Analysis

A New Approach Within ANP-SWOT Framework for Prioritization of Ecosystem Management and Case Study of National Park Djerdap, Serbia

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ABSTRACT

Complex National Park (NP) Management Problems often requires a multidisciplinary approach in the process of business decision-making involving various stakeholders from the region. In the decision-making process, the methodology, based on combining SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) and the Analytical Network Process (ANP) methods, has been proved as a very useful tool in numerous surveys as it is being presented in this paper on the example of the National Park Djerdap (NPDJ). In the conducted research, aimed to achieve business vision of this company, a four-phase decision making approach was defined. In the defined model, the situation SWOT analysis was used as the baseline in the analysis of the situation on the ground. Hence, four scenarios were generated by experts using the ANP method of multi-criteria decision-making. The results obtained within the research identified the scenarios of the highest priority - sustainable development and environmental protection - which would enable the National Park Djerdap to achieve its vision. The proposed model is flexible in the sense that its network structure and rules allow minor adjustments for its application to similar problems in the environmental management in other protected natural areas.

1. Introduction

The protected areas, which also include the national parks (NP), increasingly contribute to the sustainable development of the local community (Andam et al., 2010; Getzner et al., 2012; Getzner, 2014). In addition to the environmental dimension, the conservation of biodiversity and natural ecosystems, the economic aspects of the functioning of the national parks become more prominent over time, due to the numerous opportunities for the development of the tourism, and other related activities in the region that complement the tourist offer of the national parks (Steven et al., 2013). It also has extensive consequences for the entire region as it leads to a better utilization of the existing capacities and opening of the new business entities in the region (Lesáková, 2011) due to an increase in the number of the tourists which creates a significant growth in demand for a variety of products and services (Getzner, 2014).

With the evolution of the understanding of the significance of the national parks, there is a need for a change in the management style (Bulatović and Tripković Marković, 2015) in order to achieve harmony between the management functioning of the NP, local government, state authorities, private and public enterprises and local population (Puhakka and Saarinen, 2013). The management of the NP based only

on the environmental protection has been outmoded (Das, 2011). Contemporary business conditions require the introduction of an integrated management approach in the NP (Das and Chatterjee, 2015), which includes the harmonization of their business with the needs of the society and development priorities, i.e. the control of the NP area, the protection of biodiversity and focus on the economic development (Plummer and Fennel, 2009; Jalani, 2012). The integrated management approach contributes to the development of the national park and the region where the NP is located (Dharmaratne et al., 2000; Chiu et al., 2014). This provides the local community with the following benefits: the income-generating, the employment growth and the increase in the awareness of the importance of the protected areas (Sirivongs and Tsuchiya, 2012; Moharramnejad et al., 2013). The functional way of management in the national parks balances the needs of the society and the economic and environmental principles, ensuring the long-term sustainable development of the region through the more rational exploitation of the resources, more efficient asset allocation and improvement of the tourist potential (Dharmaratne et al., 2000; Plummer and Fennel, 2009; Bulatović and Tripković Marković, 2015; Zamfir and Corbos, 2015). Based on this, the development of the national parks is, on one hand, aimed at achieving sustainable tourism in order to meet the needs of the tourists, as well as the needs of the tourist destination

while protecting and increasing the possibilities for future generations' tourism. However, it also protects and increases the development potential of the entire region through keeping with the social, economic, political, environmental and spatial principles (Reihanian et al., 2012; Hansen, 2013; Grošelj et al., 2016).

The development of the management strategies in the national parks introduces the preferred courses of action aimed at achieving long-term sustainability (Sharpley, 2000; Tucker and Boonabana, 2012; Cortés et al., 2003). During the planning of the developmental alternatives, it is important to consider the interests of all internal and external stakeholders from the region (Cortés et al., 2003).

National park management is a complex task which requires thorough multidisciplinary consideration of a great number of issues that the development and implementation of a clear and effective management strategy are depending on. SWOT analysis (Reihanian et al., 2012; Ghorbani et al., 2015) has been a very efficient tool in defining the management plans aimed to determine the factual state that characterizes the performance of a national park. SWOT analysis is used both for determining the strategic position of the company and getting the real picture in deciding which strategy suits the company better. It is also used in realizing whether the generated strategies (business scenarios) would enable the company to apply it appropriately (Houben et al., 1999; Kangas et al., 2003; Kajanus et al., 2012). In order to improve the quality of the application of this tool by quantifying SWOT factors, its application has been significantly extended. Lately, SWOT analysis, as a tool for generating and ranking strategies, has been upgraded with numerous Multi-Criteria Decision Making (MCDM) methods that significantly expanded its application and opened many opportunities for decision-makers to make objective decisions under conditions of uncertainty (Sevkli et al., 2012; Kheirkhah et al., 2014). Numerous studies in the world have used SWOT analysis in defining management strategies in the function of local development of national parks, both in developed and underdeveloped countries (USA, Sweden, Finland, China, Thailand, Australia, Greece, Bulgaria, Montenegro, Turkey, Malaysia, Vietnam, Kenya, Taiwan and many others) (Shafer, 1999; Arabatzis and Grigorodis, 2010; Hong and Chan, 2010; Ataberk and Baykal, 2011; Arnberger et al., 2012; Mayaka and Prasad, 2012; Liu et al., 2013; Ghorbani et al., 2015; Bulatović and Tripković Marković, 2015; Randle and Hoye, 2016; Ly and Xiao, 2016; Kangas et al., 2016).

