

SUSTAINABLE DEVELOPMENT MODEL FOR NAUTICAL TOURISM PORTS

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Abstract

Nautical tourism ports make an open, dynamic and complex system which has been rapidly evolving; this is the reason why the development of this system requires continual monitoring and research. The existing models and development plans concerning nautical tourism ports do not provide for a systematic qualitative and quantitative development of nautical tourism, thus contributing to economical inefficiency likely to cause even ecological imbalance. The more so if nautical ports are regarded as business subjects by whom the concept of sustainable development is declaratively acceptable. For this reason, this paper presents in a systematic and clear way the results of the research based on an overall analysis and evaluation of nautical tourism ports' position and development plans. On the basis of the results obtained, the paper presents a model of sustainable development of nautical tourism ports whereby the authors propose to redefine the approach to planning the development of nautical tourism and particularly to creating the offer and to understanding the relationship between economic development and environmental protection.

Keywords Nautical tourism ports, Planning, Economic efficiency, Sustainable development, Linear programming method, the PESTELI method

INTRODUCTION

In determining whether a business subject is successful or not, less successful or unsuccessful, it is important to consider whether there is a systematic and detailed development planning in place in the company. Any company development planning has to be in compliance with its business policy; nevertheless, various external factors coming from the environment of the company have necessarily to be taken into consideration. External factors (comprising natural-spatial, social-cultural, legal-political and economic environment) are often outside the range of the company's business policy even if in the long-term they have an intensely interactive relationship. In this way, in their development, while having in mind the principles of sustainable development as one of the most important external factors today, nautical tourism ports may set up models and development plans which shall enable their efficiency not only in implementing their business process but also within the environmental protection and protection of living quality standards. The new dimension of such nautical reality is present even in the nautical tourism ports of the developed European states and may be reflected in the achieved nautical tourism ports' development level in general as well as in the constant process of their flexibility and adaptation to changes in the environment.

Pleasure boater, as a client (user) of nautical tourism ports, has access to new information, value orientations and requirements; therefore, business processes which are evolving in the nautical tourism ports have to be based on flexibility and adaptation as well as on creation of new forms of nautical services. These processes in Croatian nautical tourism ports are visible through the implementation of computerization, automation, individualization and internationalization of offers and services. Shaping of such nautical needs is followed by easily recognizable impact of the traditional offer and great changes in the offer of port and additional services. Taking into consideration the above mentioned facts, it can be concluded that nautical requirements include an offer adaptable to every single pleasure boater, which means appreciation for marketing approach, sustainable development principles and economical profitability in nautical tourism ports' development planning.

The subject of the research dealt with in this article is focused on the analysis of characteristics featuring the impact of environmental and business activities' upon nautical tourism ports' development in compliance with sustainable development principles. This is the reason why the authors, on the basis of so-far researches on possibilities and limitations concerning nautical tourism development, illustrate a model of development of nautical tourism ports, based on some significant development elements: human resources lifelong learning (permanent professional training), achievement of quality standards, arrangement of the location and achievement of building construction level, in addition to adequate technical-technological sustainable development conditions. In order for possible development model to be presented, the authors have chosen linear function and using the linear programming method (Simplex) they have established the growth coefficient, while defining the model constant by numerical evaluation of the environment development level by use of the Pesteli method. In this way, they have presented a frame of possible development of nautical tourism ports in the Republic of Croatia.

1. THE SIGNIFICANCE AND ROLE OF NAUTICAL TOURISM PORTS IN THE TOURISM AND ECONOMICAL DEVELOPMENT OF THE COUNTRY

Particular significance of nautical tourism in promoting economical development of the country in general is reflected in its numerous advantages. Nautical tourism has a very high multiplier effect, allowing it to become one of the most competitive products of Croatia in the world. Nautical tourism is a selective form of tourism which ensures at least 180-210 days of business activities in the year, while, in relation to the hotel capacity, the turnover of the invested capital is much more dynamic. Investments in nautical tourism are lower in relation to the same number of accommodation units, while the invested capital return is as much as twice as fast as in other tourist branches since attracting financially better standing quality clients, promoting in this way the quality and strengthening the image of the country. Croatia is comparatively more abundant in advantages crucial for the development of nautical tourism as compared with its direct competitors in the nautical market of the Mediterranean Sea.

