

**Paola Badurina-Tomić**

E-mail: badurina@shortsea.hr

Intermodal Transport Cluster, Trpimirova 2, 51000 Rijeka, Croatia

**Čedomir Dundović**

E-mail: dundovic@pfri.hr

**Neven Grubišić**

E-mail: grubisic@pfri.hr

University of Rijeka, Faculty of Maritime Studies, Studentska 2, 51000 Rijeka, Croatia

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## **Selection of suitable locations for nautical tourism ports in the Ličko-senjska County**

### **Summary**

Nautical tourism has become an increasingly popular way of respite, and for a country possessed of nautical capacities it represents a very important factor in the development of tourism in general. *Strategy for the development of nautical tourism for the period 2009-2019* has predicted a special nautical capacity growth for the Ličko-senjska County, which is not particularly abundant in nautical capacities. In accordance with the respective spatial plans, also containing decisions adopted in respect of future development of nautical tourism, there were five proposed locations taken in account in this paper for the selection of a suitable location in the Ličko-senjska County. Using the multi-criteria analysis and the VISUAL PROMETHEE software program, location 1-Novalja was selected as the most suitable one.

The contribution of this work is primarily reflected upon the analysis of previous research works and the adoption of possible measures for further development of nautical tourism in the Ličko-senjska County.

**Key words:** The Ličko-senjska County, multi-criteria analysis, nautical tourism, *Strategy for the development of nautical tourism*, VISUAL PROMETHEE

### **1. Introduction**

Ever since ancient times, humans have always been placed around water surfaces and have used various types of vessels. Their modernization has increased human need for more frequent navigation and use of these values. Today, these values are raised to a higher level, nautical tourism is often called the “elite” type of tourism and sailing

for fun and relaxation is expressed more than ever before. The development of nautical tourism is of national interest and the construction of nautical tourism ports, especially marinas, is very important for the growth of local and regional development. It is widely known that Croatia is abundant in marine and coastal resources and therefore tends to their exploitation and use, not only to bring positive economic effects, but also to enable planning and preservation of the coastline area.

The whole problem is about how to achieve balance between the environment and spatial values in areas which represent potential locations for the construction of nautical tourism ports. In creating spatial plans, construction and operation of nautical ports must be envisaged and set as the primary goal. According to previous research works by numerous authors who have been engaged in the research on the development of nautical tourism in Croatia, the current situation is evaluated as satisfactory. For example, authors Dundović, Č. and Kovačić, M., in their paper "Criteria for Selecting a Location for a Port of Nautical Tourism" highlight spatial possibilities and constraints, and propose criteria to ensure the optimum selection of a location and facilities for a nautical tourism port [1, 41-65]. Furthermore, the main thought in their paper "A Comparative Analysis of the North Adriatic Nautical Ports' Organizational Models" is that the overall system of nautical activities is not enough coordinated, which primarily involves the creation of a proper statutory business requirement for all activities related to nautical tourism [2, 209-232].

Authors Jugović, A., Zubak, A., and Kovačić, M., in their paper "Nautical Tourism in Croatia as a Function of Destination Development" emphasize that this type of tourism belongs to the elite tourism and produces extraordinarily significant economic effects with high profitability, which are particularly expressed through numerous multiplicative effects [5, 61-72]. Furthermore, authors Dundović, Č., Kovačić, M., and Badurina-Tomić, P., in their paper "Contribution to Study on the Current Situation and Development Trends of Nautical Tourism in Croatia" analyze the current state of nautical tourism in Croatia and point out the advantages and possible consequences of the construction of new marinas in Croatia [3, 207-224]. A scientific paper by Kovačić, M., Bošković, D., and Favro S., examines the level of built capacities reached in ports of nautical tourism and point out their scarcity, especially in islands where the number is even lower. Special attention is paid to the possibility of implementing pontoon berths in the function of development of nautical ports in islands. The islands have numerous beautiful, naturally protected bays and local ports which have been systematically neglected in the development of nautical ports. Therefore, it is essential to think about the future of nautical tourism in the Adriatic, especially in islands, because of their influence to their complete economic development [13, 54-62]. Authors Dundović, Č., and Grubišić, N., in their paper "Ports of Nautical Tourism: Factor in Croatian Tourist and Economic Development" highlight that nautical ports should be built and expanded in accordance with environmental characteristics of the Adriatic Sea and natural ecosystems where special attention should be paid to the planning of the port system [12, 317-321].

Due to the improvement of the overall managing system within this sector, planning, design and selection of the most suitable locations for nautical tourism is extremely important. This paper will explore possibilities for the development of nautical tourism in general and possibilities for the construction of nautical tourism in the Ličko-senjska County where this type of tourism has not yet been developed.

These procedures require numerous studies based on different criteria and methods. To achieve the perfect choice of location for nautical tourism, multi-criteria analysis is increasingly accepted as a model for making optimal solutions for site selection. Methods of multi-criteria analysis are different and may be based on the opinions, attitudes and conclusions of individual or groups of experts. Most methods are subjective, and require additional computer support in the form of software programs tailored to handle all the criteria and conditions to be taken into consideration when choosing a location.