Decision-makers encounter many challenges which have to be overcome when defining the Management Plan and they need to consider a number of participants who are affected by the management of the national parks (Masberg and Morales, 1999). The management of the National Park Djerdap, the largest national park in Serbia, is facing many challenges in its management. Bearing in mind various developmental problems in the region on the territory where the park is located, the management of this pubic enterprise has to endure a demanding challenge. The management of the NPDJ is expected to elaborate in details the alternative scenarios whose objective is the development of the NPDJ with the contribution to the regional development (Masberg and Morales, 1999). The draft for the NPDJ Management Plan for the period from 2017 to 2026 was passed and it defines the basic guidelines for the future management (Management Plan, 2016). Based on this draft the authors of this paper propose the universal model which can be used for the ranking of the alternative scenarios for the realization of the business vision of the enterprise built on the integration of the strategic goals and SWOT factors, using the ANP method for the multi-criteria decision-making. The ANP method, which is one of the widely used multi-criteria decision making techniques, was chosen because of its superiority in addressing the complex network structure. Analyzing the MCDM methods, the ANP has been found as the most appropriate methodological solution for defining complex decision making structural model for achieving the vision of National Park Djerdap. Moreover, the advantage of an ANP method in relation to other methods is in its possibility to evaluate all relationships between clusters of the network structure and elements within

them by adding potential interactions, interdependencies and feedbacks in the decision making system (Sevkli et al., 2012; Grošelj et al., 2015; Gigović et al., 2017). It handles interdependence among elements by obtaining the composite weights through the development of so called "supermatrix". The node of a network structure represents a cluster with elements inside it, a straight line or an arc denotes the interactions between two components and a loop indicates the inner dependence of elements within a component (Hsu et al., 2012; Kheirkhah et al., 2014; Pamučar, D.S., et al., 2017).

Hence, the aim of this paper was to create systematic approach and define scenarios for the future development of NPDJ in order to fulfil park vision and that is to promote the potential of this natural protected area as well to underline its role as a main factor of the regional development in this part of Serbia. In order to accomplish the defined goal, the following sections were discussed in this paper: Section 2 (Theoretical framework) describes the review of benchmarking practices in this field; Section 3 (Methodological framework) gives short background regarding ANP method and presents methodological frame consisted of four steps; Section 4 (Case study - National Park Djerdap, Serbia) describes the case study of NPDJ, whereby the defining and evaluation of the elements of decision making of the proposed model were realized based on the inclusion of the most important stakeholders from the region as well as representatives of the management of the NPDJ; Section 5 (Discussion of results) discusses the obtained results of proposed model whereby the obtained results indicate that sustainable development and environmental protection are the most important directions for the future development of the NPDJ; and Section 6 (Conclusions) presents the main conclusions and recommend further actions.

2. Theoretical Framework

The positive impact of the national parks on the regional development is witnessed by the numerous benchmarking partners, i.e. the national parks and protected natural areas which represent the good examples of the management accomplishing benefits for the whole region in the world (CNPPAM, 2002).

Overcoming the existing conflicts between the key stakeholders that influence the development of the national parks and its management is a key obstacle to their development in many countries (Coria and Calfucura, 2012). In order to achieve collaboration between the stakeholders and the management of the NP, it is necessary to create a partnership that will be based on the realization of the shared objectives. Successful partnerships require investing effort of all participants, including making a decision first, and then implementing the planned activities together (Ghorbani et al., 2015). An example of such a successful partnership is the New Forest National Park (England), where, on the initiative of the local authorities, the integrated management strategy was defined which included the interests of the local stakeholders from the area on the one hand, and the protection of nature as the primary priority of the NP on the other hand (Gvozdenović et al., 2014). A partnership between the 10 public institutions, NGOs, various informal groups, businessmen and interested individuals was established. At the beginning, the management had difficulty in managing the work of all stakeholders, but, in time the relations improved and the decision-making progressed. With the support of the European Union, through the LIFE projects, a common vision of the New Forest National Park was created and the strategic and action plan was defined. Now, this protected natural area in England is annually visited by about 13.5 million people (New Forest district council, 2017).