Nautical tourism is considered one of the most propulsive kinds of recreational tourism. Thanks to its multiplier effects, it contributes to a richer and more versatile quality of life, urbanization and area planning, thus paving the way to other effects, directly or indirectly linked to an overall tourist humanization of space. Through pleasure boaters' consumption, and particularly foreign ones, numerous direct and indirect effects (Bošković et al. 2006) for single economic subjects and for the country in general are achieved. Thus, for example, nautical tourism ports and especially marinas as complex facilities offering a wide range of services often produce a higher rate of return on equity invested in their construction than the capital invested in other forms of tourism. Furthermore, the construction of nautical tourism ports involves also builders, shipbuilders and other industries through the sale of their products to pleasure boaters through hospitality and commercial services rendered.

Nautical tourism contributes to the general development of the economy of any country or any area by fostering their growth and development through both their current activities and those related with them horizontally (excursion tourism, diving tourism, photo safari, servicing, and so on) or vertically (handicrafts, shipbuilding, and so on). All those activities contribute to the growth in employment of domicile inhabitants, which is particularly important for insular economy. As far as social aspect of nautical tourism is concerned, its contribution is seen in the transfer of information, knowledge, culture and lifestyle. In this way, nautical tourism has a significant contribution as its foreign boats and yachts and their equipment attract domicile population, thus promoting the development of ideas, creativity and free thinking. The impact produced by nautical tourism on the general development of an area or a country in social terms affects particularly the education of young men. From the viewpoint of the receptive country, nautical tourism represents an important source of foreign exchange yield which is considered a specific form of export (the so-called invisible export). All expenditures of foreign tourism in any country represent a contribution to the balance of payment of the host country. Foreign exchange earnings from tourism are very important sources for developing countries, inclusive of Croatia.

2. SELECTION OF METHODS FOR ANALYSING THE MODEL OF NAUTICAL TOURISM PORTS' DEVELOPMENT

Considering all the mentioned theoretical assumptions and previous researches of nautical tourism ports during 2008 and 2009, the authors of this paper have carried out a research on possibilities and limitations of the development of nautical ports with particular emphasis on the Northern Adriatic nautical ports. Relevant business operation factors for nautical tourism ports have been examined and particularly rules and regulations, the area and ecological factors, infrastructure and technological-economical aspects, and the role of human resources in the management of nautical tourism ports has been established.

The research has been aimed at offering a long-time development model for achieving successful business operation based on some significant development elements:

1. human resources (permanent professional training) lifelong learning,
2. achievement of quality standards,

3. planning of the location and achievement of building development level, and
4. adequate technical-technological conditions.

In establishing the development model for nautical tourism ports, on a theoretical level the model of nautical port as an autonomous business subject has been chosen. The authors have used the data resulting from business operation analyses in respect of the selected companies and authors' own observations. For presenting the development model, thanks to its simplicity, the linear function has been chosen. The shortcoming attributable to the presentation by linear function is due to the impossibility for the model to be fully illustrated, that is for all the factors of the environment to be taken into consideration.

However, considering the most important factors, it is possible for the area of model definition to be established, under the assumption of maximum and minimum possible investments being in the function of the creation of prerequisites for sustainable growth and development of nautical tourism ports. Within the area of the definition, and after having positioned the previously selected and theoretically elaborated model, it is possible, with a certain probability, to evaluate the analyzed model of nautical tourism ports development. Such evaluation is important for business planning and further development of nautical ports.

In order for the maximum coefficient to be obtained, after having selected the linearly dependent factors, the Simplex method of linear programming has been applied (Brajdić 1998). Moreover, owing to the simplicity of its optimization and accessibility tools, the SOLVER method has been chosen as well. The starting point in the calculation of the linear equation coefficient represents investments in single development factors (investment in education of personnel, achievement of quality standards, location arrangement and achievement of building level and investment in adequate development, technical and technological conditions), while the constant has been defined by numerical evaluation of the environment development level using the PESTELI analysis method.

In order for the environment to be defined, the PESTELI environment analysis method has been used which allows for numerical evaluation to be obtained in respect of every single area, which makes it closely related with mathematical model. Its disadvantages are seen in its specialist nature and dependence upon defined topics within an area and therefore it needs to be implemented after a research. For research purposes and in order to receive high-quality input data, an analysis of selected business subjects' environment has been carried out. The selected environment factors within each single area have been evaluated using the PESTELI method and processed, and the obtained results have been used in defining the development strategy. The advantages of the used method are reflected in the complete coverage of environment factors for better decision making, based on an overall environment analysis.