## **2. Analysis of the current state of nautical capacities and revenues from nautical tourism**

Nautical tourism is a part of the overall Croatian tourist offer. Considering global trends imposed by the marine market, changes in the structure of the nautical market, a growing number of large yachts, there are new segments and target markets, which offer many opportunities and open doors to numerous investors from all over the world for developing and building new marinas. Expand of capacity and its pervasive unstoppable increase in demand, imposes a faster construction of new berths.

### **2.1. The existing and planned capacities of nautical tourism ports**

Changes in the market impose the lack in adequate berths i.e., nautical capacities, that could satisfy all the demanding needs of yachtsmen. Nautical capacities make nautical tourism ports and nautical moorings. The Croatian Adriatic is a unique and specific unit which can be divided into several regional entities, namely: the North Croatian coast, the North Adriatic and the South Croatian coast. According to their geographic characteristics, two sub regions can be distinguished: Istria, which extends from the Bay of Piran to cape Kamenjak, and Kvarner, which extends across the East coast of Istria, Rijeka and the Opatija coastline, the Vinodol and Crikvenica coastline, the foothills of Velebit and the Kvarner islands (Cres, Lošinj, Krk, Rab and smaller islands) [8].

According to the latest data from 2014, Croatia has 53 marinas, 14 dry marinas, 13 berths and 22 moorings. Due to the constant growth in the demand for nautical capacities in Croatia, it is necessary to upgrade the infrastructure capacity and the capacity to complement the superstructure which would further enrich the offer. Table 1 presents an overview of the existing and new planned capacities of nautical tourism.

*Table 1 The existing and planned capacities of nautical tourism according to the county spatial plans*

County	EXISTING (2013)			NEWLY PLANED (2015)		
	IN THE SEA	ON LAND	TOTAL	IN THE SEA	ON LAND	TOTAL
Istarska	3668	802	4470	7 330	7100	14 430
Primorsko-goranska	3455	1803	5258	3 100	0	3 100
Ličko- senjska	-	-	-	850	<b>800</b>	<b>1 650</b>
<b>Zadarska</b>	<b>3553</b>	<b>1221</b>	<b>4774</b>	<b>1 800</b>	<b>0</b>	<b>1 800</b>
Šibensko- kninska	<b>3529</b>	<b>938</b>	<b>4467</b>	<b>2140</b>	<b>0</b>	<b>2140</b>
<b>Splitsko-dalmatinska</b>	<b>2021</b>	<b>503</b>	<b>2524</b>	3 185	0	3 185
Dubrovačko-neretvanska	714	206	920	7350	0	7 350
TOTAL	16 940	5 473	22 413	25 755	7 900	33 655

Source: The Croatian Bureau of Statistics, <http://www.dzs.hr> (27.01.2016)

There have been 54,675 locations projected for construction by 2019, out of which 42,695 sea berths and 13,373 land berths [9, 41]. The largest planned growth in the total capacity refers to Istria which has been developing tourism in all its forms, with special emphasis on the sustainable and selective form of tourism, followed by the Split-Dalmatia, the Primorje-Gorski Kotar and the Šibensko-kninska County. Particular growth projection refers to the Ličko-senjska County which doesn't even have any nautical capacities at the moment. A breakdown of capacities of nautical tourism is presented in Table 2 [4, 210].

*Table 2 The capacity of nautical tourism ports in 2014*

	2013	2014
<b>Number of nautical tourism ports</b>	106	112
<b>Number of marinas</b>	67	72
<b>Water surface</b>	3 278 064	3 322 650
<b>Number of berths</b>	16 940	17 221
<b>Vessel length</b>		
<b>up to 6 m</b>	727	773
<b>6-8 m</b>	1 446	1 360
<b>8-10 m</b>	2 900	2 851
<b>10-15 m</b>	8 919	9 026
<b>&gt;15m</b>	2 948	3 211
<b>Length of the coast for mooring (m)</b>	63 110	65 178
<b>Space for boats on the mainland (capacity)</b>	5 473	5 375
<b>Total surface area (m<sup>2</sup>)</b>	799 822	799 032
<b>Covered area</b>	8 876	8 361

Source: The Croatian Bureau of Statistics, <http://www.dzs.hr> (27.01.2016)

According to the data in Table 2, it is evident that the number of nautical tourism ports has increased from 106 to 112, and the number of marinas from 67 to 72. By comparison of the two presented tables, it can be said that the goals of the Strategy for the development of nautical tourism have been followed and they have been increasing, i.e. the construction of new nautical capacities increases the offer of the Croatian nautical tourism and thus provides greater demand and improved competitiveness of nautical services. With the construction of new capacities, the renewal and upgrading of existing nautical ports have opened a number of other issues. Particularly, the question why is the Croatian nautical tourism by 8 to 10 times less developed than the nautical tourism in other Mediterranean countries, having in mind its capabilities in terms of space, including the opportunities provided for rich content? The answer lies in the integrated management of the entire nautical tourism system as a complex system. This would mean complete harmonization of legislation related to tourism, especially regulation of nautical tourism ports and alignment and adjustment of the spatial planning legislation for cities and counties. First of all, it is necessary to regulate and make a single law on concessions, which are the basis for the development of special purpose ports and nautical tourism ports. Given that, marinas are basis for the development of nautical tourism, and to unify their operations in a number of activities it is necessary to understand their importance and role in the development of the city and arrange for sailing port regulations, operations in terms of concessions and issues related to the construction of the maritime domain.