The successful development of the NP in the market can be achieved by incorporating the offers of the national parks at the state level. The United States National Service (USNS) is an office that successfully manages and protects national parks in the United States. This office controls the work of 376 protected areas (National Park Service, 2017). In addition to 60 national parks, it also includes the protection of the

Table 1
Application of MCDM techniques in the national parks and protected areas.

Technique	Fuzzy (literature)	Traditional-crisp (literature)
ANP/AHP	Halabi et al. (2012); Chatterjee et al. (2015); Daroudi and Daroudi (2015); Wang et al. (2015); Najafinasab et al. (2015); Grošelj et al. (2016); Arsić et al. (2017)	Monavari et al. (2010); Tsai et al. (2010); Jozi et al. (2011); Jeon and Kim (2011).
TOPSIS	Li-fang et al. (2012).	
VICTOR		Tsai et al. (2010)
ELECTRE		Rudolphi and Haider (2003); Hamadouche et al. (2014); Botteroa et al. (2015)
PROMETHEE	Kheirkhah et al. (2014)	Hamadouche et al. (2014); Botteroa et al. (2015)

national monuments (Shafer, 1999). The USNS represents a good example of business practice which unites the representatives of the management of a large number of national parks whose aim is the satisfaction of the tourists. 90% of the services and revenue of this organization are achieved by the activity of the small enterprises (National Park Service, 2017) and the work of this organization significantly contributes to the development of the small and medium-sized enterprises in the local communities. In 2015 this service recorded a record number of visits (National Park Service, 2017).

Taking action in the protected areas in consultation and cooperation with the local population has positive effects on the development policy, plans and activities of the entire region (Jeon and Kim, 2011). Numerous wetlands on the territory of the Northern Scotland were turned into plantation forests during the 80′s, with the support of the government, causing the dispute between those responsible for the forest management and those who advocate for nature. Afforestation was seen as an employment possibility for the local population, although the disturbance of natural habitats was not generally supported. When a non-governmental organization was offered to buy land and restore the wetland, the consultations with the local population were initiated. The activists visited all the households in the region, presented their project and asked for people's opinion which resulted in the formation of the joint plan of action. The restoration of the wetlands was realized on the defined plan, which reduced the wood production, although a great deal was invested in the improvement of the tourist offer and promotion of the tourism in the region. This offered the local population employment opportunities and possibilities to develop the business, and natural habitats were preserved (Gvozdenović et al., 2014), thus realizing the mutual interest.

In 2013, the Victorian State Government (Australia), made some changes in the law allowing the private sector participation in forming the touristic offer for the Victorian National Parks (Randle and Hoye, 2016) through the establishment of public-private partnerships. This provided the opportunity to work on the neglected and decayed infrastructure on the territory of the national park and construct the missing facilities for the purposes of tourism (Haukeland et al., 2010) which represents one of the essential preconditions for long-term sustainable development of the national parks.

However, by reviewing the scientific literature, it can be concluded that there is still not enough strong synergy between theory and practice for the subject of this study. Although management science has developed a number of methodological approaches to systemic management in national parks, practice still reluctantly applies the proposed solutions. One of the reasons for this resistance is that the practice and current approaches applied are not strongly and transparently based on the theoretical frameworks. Thus this paper proposes a universal model of systemic approach to the NPs management which besides the theoretical contribution also shows its wider practical application.

3. Methodological Framework

To establish the foundation for the proposed methodology, this section aims to briefly describe the applied well-known multi-criteria

decision making approach ANP as well to explain in more details proposed steps in methodological procedure.

3.1. The Analytic Network Process (ANP)

The methodology based on the multi-criteria decision-making process (MCDM) represents a good starting point for resolving managerial problems considering national parks because it is possible to acquire the list of the strategies with the priority and alternative courses of action based on the ranking of the SWOT factors in relation to multi-subfactors simultaneously (Reihanian et al., 2012; Živković et al., 2015; Grošelj et al., 2016; Arsić et al., 2017).

In the literature, one can find numerous examples of the application of different MCDM methods, either alone or in a combination with other methods, in a conventional form or in the fuzzy environment (Kurttila et al., 2000; Kajanus et al., 2004; Saaty, 2008; Tadić et al., 2014; Dimić et al., 2016; Pamučar, D.S., et al., 2017). The objective of multi-criteria decision making models is to select the best alternative or object from a set of feasible alternatives or objects with regard to a given set of criteria. Based on the literature survey (shown in Table 1), it can be noticed that authors have given much attention to both the development and application of various multi-criteria techniques in national parks such as: AHP, ANP, TOPSIS, ELECTRE, VICTOR, PROMETHEE (Monavari et al., 2010; Tsai et al., 2010; Daroudi and Daroudi, 2015; Arsić et al., 2017).