This paper has used the knowledge, material and documentation in respect of the environment and the evaluation represents the results of authors' elaborated work and research carried out.

3. DEFINITION OF THE NORTHERN ADRIATIC NAUTICAL TOURISM PORTS IN THE FUNCTION OF SUSTAINABLE DEVELOPMENT

The Northern Adriatic nautical tourism ports development model is based on the principles of sustainable development, as illustrated by the following linear function:

$$y = z_{\max} t + b$$

where single letters have the significance as following:

- y – development,
- z – parameter (fall, growth or constancy) of the function affected by internal factors,
- t – time,
- b – parameter indicating the impact of the environment which is constant and not dependent upon internal factors.

The entire model is yet more complex and therefore the internal part of the model z is illustrated as a linear function of the internal elements to be optimized using the linear programming theory procedures and SOLVER tools. This is why the function of maximum (z_{\max}) has been added. The environment evaluation of the organization b , will be obtained by PESTELI analysis.

3.1. Standard problem of linear programming

The standard problem of linear programming for the maximum criterion is as follows:

$$\text{Max} Z = c_1 x_1 + c_2 x_2 + \dots + c_n x_n$$

with the limitation as follows:

$$\sum_{j=1}^n a_j x_j \leq b_i \quad i = 1, 2, \dots, n$$

and the condition of non-negativity:

$$x_1, x_2, \dots, x_n \geq 0$$

Conditions to be satisfied in order for the standard form of linear programming to be applied are as following:

- linearity of the function of target and the relationship of structural variables in limitation equations;
- discreteness and addictiveness of the process in the consumption of resources and in the function of criteria,
- arbitrary divisibility of factors,
- limited number of processes, activities and limitations.

In the Northern Adriatic nautical tourism ports development model in the function of sustainable development, the model function has been established in the form as follows:

$$\text{Max} Z = 2,5x_1 + 2x_2 + 1x_3 + 1,5x_4$$

where:

- x_1 - denotes investments in human resources permanent professional training (lifelong education of personnel), where the impact ponder on the efficiency of the organization in the function of sustainable development has been assessed at 2.5;
- x_2 - denotes the achievement of the **quality standard**, where the impact ponder on the efficiency of the organization in the function of sustainable development has been assessed at 2.
- x_3 - denotes the **assessment of the location and the building level achieved**, where the efficiency of the organization in the function of sustainable development has been assessed at 1.
- x_4 - denotes **technical and technological conditions for sustainable development**, the efficiency of the organization in the function of sustainable development has been assessed at 1.5.

The function of the target is the investment in the development which has to be maximized. The coefficients, expressed by the linear function, have been defined by the impact of ponders of each single factor on the efficiency of the port development model. Such coefficients are the result of a subjective evaluation of business operation data collected in various nautical ports of Croatia based on the numerical evaluation scale ranging from 1 to 3.

Considering that rate 2.5 has been assigned to the most important factor of the organization of nautical tourism ports, that is to human resources, one should bear in mind that quality standards are also significant and in this paper they have been rated 2, while the achieved port building level, which is also important, but not decisive, has been rated 1, application of new technology 1.5, which is much more significant as compared to the building level achieved, but is not decisive. This means that technology, construction level and quality standards are not sufficient, and cannot replace human resources which are indispensable for a successful organisation.

Restrictions are represented by overall possible investments (from profits earned), minimum and maximum allocation of costs by the element, which means 20% and 30% up to 100%, in addition to the condition of non-negativity. After having examined financial results 2000 - 2008, the minimum possible investments are predicted to amount to 20% or 30% at the maximum, out of possible 100%. Greater investments were not possible due to adverse credit and other objective reasons related with market operations. It has to be emphasized here that ponder values and maximum allocation of costs in the overall investments are valid for well set up nautical tourism ports, with no costs of initial investment in their construction being included. As for the moment, data for 2009 are not completely available.

The optimization tool used was the SOLVER, embedded in its incomplete form in the MS Excel application, thus being accessible to a wider range of users. Any linear programming problems will be solved by the SIMPLEX method being limited to 200 variables, which is more than enough for the model, considering that the researched model includes only four variables as presented in Table 1.