## 2.2. Analysis of nautical tourism by the vessel type and size

One of the criteria for site selection is the size of the port, which is conditioned by the type and size of yachts. Therefore, Table 3 will show the number of permanently moored yachts, the length of the yachts and the length of yachts in transit, as the basis for further research work.

*Table 3 The number of permanently moored yachts and the length of yachts in transit in 2014*

Length of the yachts	Total number of yachts	%	Total number of yachts in transit	%
up to 6 m	206	1.76 %	4 117	2.33 %
6-8 m	862	7.39 %	12 984	7.36 %
8-10 m	2 108	18.07 %	26 546	15.05 %
10-12 m	3 392	29.08 %	53 294	30.02 %
12-15 m	3 449	29.57 %	61 361	34.79 %
15-20 m	1 292	11.07 %	13 894	7.88 %
>20 m	355	3.04 %	4 202	2.38 %
Total number of permanently moored yachts (sea berth) and yachts in transit (sea berth)	11 664		176 398	

*Source: Authors, based on: <http://www.dzs.hr/> (27.01.2016)*

Table 3 indicates a greater presence of permanently moored yachts sized 12 to 15 meters in length and yachts between 10 and 12 meters. The number of yachts of up to 6 m is insignificant with only 206 yachts accounting for 1.76%. Sailing in transit means navigation within the Croatian territory and along the Croatian coast without landing or embarking passengers. Most often it implies short stays of travelers for fuel supply, vessel supplies and other needs. Thus, the majority of watercrafts in Croatia are made of yachts in transit and their most common length ranges between 12 and 15 meters, accounting for about 35%.

The importance of nautical tourism for the economic development of the country is reflected upon the revenue from nautical tourism. Incomes from the nautical tourism in 2014 amounted to HRK 716.6 million, where HRK 527.8 million was realized from mooring rentals, having amounted to 73.7% of the total revenue. Compared to 2013, the total revenue was increased by 4.4% [4]. The Strategy for the development of nautical tourism has included plans for 15,000 new berths to be built and, in accordance with traffic growth projections, the total income from nautical tourism has been envisaged to amount approximately to HRK 15 billion [9, 41].

### **3. Site selection, planning and design of nautical tourism ports**

Selection of location, planning and design of nautical tourism make the basic precondition for the creation of new nautical capacities. This is primarily related to the construction of marina, the key factor of nautical capacities. Selection of location includes port accommodation to suit the performance of its activities within the particular area. The main problem in choosing location for this activity is about selecting the most suitable one. The planner should be noted as the key person who coordinates and controls the process of location selection which should be optimal for the port. Then follows the process of spatial and transport planning which determines the interdependence of space and traffic. With plans in place, conditions for the construction of the port can be established. Once the programming and the required analyses and preparations for various studies and programs have been completed, the future construction of marina is defined.

Projecting deals with establishing a schedule of land and water areas that nautical tourism demands. The construction of a marina is a complex task and requires maximum cooperation and compliance of all the participants of the project team with the contractor. Equipping a marina and a business organization are extreme phases including the use of the basic port infrastructure and superstructure for the purpose of performing the core business with professional managerial skills and profitable port management.

#### **3.1. The Ličko-senjska County - new nautical capacities**

The Ličko-senjska County is located in the central part of Croatia and is designated as an important geo-traffic intersection between Croatia's three largest cities – Rijeka,

Zagreb and Split. This county has a special importance because of its location between the South – the Adriatic, and North – the Croatian Danube valley. Mountain Velebit gives a significant contribution to the physical appearance of the County dividing the space in two parts: the coastal part and the continental part. The continental part of the Ličko-senjska County is part of the overall geo-strategic center of Croatia. By its physiognomic-homogeneous characteristics the county is divided into two larger and essentially different spatial units: continental-mountainous Lika and coastal – foothills and islands unit. The Lika region is also among the leading Croatian counties in the number and diversity of protected natural sites and locations.

The Ličko-senjska County extends to 5,350.50 km<sup>2</sup> covering 9.46% of the national territory. It covers most of Mountain Velebit and the Senj-Karlobag coastline and extends exclusively across the major portion of the Lika hinterland. The northwestern part of the island Pag also belongs to the County. The County occupies the central position within the Croatian territory and it can be said that it is very important to the adjacent area with Croatian largest cities and counties, the Primorje-Gorski Kotar County in the northwest, the Karlovac County in the north and the Zadar County in the south. With an area of 2.29 km<sup>2</sup>, this island represents 0.07% of the total area occupied by all Croatian islands [7].