Recently, there have been a lot of studies reporting on the application of ANP to variety of problems in national parks that include the selection of strategy of sustainable development in national parks (Öztürk, 2015; Grošelj et al., 2016), identification the strategies for implementation of ecotourism (Hong and Chan, 2010; Daroudi and Daroudi, 2015; Ghorbani et al., 2015; Siswanto, 2015; Arsić et al., 2017), visitors' satisfaction and perceptions in national park (Arabatzis and Grigorodis, 2010), and ranking websites (Tsai et al., 2010).

Analytic Network Process represents a generalized form of the AHP method which was developed by Thomas Saaty in 1996. The objective was to eliminate the problem of the interdependence between the criteria and/or alternatives in the complex multi-criteria models (Lovreta, 2007). The ANP method consists of two parts. The first part consists of a controlled hierarchy or a criteria and subcriteria network which controls the system interactions. The second part consists of the influence between the elements and cluster's grid. The decision-making problem which is analysed with the ANP method is often examined using the grid structure due to the occurrence of the functional interdependences between the clusters (Saaty and Takizawa, 1986). All interdependences within the clusters are called internal interdependences, and all interactions and backlinks between the clusters are called external interdependences.

The ANP procedure is realized through four steps (Saaty, 1996; Panić and Lovren, 2014). First, the defining of the model and structuring of the problem are performed. The interpretation of the problem is done through a system similar to a network. The next step includes the comparison of the elements of decision pairs in each cluster and determination of the priority in regard to the control criterion. Interdependence between the cluster criteria is also examined and compared

Table 2
Saaty's 1–9 scale for AHP preference (Saaty, 1996).

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one over another
5	Strong importance	Experience and judgment strongly favor one over another
7	Very strong importance	Activity is strongly favored and its dominance is demonstrated in practice
9	Absolute importance	Importance of one over another affirmed on the highest possible order
2, 4, 6, 8	Intermediate values	Used to represent compromise between the priorities listed above 1, 3, 5, 7 and 9

using the Saaty scale shown in Table 2. The matrix form is used for the comparison of the elements of decision pairs.

The supermatrix is formed in the third step. In order to attain a global priority in the system with the inter-dependable influences, the local priority vectors are entered into the corresponding matrix columns. The result is a supermatrix which is, in fact, a divided matrix where each segment represents the connection between the two clusters in the system. Within the supermatrix, W local priority vectors, which can be found in the W_{21} matrix, represent the influence of the strategic goals in the company's vision, while the W_{23} matrix represents the influence of the strategic goals on the SWOT factors. The influence of the SWOT factors on the strategic goals is presented in the W_{32} matrix. The W_{43} matrix within the supermatrix shows the influence of the SWOT subfactors within the defined SWOT factors and the W_{54} shows the interrelationships of the proposed alternatives in regard to the SWOT subfactors. The standard form of the supermatrix for the proposed model is shown in Fig. 1.

The synthesis of the criteria and alternatives priority is done in the last step, as well as the selection of the best alternative. In order to perform global priority vectors, obtained supermatrix from the previous step, which is in this case also equal to the weighted supermatrix, should be raised to the limiting powers (Yuksel and Dagdeviren, 2007):

$$\lim_{k \to \infty} W^k \tag{1}$$

Raising the supermatrix (in this case weighted supermatrix) to exponential powers produces the long-term relative influences of the elements on each other (Saaty, 1996). In addition, if the supermarix has the effect of cyclicity, there may be two or N limiting supermatrices. In this case, the Cesaro sum is calculated as in following equation in order to get average priority weights:

$$\lim_{k \to \infty} \left(\frac{1}{N} \right) \sum_{i=1}^{N} W_i^k \tag{2}$$

Finally, the ANP methodology can also be used for the collective evaluation, where values that form the estimates of the group for the compared elements of decision pairs are formed by the stakeholders in the group.

$$a_{ij} = \left(\prod_{p=1}^{s} a_{ijp} \right)^{1/s} \tag{3}$$

The a_{ij} is the stakeholder's aggregate grade for the compared
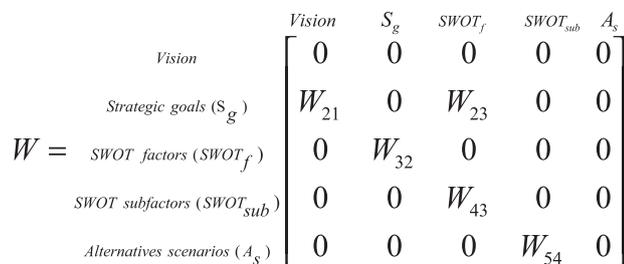
elements of decision pairs, and a_{ijp} is the individual grade for the elements of decision pairs provided from the p stakeholders in the group (Pamučar, D., et al., 2017).