Table 1: Presentation of the initial situation in SOLVER

	Human resources	Standards	Construction level achieved	Technology	Function (max)		
	x_1	x_2	x_3	x_4	$2,5x_1+2x_2+1x_3+1,5x_4$		
	0	0	0	0	0		
	2,5	2	1	1,5			
Limitation function	1				0	30	max
		1			0	30	max
			1		0	30	max
				1	0	30	max
	1	1	1	1	0	100	max
	1				0	20	min
		1			0	20	min
			1		0	20	min
			1	0	20	min	

The solution using SOLVER is shown in Table 2.

Table 2: Presentation of the solution using SOLVER

	Human resources	Standards	Construction level	Technology	Function (max)		
	x_1	x_2	x_3	x_4	$2,5x_1+2x_2+1x_3+1,5x_4$		
	30	30	20	20	$185,0000018(index=1,85)$		
	2,5	2	1	1,5			
Limitation function	1				30,0000003	30	max
		1			30	30	max
			1		20	30	max
				1	20,0000007	30	max
	1	1	1	1	100,000001	100	max
	1				30,0000003	20	min
		1			30	20	min
			1		20	20	min
			1	20,0000007	20	min	

The solutions obtained using SOLVER indicate that the optimal investment in the selected factors of nautical tourist ports is reached when the investment is allocated as follows:

- investment in human resources: 30 %,
- investment in quality standards: 30 %,
- investment in the construction level: 20 %, and
- investment in technology: 20 % of overall investments.

Such allocation of costs is indicative of homogenized and balanced investments in nautical tourist ports aimed at achieving the model of organization which will be in the function of an efficient business operation.

3.2. PEST Environment Analysis

The PEST or STEP analysis is a method and technique used by managers in monitoring the impact of the environment their organization operates within. The PEST analysis covers political, economical, socio-cultural and technical-technological fields. Where the importance of a certain area so requires, it is possible for specific analysis area to be extended and deepened appropriately. In this case, such models are called extended PEST models. Where the analysis is extended to ecological, industrial and legislative area, it is called PESTELI (*Ecological, Legislative, Industrial*). Each PEST, or PESTELI analysis is unique as it is adapted to the business subject for which it has been drawn up and to the choice of the domain to be examined; in fact, beside the description method, one of the calculation method is the numerical rating method which has been used in this paper.

The environment affecting the organization may be numerically determined on the basis of various statistical data and evaluations. The scale ranging from -5 for the most negative action up to 5 for the most positive action of factors affecting the environment is most frequently used for the action power. The factor coefficient is multiplied by the influence of the factor on the specific business subject. For example, the duration of a concession on a maritime demesne has a great importance for nautical tourist ports, but for agricultural production in the hinterland it produces no impact at all. Naturally, in the latter case, this environmental factor will not be examined.

The scale has been divided in numerical values from 1 to 5. Once all the environmental factors have been established, the evaluation of the environment will be obtained, which determines the environment the business subject operates in. This evaluation can be negative, neutral (around 0) or positive. However, since these conditions cannot be changed in the organization of the business subject, they are a constant in the function of the model and they change under the influence of external factors arising from the environment (Table 3).

Environmental factors used in the application of the PESTELI method have been selected according to the areas considered to be important in defining the environment of nautical tourist ports operation. Some negative factors, such as, for example, public administration efficiency, duration of concession, have a negative incidence on the efficiency of port business operation. Negative factors also include the level of services, service prices and growth in pollution. On the other hand, owing to their positive action, new life trends, application of quality standards, technological inventions and political stability encourage the development of nautical tourism ports.

Table 3: **PESTELI environment analysis of the Northern Adriatic nautical ports in the function of sustainable development**

<i>Environment factor</i>	<i>Action power (-5 do +5) a</i>	<i>Importance for the organization (1-5) b</i>	<i>Overall estimation axb</i>
Political legislative frame			
Law consistency	2	5	10
Duration of concession on maritime demesne	-1	4	-4
Fiscal system	3	3	9
Public Administration efficiency	-4	2	-8
Political stability	3	4	12
Overall estimation			19
Average estimation			3,8
Economic frame			
Efficient business operation (concession amount)	0	4	0
Competition strengthening	-2	2	-4
Drop in standard	-2,5	3	-7,5
Higher level of services	-1,5	4	-6
Price of services	-2,5	4	-10
Overall estimation			-27,5
Average estimation			-5,5
Technical and technological dimension			
New quality standard	1	3	3
New technological invention	2	3	6
Growth in the number of yachts	-2	4	-8
Overall estimation			1
Average estimation			0,333333
Natural economical dimension			
Prolongation of off-seasonal activity	2,6	4	10,4
Growth in ecological pollution	-1	5	-5
Application of quality standards	3,25	5	16,25
Overall estimation			21,65
Average estimation			7,216666
Social and cultural dimension			
Growth in the number of inhabitants	0	1	0
Growth in education level	2	4	8
New trends of life	2	3	6
Overall estimation			14
Average estimation			4,666666
Overall environment for organization			28,15
Average estimation			1,48