### 3.2. Potential locations for the development of nautical tourism ports

Taking into consideration the above fact, only some parts of the Ličko-senjska County are situated near the sea and the coast. These locations are Senj, Karlobag, Stinica and the island portion of the Ličko-senjska County. The city of Novalja, and villages Stara Novalja and Tovarnele were selected for the analysis, which was made in accordance with the regional plans which include plans for nautical tourism ports. In this section other possible locations will be displayed i.e. smaller bays suitable for accommodation of nautical tourism. Table 4 shows water surfaces, small coves and bays within the town of Senj, planned for the development of special purpose ports.

*Table 4 Water surface for special purpose ports*

Locality	Water surface	Capacity	Constructed/unconstructed
Senj	1.8ha	Up to 200 sea berths	Unconstructed
Krivača(Stinica)	4.4ha	Up to 200 sea berths	Constructed/unconstructed
Lukovo	1.2ha	Up to 50 sea berths	Unconstructed
Starigrad	0.5ha	Up to 50 sea berths	Constructed/unconstructed
Sv. Juraj	4.8ha	Up to 50 sea berths	Constructed/unconstructed

*Source: <http://www.senj.hr/Spatial Plan/> (28.01.2016)*

In Table 4, the planned area shows the number of berths in accordance with the spatial plan. This plan has specific surfaces for sport ports in Senj and fishing ports

of Sv. Juraj and Jablanac which must provide facilities for reception and storage of fish. Public ports in the area of the city of Senj are: Senj and Stinica as ports of county importance, and Sveti Juraj, Lukovo, Klada, Starigrad and Krivača, as ports of local importance. There are the existing berths for accommodation of up to 10 vessels, apart from the public port in the bay of Žrnovnica. Plans for anchorages within the City of Senj refer to the following bays: Vlaška I, Ždralova, Vlaška II, Vela Ivanča i Bočarije Vele [8].

#### 4. Site selection methodology

Choosing location for the accommodation of port and its content is a complex problem that requires careful consideration. As already mentioned above, Croatia has considerable potential for the development of recognizable nautical products, but the current arrangement of capacity and quality of services is not satisfactory. Taking into account physical plans of Novalja and Senj, which comprise decisions made for the future development of nautical tourism, five proposed locations for the implementation of a multi-criteria analysis were taken into consideration in this paper. These are: location 1-Novalja, location 2-Stara Novalja, location 3-Tovarnele (Lun), location 4-Senj, location 5-Stinica. Each location has its own characteristics to be considered in determining and weighting the criteria. The data referring to each location were taken from the Republic of Croatia Hydrographic Institute - "Pilot for small ships, parts I and II" and "The Croatian Adriatic Nautical Pilot". Based on these data, the criterion and ranking scales are defined.<sup>1</sup>

##### 4.1. Implementation of the PROMETHEE method and the VISUAL PROMETHEE software program

To optimize the choice of a location, it is necessary to use the multi-criteria analysis and certain methods. The methods that can be used in addressing this challenge are the AHP method, PROMETHEE methods and GAIA methods. The AHP method enables the comparison of the criteria and location in pairs and makes various analyses, such as the sensitivity analysis and some others. The GAIA program gives a geometric presentation of the results of PROMETHEE methods and can obtain numerical results and graphs that help the decision-maker to have a more realistic view of the problem [6, 78-80]. The research in this paper will be displayed using PROMETHEE methods and the Visual PROMETHEE software program. The PROMETHEE method (Preference Ranking Organization Method for Enrichment Evaluations) belongs to the group of methods for the multi-criteria selection of the set of alternatives described by several

<sup>1</sup> It should be noted that the evaluation of criterion is made on the basis of data from the above mentioned books and author's opinion and knowledge of each location.



attributes that are used as criteria [10]. This method allows for the analysis of quantitative and qualitative criteria of different importance and expects from the decision maker to establish an alternative solution by optimizing all of the criteria. The PROMETHEE method is based on the mutual comparison of two alternatives (compared pairs) with respect to the individual criteria. In order to compare the different criterion and to execute a summary evaluation and ranking of the alternatives, the preference function  $P(a, b)$  must be defined.

Selection of preference function represents the most difficult step and the decision maker can choose the type of preference, i.e. how to prefer one location in relation to another in a particular criterion. This will be shown in Figure 1.