3.2. Proposed SWOT-ANP Model

Due to the constant changes the management of the NP encounters, a need for the implementation of a system framework, which allows the structuring of the problems and offers relevant data for the analysis, becomes necessary. Based on this, the main objective of this paper is the development of the model for the strategic decision-making that can be used for the evaluation of the alternative scenarios in regard to the SWOT factors and the strategic goals. The structure of the proposed approach, as shown in Fig. 2, consists of a grid with the following clusters: vision, strategic goals, SWOT factors and alternative scenarios.

Defining of the integral model is an acceptable starting point in identifying the alternative scenarios (based on the interrelationship between the SWOT factor and subfactors) to choose for the preferred course of action. At the beginning of the 21st century the combination of the SWOT analysis and the AHP method brought the A'WOT method (Kurttila et al., 2000; Stević et al., 2016). The aim was to improve the measurability of the SWOT factors and to upgrade the quantitative basis for the strategic planning. This method found a wide application in various fields (Kurttila et al., 2000; Kajanus et al., 2004; Arsić et al., 2017; Kangas et al., 2016). Complex problems that decision-makers have to model can often be explained only by using the classical linear hierarchy. Therefore, the Analytic Network Process, ANP, substitutes the hierarchical structure with the grid structure which allows the structuring of the decision-making problem with the interdependence between the clusters (Sevkli et al., 2012; Grošelj et al., 2015). The ANP approach enables the modelling of the complex interconnections between levels and attributes (Saaty, 2006; Yuksel and Dagdeviren, 2007). To produce the definite priority of the defined scenarios (alternatives), the ANP method of the multi-criteria decision-making was used in the study conducted in the NPDJ due to the numerous advantages it possesses (Hsu et al., 2012; Chan and Bhatta, 2013; Panić and Lovren, 2014). For the purpose of this study, a model which provides the selection of the alternative scenario in order to achieve the vision of the company was defined based on the interaction between SGs and SWOT subfactors (Fig. 2). The realization of the proposed approach shown in Fig. 2 is performed through the following four stages (see Fig. 3): 1 - the identification of the elements; 2 - interrelationship of the criteria in the model; 3 - comparison of the alternatives and subfactors; and 4 - the extensive synthesis of the results obtained by the ANP method.

In order to define all elements of the proposed model (see Fig. 3), were involved the most important stakeholders from the region. The group of stakeholders which is called LAG (Local Action Group) consisted of representatives from the management of NPDJ, local municipalities, NGO representatives, local residents, nature protection associations and experts from universities. Through a series of workshops and meetings, firstly they were familiar with the methodological steps and their tasks during defining of the model. And then after generating the final form of the model, they evaluated the elements for each defined cluster in the model.

$$W = \begin{array}{c} \textit{Vision} \\ \textit{Strategic goals (S}_g) \\ \textit{SWOT factors (SWOT}_f) \\ \textit{SWOT subfactors (SWOT}_{sub}) \\ \textit{Alternatives scenarios (A}_S) \end{array} \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ W_{21} & 0 & W_{23} & 0 & 0 \\ 0 & W_{32} & 0 & 0 & 0 \\ 0 & 0 & W_{43} & 0 & 0 \\ 0 & 0 & 0 & W_{54} & 0 \end{bmatrix}$$

