, and vans, trailers and so called campers waiting to embark.
6. Criteria connected with functioning of the sea terminal in relation to the town traffic in whose surroundings the terminal is located - primarily for FP terminals, and to a lesser degree for CP terminals.
 - Different sub criteria can appear for FP terminals: burdening of the town road net and capacity of these roads in changed traffic conditions, securing the parking space in the terminal function, geometrical elements of accessing roads, pedestrian accessibility, connection with public transport lines and other.
 - For CP terminals sub criteria are connected with the pedestrian traffic and its complementary public transportation.

The importance of each criterion as well as selecting the sub criteria can vary depending on the structure and intensity of terminal traffic. Namely, for a terminal primarily burdened with ship passengers (CP) the criteria of pedestrian distance and connection of the terminal with public transport will be more important than the quality of road connection of the terminal with highways routes. In that aspect, each terminal should be viewed as a whole taking into consideration all the input factors and all the mentioned criteria in choosing the solution. The mentioned criteria can be used, conditionally, for evaluation of different solutions for the sea passenger terminal on certain locations but in that case part of the criteria connected with location evaluation becomes dispensable, and the terminal solution postulations take the priority. [14] [15]

3.2. Criteria evaluation and choosing the solution

When choosing the sea passenger terminal location one cannot take into consideration only the individual location theory, not even the general location theory. They both consider the problem narrowly and limit it to a certain number of elements and a way of viewing it. Modern spatial theory gives, in that aspect, wider gamut of viewing the location elements so that spatial models can be considered.

One of the crucial elements of optimal location selection importance is the lasting location character. Nor should the spatial perseverance law be forgotten because it says that something that developed somewhere will, in terms of time, maximally hold on to its locality and execute, even somewhat changed, the primary function in a new (and technologically new) way – at the same location. Having this in mind one should particularly view the localities found today, which perhaps were not wrongly selected in the past, but the changed elements brought them into today's inadequate location situation, and by the principle of the spatial perseverance law they keep on holding to that location.

For location evaluation and selection, and even for solutions, it is possible to use different methods. It is possible to reduce all evaluation elements to a common measure, and that measure is in general "money" because valorisation and optimal solution selection include implicitly the solution search according to the economy criteria where all the criteria are expressed through money which is not the best way of selecting a solution. Evaluation can also be done through the procedure of multiple criteria optimisation. This procedure implies selecting as the best variant the one giving the optimal variant of the goal (in this case the most favourable location) function value, and permits different qualitative expressing, weighting and rating of the criteria, getting one optimal solution as the final answer. The optimal solution represents the compromise between the goals and possibilities, in other words goal realization efficiency bearing in mind the limitations. It is important to define well the criteria and measures (so called criteria "weight") because the quality of carried out selection procedure for choosing the best variant and correctness of the final decision, depends directly on their quality. [16]

One should also respect that the same or similar criteria will only partially have the same values in different environments. It should not be forgotten that for the valorisation of certain elements it is possible to use the somewhat same or similar valorisations, while in certain present elements there will be various views (conditioned by regional, cultural, sociological, natural and other characteristics of the area), so the very

weighting will be different. It will naturally relate less to the quantitative elements, but it will be greatly represented in qualitative ones. So towns and ports originally belonging to different primary entrance elements will conduct their weighting in somewhat different way. Macro socio-economic-cultural background of the north Mediterranean towns is only partially similar and conditions only partial similarity of weights themselves and even of final solution selections. Local elements could primarily be revealed in cases where two equally valuable solutions are being generated through the comparison of location elements for different solutions, but even then the decision should be based on the interdisciplinary professional opinion with obligatory integration of the public in making the final decision.

4. CONCLUSION

Optimal location selection (as well as solutions) for the sea passenger terminal in terms of modern construction of historical towns of the European Mediterranean is a complex problem. Researches of demographic, traffic and location conditions in major terminals of this area show that, regardless of different terminal location in regard to the urbanity (town centre or out of centre) or the size of the town-port, in every bigger European sea passenger port the traffic conditions have been uniformly solved: good connections with other traffic terminals and land roads net have been realized and conditions for parking of vehicles waiting to embark within the terminal. In this way the potential problem of terminal generating traffic within the town traffic system is being minimised.

Possible location selection criteria or terminal solution evaluation, that should be evaluated objectively and interdisciplinary, is defined in this work; it also suggests some of the methods of the multi-criteria optimization, taking into consideration local particularities and integration of the public.

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SAŽETAK

LOKACIJSKI KRITERIJI ZA ODABIR POLOŽAJA POMORSKOG PUTNIČKOG TERMINALA U ODNOSU NA URBANO TKIVO GRADA

Tipični mediteranski grad se u pravilu razvija oko svoje povijesne jezgre koja može biti longitudinalno položena para-

lelno sa linijom morske obale ili koncentrirana na prostoru manjeg ili većeg poluotoka ili smještena u zaljevu. U pravilu gradove ovoga tipa karakterizira velika izgrađenost površina u širem centru grada, nedostatna mreža prometnica i nedovoljan broj parkirnih mjesta, te konačno sukob urbane strukture i terminala koji u pravilu pretendiraju na isti prostor. U radu su analizirani mogući kriteriji koje je pri odabiru položaja pomorskog terminala s aspekta funkcioniranja u odnosu na grad i gradski promet potrebno respektirati. Izvršena je usporedba određenih pokazatelja vezanih za putnički pomorski promet u osam većih europskih luka na Sredozemlju i četiri glavne hrvatske pomorske putničke luke. Cilj je rada definirati moguće kriterije procjene lokacije putničkog pomorskog terminala te razraditi način vrednovanja svakog pojedinog kriterija.

KLJUČNE RIJEČI

pomorski putnički terminal, lokacijski kriteriji, mediteranski grad

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