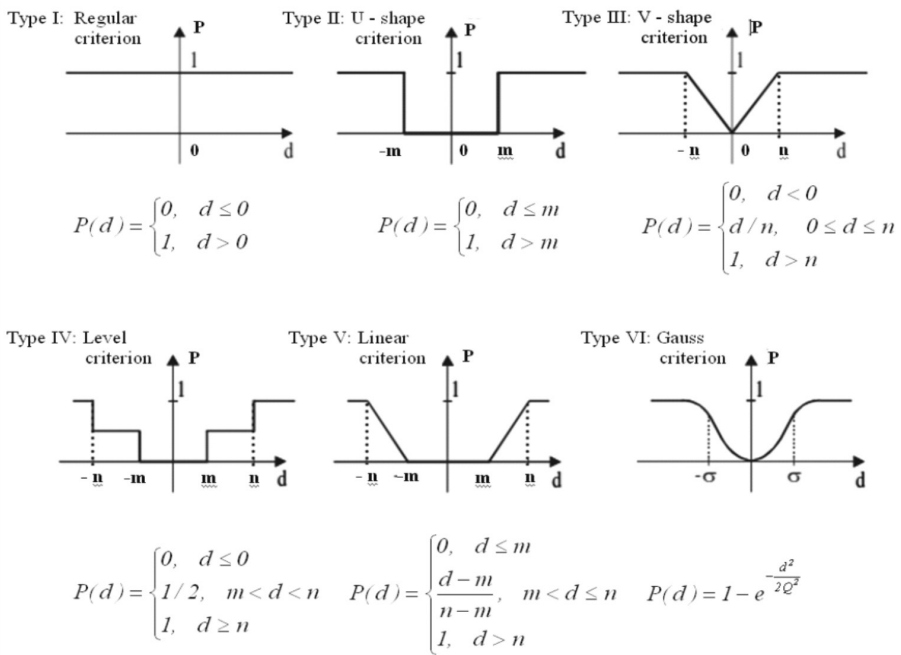


Figure 1 Standard types of preference function  $P(d)$  with the parameters  
 Source: Tomić, V., Marinković, Z., Janošević, D.: Promethee Method Implementation with Multi-Criteria Decisions. Facta Universitatis: Mechanical Engineering, Vol.9, No.2.,2011, str.193-202

Type I (Usual / Regular) - if there is any difference in the points between two locations (including the smallest ones), preference will be assigned the value 1, i.e. preference function will have the value 1 for any  $d(a, b)$ . In this case, preference is strict. Type II (U-shape) - preference will be strict only when the difference in the points reaches a threshold of indifference, which is determined by the parameter  $m$ .

So, if the difference in points  $d(a, b)$  is lesser or equal to the value of the parameter  $m$ , there will be no preference  $P(a, b) = 0$ . Type III (V-shape), similar to the U-shape, preference will be strict after the difference in points is higher than the linearity threshold which is arbitrarily set by adjusting the parameter  $n$ . However, unlike the type II, if the difference in points is lesser than the threshold, there will be certain preference presented which will depend on that difference, i.e. it will be increased linearly-progressively, as the difference in points is higher until the linearity threshold  $m$ . Type IV (Level) is a variation of type II, where there are two thresholds, the threshold of indifference and the weak preference threshold which define the parameters  $m$  and  $n$ . Type V (Linear) is similar to the type III, except that with type III there is a threshold indifference. Types I and IV (Usual and Level) is recommended for use where there are quality criteria and scales up to 3 or 5 (yes / no, 3-point, 5-point). In that case, the small difference in points (e.g. 2 vs. 3) represents significant difference in quality compared to the criterion used in estimating something. If it is decided that the difference of one point does not affect or has insignificant influence on the choice of location i.e. on the preference, it is possible for the threshold of indifference to be set, e.g. 1 using type IV (Level). In that case, on a 5-point scale, if the difference in points is two or more, the preference function will be strict i.e. equal to 1. If there is a difference in points 1 or 0, it will be interpreted as no preferences i.e. that two locations are equal according to this criterion [11, 193-202].

#### 4.1.1. Defining criteria and weight factors

Defining criteria is the first step of choosing a software tool for the selection of location for nautical tourism. When determining criteria, spatial plans are of great importance because they comprise precise and detailed preparation of the conditions concerning all location possibilities. The criteria and sub-criteria used in this paper as a multi-criteria basis, used for the location selection analysis, are defined as natural factors, nautical conditions, traffic-technical, environmental and socio-economic factors. (Table 5)

Table 5. The criteria and sub-criteria for analysis

Criterion	Sub-criterion	Evaluation/ratings
1.Natural factors	a. The influence of wind	Very weak -1 Weak -2 Moderately strong -3 Strong -4
	b. The influence of the waves	Quiet -1 Slightly wavy-2 Moderately wavy-3 Strongly wavy-4 Wavy-5 Strongly wavy-6