Fig. 1. The shape of the supermatrix of the network.
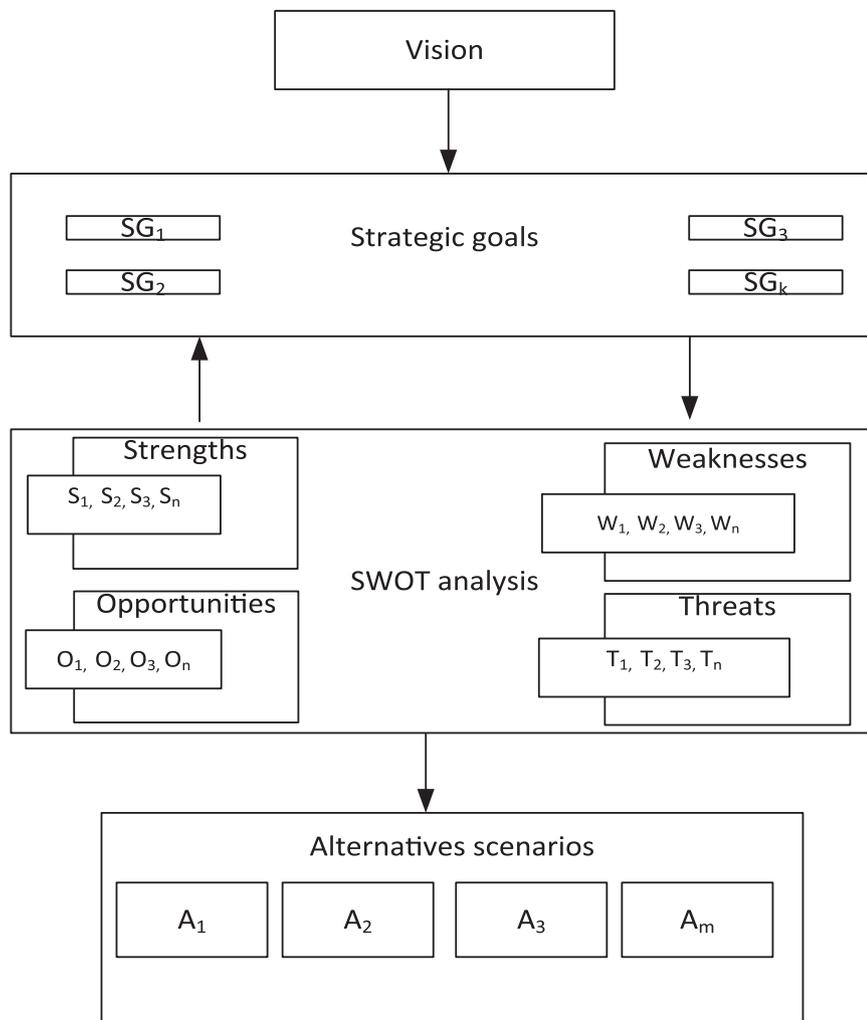
Phase 1. Starting from the vision which represents the desired position that the organization strives to achieve in the future, firstly the analysis of the relevant literature sources and documents of public interest was performed as well opinions of key stakeholders were collected through the brainstorming sections during the workshops. Based on that in order to define network structure of proposed model all necessary elements such strategic goals, SWOT criteria and subcriteria, as well alternatives scenarios were than defined (see Fig. 3).

Phase 2. The interrelationship between the criteria in the model is determined in the second phase of the proposed model in order to determine their significance. The comparison is performed between the SGs and the company's vision and between the SWOT factors and proposed SGs, as well as between the SGs and SWOT factors. The mutual significance of the SWOT subfactors within each SWOT factor is also determined. The classical technique which was suggested by Thomas Saaty can be used for the extraction of the weight vectors and matrixes for the defined matrix for the comparison of the element pairs of this phase (Saaty, 1996).

Phase 3. In this phase LAG representatives performed the comparisons of the proposed alternatives scenarios in the model and their priorities were calculated regarding to the each defined SWOT subfactors.

Phase 4. The complete synthesis of the obtained weights by the ANP method is performed. The interdependences between the clusters are determined which allow the final ranking of the proposed alternatives in regard to the conducted SWOT analysis and defined SGs of the company's vision. The evaluation of the supermatrix based on the obtained results from the second and third phase is accomplished using the Super Decision programme (Super Decision, 2000). The network's structure in this type of model serves to resolve the issues when making decisions. By doing so, the decision-makers (LAG representatives) are offered the insight into the final decision about the future course of action. Fig. 3 shows the schematics of the development of the suggested phases in the model.

4. Case Study - National Park Djerdap, Serbia

Djerdap National Park is located in South-Eastern Europe, in the northeastern part of Serbia, on the border with Romania (Fig. 4). Municipalities in which extends the Natiponal Park Djerdap (Golubac, Majdanpek and Kladovo) are located in the region of Southern and Eastern Serbia. By decision of the government of Serbia, it occupies a total area of 63,608.4 ha ("Official Gazette of RS", 2013). This area was put under protection because it represents a unique natural, cultural, historical and archaeological phenomenon in Europe and in the world and it is one of the most beautiful areas in Serbia (Lovreta, 2007).

This study complements the proposal of the Management Plan for the NP Djerdap in the period from 2017 to 2026, which defines the basic determining factors for the future management. The mentioned Management Plan defines SGs, which are thoroughly analysed in the study, on the basis of the conducted SWOT analysis, and then ranked in regards to the company's vision. Based on the obtained results, the alternative courses of action that encourage the development of the entire region are proposed. The proposed solution will serve as a starting point