All environmental factors are important for business operations of nautical ports; however, consistency of the legislative system, application of quality standards, pollution, if any, and other factors which have been ranked 4 and 5, are particularly significant for an efficient operation and evenly developed growth of nautical tourist ports.

4. ANALYSIS OF THE NORTHERN ADRIATIC NAUTICAL TOURISM PORTS IN THE FUNCTION OF SUSTAINABLE DEVELOPMENT

By inserting the achieved results from the previous chapter in the linear function $y = z_{\max}t + b$, the area of possible model solutions, limited by the indicated lines, is obtained:

$y_1 \equiv y = 1,85t + 1,48$ at the maximum growth of the function, or:

$y = 1,48$ where no investment in nautical tourism ports is present.

This means that by maximizing z_{\max} the coefficient of maximum growth is obtained, while by its minimizing, i.e. making it equal to 0 (with no investment), a constant function depending only upon the environmental evaluation is achieved.

If investments in the selected organization factors of nautical tourism are allocated as follows: investment in human resources – 30%, investment in quality standards – 30%, investment in the construction level achieved – 20% and investment in technology – 20% of overall investments, then under the ideal market conditions (low interest rate, growth in seasonal operation days, greater productivity and so on), it is possible to reach the maximum growth coefficient of 1.85% per annum. In this case, the quantitative growth would be achieved in a shorter period of time, which is very difficult to achieve under the conditions being in place for nautical tourism ports in Croatia.

It may be expected that investments will follow a much more moderate increase, especially in nautical tourism ports with unsettled ownership rights and in sport and communal ports managed by port authorities and citizens associations.

Problems obstructing the development of nautical ports are caused by frequent changes in political and legislative fields (that is rules and regulations), such as the adoption of new Concession Act, which additionally restrains the concession awarding procedure as a prerequisite for business performance. Slowness in determining the limits and registration of the maritime demesne has a negative impact on potential locations of nautical tourism ports. Beside the Concession Act, particular problems are caused by regional plans as the basis for location and development of nautical ports. Slowness and weakness of regional planning have a continuous negative impact on the indispensable nautical infrastructure.

Furthermore, economical environment is of particular significance for the development of nautical tourism. Positive changes in the growth in standard and in service prices can significantly contribute to their possible development.

The offered model points to the need for investments as without investments there can be no development; however, in order for such a goal to be achieved, and apart from market conditions, other environmental prerequisites, such as legislative, technical-technological and other conditions, are equally important.

CONCLUSION

Application of the proposed model in the nautical tourism development planning has a significant importance for nautical ports operation. However, without the high quality professional personnel required for the management of nautical tourism ports, there can be no continuous development. In fact, no growth by itself can bring any long-term progress. Without development, growth can only provisionally provide successful operation. Therefore, it is logical to conclude that growth is just a component of any development, while development is a changing process reflected in continuous and successful operation of nautical ports, and especially in the satisfaction of their employees.

This is the reason why changes in ownership, and especially in management, are necessarily required to pave the way to the development of nautical tourism ports. In this case, the State can operate with its incentives, taking part in business operation only in capacity of a business partner with the aim of achieving efficiency.

Privately owned nautical tourism ports operating as independent business subjects show that it is possible to operate positively and to follow development. Investments are constant and they refer to current maintenance, modern infrastructural solutions and technical-technological equipment aimed at enhancing service quality. Particular attention is paid to the protection of the sea and environment, which represents an additional investment featuring, beside its positive influence on ecology and marketing, an efficient impact on their business operation.

The autonomous model of operation has proven to be the best business model in the world and recently, some Mediterranean countries in encouraging their development have taken part in their capacity as business partners in the financial segment without influencing business operation of nautical tourism ports.

In the environment the Northern Adriatic nautical ports operate in, the autonomous business model appears to be the best solution for their better and successful business operation.

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