2. Nautical conditions	a. Port entrance and maneuvering security	Without obstacles -1 The existence of sporadic obstacles-2 The existence of continuous restrictions - 3
	b. Depth of the sea	< 2 m - 1 2-3 m - 2 3-5 m - 3 > 5 m - 4
3. Traffic and technical factors	a. Construction of port infrastructure	Low level – 1 Medium level -2 High level -3
	b. Reception capacities (number of berths)	Up to 50 -1 50-100 -2 100-200 – 3 200 -300 -4 300- 400 -5 400- 500 -6
	c. Space for the development of other service activities in port	Insufficient -1 Satisfactory – 2 Sufficient - 3
	d. Mobility of nautical tourists (required hours of travel)	30 min -1 45 min -2 1h – 3 1,5 h – 4 2h -5 > 2h - 6
	e. Quality of berths	Berth on buoy/ anchor – 1 Berth on pontoon – 2 Fixed – solid berth - 3
4. Environmental factors	a. Ecological value of micro-location	Low importance -1 Medium importance -2 Important-3 Extremely important-4
	b. Supervision of aquatorium/port basin	Undesirable-1 Desirable-2
5. Socio-economic factors	a. Impact on the economic development of local communities	Low -1 Medium-2 High -3
	b. Cultural impact on the local community	Very weak -1 Weak -2 High -3 Very high -4
	c. Impact on other services	Very weak -1 Weak -2 High -3 Very high -4

Source: Authors

Weight criteria are used to express the importance of the criteria or to distinguish the relative importance of several criteria within the same priorities [6, 65]. They are commonly designated as a percentage and in this paper they are numbered from 1 to 10. Some of the sub-criteria such as 5b and 5c are minimized, which means that their impact should be very weak or weak.

## 5. Analysis of the results

The analysis of the results will be displayed in several different methods. The first method will be using the PROMETHEE II graph Complete Rankings. Figure 2 shows the results obtained using the graphical display or the PROMETHEE II Complete Rankings. The program enables comparison criteria using the “Action profiles”. Action profiles show the profile of random actions or criteria by which the action is determined, and they are a positive or negative rank.

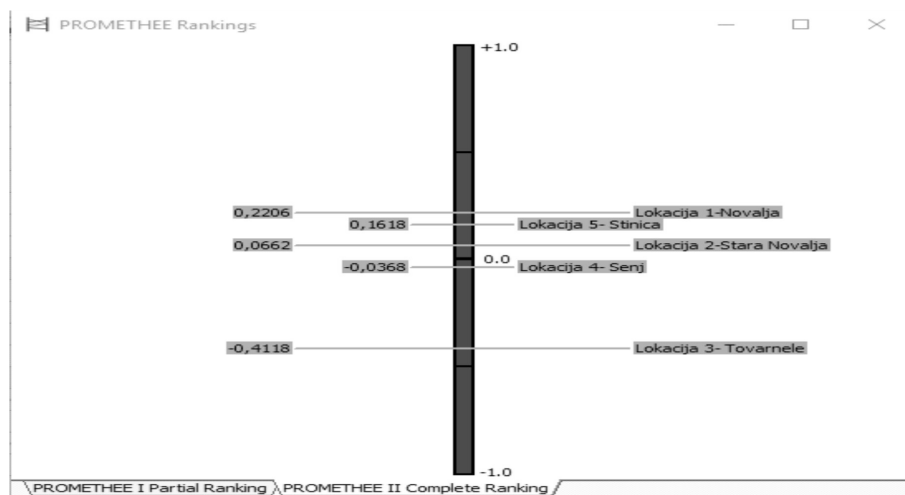


Figure 2 Obtained results with the PROMETHEE II Complete Ranking

Source: Authors, based on the Visual PROMETHEE software program

The PROMETHEE II Complete Ranking provides graphical display and allows for an easier understanding of the results. It is understood from Figure 2 that the maximum value of 0.2206 is achieved by location 1-Novalja which is positioned in the positive part of the chart, and is labeled green. It is followed by location 5-Stinica with the value of 0.1618 and by location 2-Stara Novalja with the value of 0.0662. Location 4-Senj is located in the middle of the graph; however, due to certain lower weighted criteria, the location is associated with the negative value of -0.0368. Location 3-Tovarnele is located in the red marked part, which signifies that in the case of this analysis and with this kind of criteria definition, it has highly negative values. The closer the value to 1,

the complete preference is closer to the decision maker. By using the PROMETHEE Rainbow Display, the results are the following: this display refers to the group of criteria having their sub-criteria defined by colors in the first steps of the analysis. Given the assigned good or bad ratings, the criteria are written for each location in dependence on the assessment scale. The overall view of the criteria used in the PROMETHEE Rainbow software is shown in Figure 3.