Fig. 3. The phases of the proposed model.
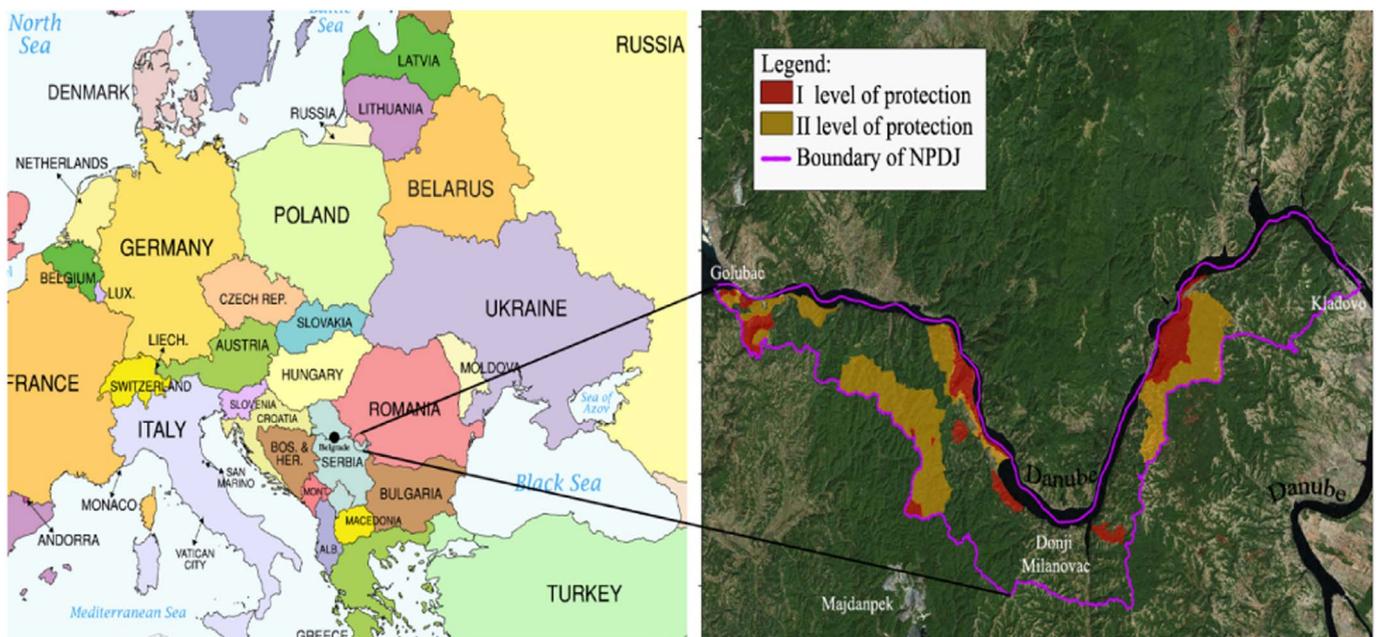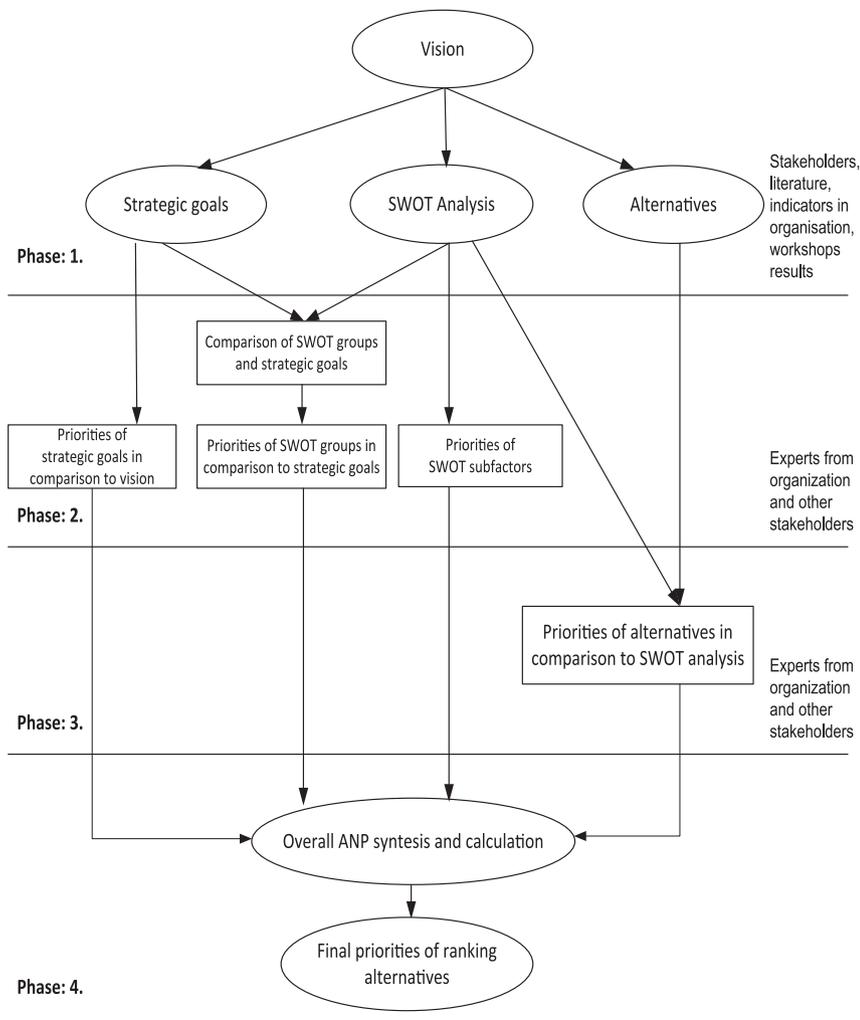
Fig. 4. Geographical location of National Park Djerdap.