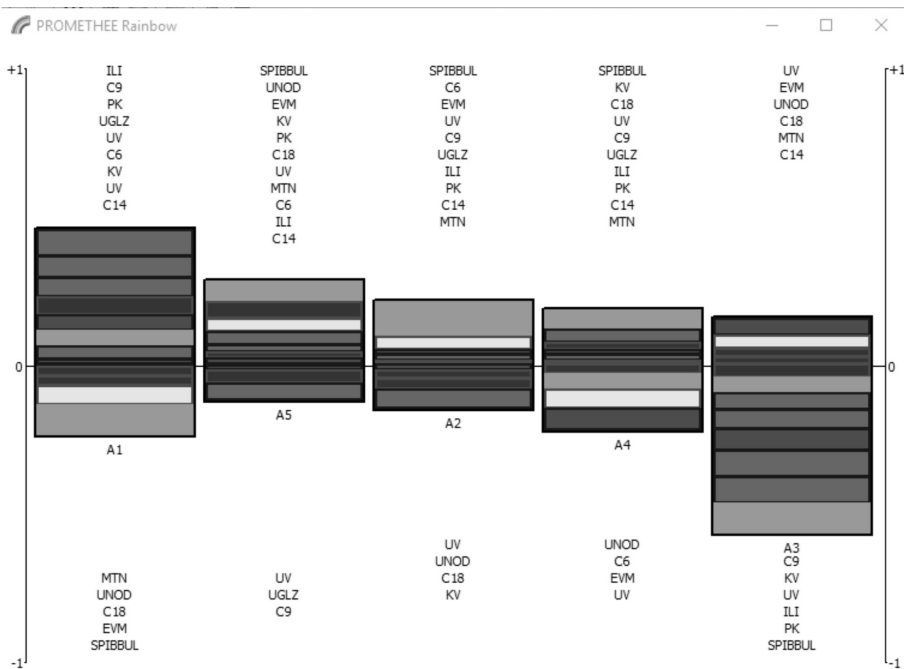


Figure 3 The PROMETHEE Rainbow

Source: Authors, based on the Visual PROMETHEE software program

The upper part of the display shows the criteria featuring the advantage of a certain location, i.e. the lower part shows the criteria featuring a disadvantage of a certain location. Location 5-Stinica contains a larger number of positive ranked criteria in the net flow. However, location 1-Novalja, location 4-Senj and location 2-Stara Novalja contain approximately the same number of positive and negative criteria. Furthermore, the results of the analysis can be presented by using the PROMETHEE Flow Table option. The table provides a view of Phi, Phi+ and Phi- values or sequence of actions (location) according to the function of preferences. It is based on the PROMETHEE II Complete Ranking. This presentation of the results can be beneficial and it allows for an easy copying of the result, if the user wants to show results in another program e.g. Excel. Figure 4 shows the results obtained using the PROMETHEE Flow Table.

Rank	action		Phi	Phi+	Phi-
1	Lokacija 1-Novalja	◇	0,2206	0,4559	0,2353
2	Lokacija 5- Stinica	■	0,1618	0,3199	0,1581
3	Lokacija 2-Stara	●	0,0662	0,3088	0,2426
4	Lokacija 4- Senj	■	-0,0368	0,2610	0,2978
5	Lokacija 3- Tovarnele	●	-0,4118	0,1691	0,5809

Figure 4 The PROMETHEE Flow Table

Source: Authors, based on the Visual PROMETHEE software program

The results obtained from Figure 4 indicates that the location 1-Novalja is most suitable for the construction of port for nautical tourism because of the values of the net flow of 0.2206 which is the result nearest to 1, and is therefore considered, according to the set preferences, to be the most appropriate location. Locations 4 and 3 are assigned negative ratings because locations offering more space and larger carrying capacities are preferred for the purpose of this analysis, while, according to regional plans, locations 4 and 3 are provided with small number of reception capacity. However, we can change the weight of criteria on the “Walking Weights” tool and the result for the location will be different. The aforementioned is shown in figure 5.

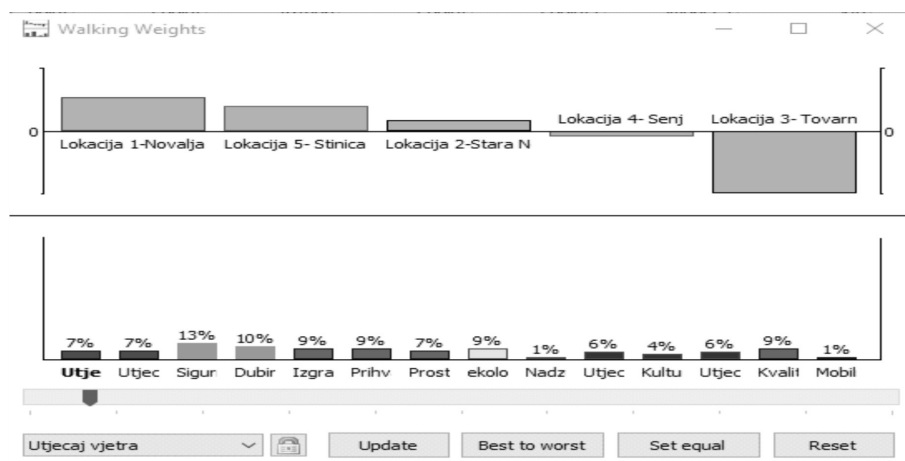


Figure 5 Walking Weights

Source: Authors, based on the Visual PROMETHEE software program

Figure 5 shows the “Walking Weights” tool which is divided in two parts. The upper part shows the locations ranked on the basis of the PROMETHEE II Complete Ranking while the lower part shows the amount of individual criteria expressed in percentages which must total 100%. As shown in Figure 5, the most common criterion is the “Port entrance and maneuvering security”. Due to this arrangement of criteria, Location 1-Novalja is highest ranked. The criterion “Mobility of nautical tourists” is ranked with 1%. However, with the minimum ranking criterion increased (Mobility of nautical tourist) to 15%, the overall result changes. (Figure 6)

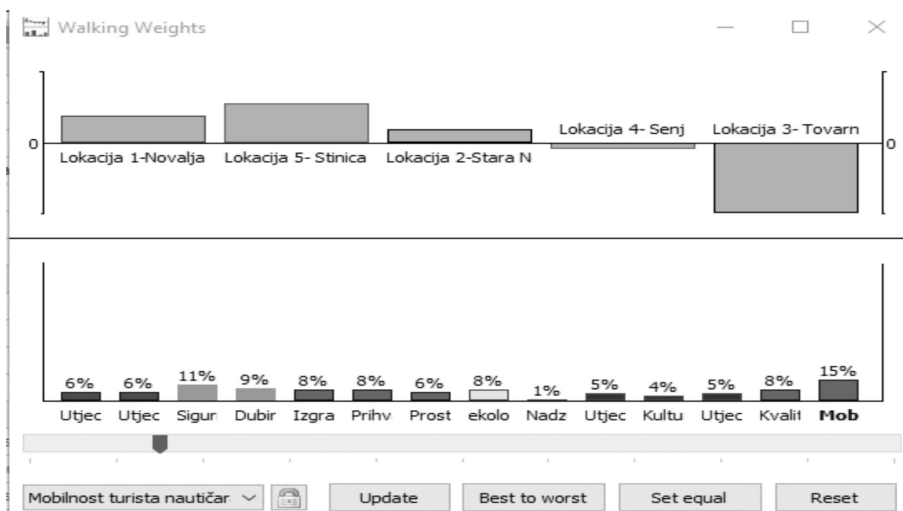


Figure 6 The overall result after changing “Walking Weights”

Source: Authors, based on the Visual PROMETHEE software program

After changing one walking weight of one criterion, it is possible to have the overall result changed, and the most suitable location is no longer location 1-Novalja but location 5–Stinica instead.

## 6. Conclusion

Exploring the history and development of these activities produces numerous benefits within this industry and nowadays it increasingly stands out as one of the main pillars of the country’s economy, with constant positive effects on the economy. Nautical tourism is a relatively new socio-economic phenomenon in society and it will be more developed in the future. However, using the advanced computer programs, optimal decisions can be reached. Methods of the multi-criteria analysis are mainly based on subjective assessments. According to the above mentioned facts, the Ličko-senjska County was used for the purpose of this research. The Ličko-senjska County

has a very poorly developed nautical capacity and, in accordance with regional plans, possibilities for the development of ports for nautical tourism and nautical facilities are reflected upon. The analyzed area was chosen because of its specific feature as the division between the land part and sea (island) part. In this analysis, five possible locations were taken in consideration: ports Novalja, Senj and Stinica (Krivača) and smaller bays Stara Novalja and Tovarnele. The analysis was based on PROMETHEE methods and the usage of the Visual PROMETHEE software program.

The research was conducted on the basis of five pre-defined basic criteria and fourteen sub-criteria. Different weight coefficients were given for each criterion to determine their importance in comparison with others, which results in positive or negative grades in the overall ranking of the analyzed sites. According to the research results, the most suitable location for the construction of a marina results to be location 1-Novalja. This analysis confirms the specificity and importance of the Ličko-senjska County as an indispensable component of its geo-location between three big cities: Zagreb, Rijeka and Split, which is a great advantage for the development of nautical tourism.

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Paola Badurina-Tomić, Čedomir Dundović, Neven Grubišić

## Odabir optimalne lokacije luka nautičkog turizma Ličko-Senjske županije

### Sažetak

“Nautički turizam postaje sve popularniji način odmora te, za zemlju koja raspolaže s nautičkim kapacitetima, predstavlja vrlo bitan čimbenik za razvoj turizma uopće. *Strategijom razvitka nautičkog turizma za razdoblje od 2009. – 2019.* poseban rast nautičkih kapaciteta predviđa se za Ličko-senjsku županiju koja do sada nije ni imala nautičkih kapaciteta.

Prema prostornim planovima, u kojima su donesene odluke o budućem razvitku luka nautičkog turizma, u ovom radu uzeto je pet predloženih lokacija za odabir optimalne lokacije na području Ličko-Senjske županije. Koristeći metodu višekriterijske analize i softverskog programa VISUAL PROMETHEE lokacija 1 - Novalja odabrana je kao optimalna.

Doprinos ovog rada ponajprije se ogleda u analizi prethodnih istraživanja te u donošenju mogućih mjera za daljnji razvitak nautičkog turizma na području Ličko-Senjske županije.

**Ključne riječi:** Ličko-senjska županija, nautički turizam, Strategija razvitka nautičkog turizma, VISUAL PROMETHEE, višekriterijska analiza.