for the future to the decision-makers in the NP. The proposed model was presented in this paper on the example of the National Park Djerdap by the authors.

4.1. Phase 1

This research is focused on the selection of the optimal scenario for the development of the NP Djerdap which will contribute to the defined NPD's vision. It reads as follows: "National Park Djerdap is recognizable part of the lower Danube region, which is well known for its preserved natural diversity and historical values that everyone would like to experience. As such, it represents one of the main pillars for sustainable development of this region based on tradition and unique space for acquiring new knowledge". The starting point in the decision-making process was a detailed analysis of the demographic, climate, ecological, biological, and geomorphological characteristics of the national park, as well as the analysis of tourism, forestry, hunting, fishing, agriculture, water management and environmental protection (Management Plan, 2016). The analysis of the available resources included the cultural heritage from this area.[1] The next step was to analyse the interested parties (Chase et al., 2011) and to choose the key stakeholders from the representatives of the local communities, the Development Agency, the Chamber of Commerce, public institutions, educational institutions, non-governmental organizations, institutes, the relevant ministry, the organization for environmental protection, and the management of the NP, as well as between the individuals in the field of tourism, forestry, agriculture and education. The participants were invited to a meeting and a workshop where the SWOT analysis was produced as a result of the brainstorming. The vision and the SGs defined in the proposed Management Plan for the period from 2017 to 2026 were presented to the participants in the workshop where they could comment on and add to them. In addition to the SWOT analysis, the participants accepted the following seven strategic goals which contribute to the NPD's defined vision: 1) conservation of biodiversity and cultural heritage; 2) increasing employment and life standard of the population in region; 3) responsible behavior of the population, tourists and economy towards the NPDJ, 4) the development of small and medium-sized enterprises; 5) sustainable use of natural resources; 6) the enrichment of the tourist offer and increase the number of tourists; and 7) cross-border co-operation.

Based on the results obtained in the workshop and in cooperation with the management of the public company NPDJ, four possible alternatives for the development of this NP, which could be implemented in practice, were identified the following alternative scenarios: A_1 - Status quo; A_2 - Sustainable development; A_3 - Forcing intensive sectoral development; A_4 - Going green.

"Status quo" i.e. the strategy of doing nothing. Everyone can realize their own ideas with no connection between sectors, suppliers, and local people (Grošelj et al., 2015). All parties try to do their best to realize their goals and ideas regarding the contribution to the NPDJ's development.

"Sustainable development" suggests nurturing of natural resources and cultural inheritance for the future generations (Ghorbani et al., 2015). Directing the NP's business to the sustainable development can provide opportunities for the multiple benefits for the entire region through the realization of the revenue and new job openings, the research and monitoring in the national park area, education on protected areas, as well as through recreation and tourism (Das and Chatterjee, 2015). One of the main focuses of this scenario is the sustainable tourism. Numerous benchmarking partners in the world noticed the possibility of introducing the concept of the ecotourism which offers the indicated benefits (Masberg and Morales, 1999; Chan and Bhatta, 2013; Ghorbani et al., 2015; Das and Chatterjee, 2015; Arsić et al., 2017). The

promotion of the protected natural area's potentials, as initial points in the regional sustainable development, increases the awareness among the local population about the importance of preserving the natural and cultural values of the national parks (Chan and Bhatta, 2013; Chiu et al., 2014).

"Forcing intensive sectoral development" was the third possible scenario. It underlines the intensive use of the natural resources, tourism, economy and industry. Creating the favorable conditions for the enterprise development on the territory of the NPDJ encourages the economic growth of the area and the entire region. The heterogeneous structure of the business and activities in the immediate surroundings of the national park (catering, agriculture, trade, retail and other) provides the variety of possibilities for increasing the economic activity and employment on the local and regional level. The construction of the centre for gathering and processing the biomass can significantly contribute to the improvement of the economic conditions in the NP and the development of the region as well. The public-private partnerships with the interested investors can secure the construction of the eco-lodgings on the territory of the NP which will contribute to the development of tourism.

"Going green" the fourth possible scenario, emphasizes the preservation of the bio and geo-diversity in the area of the NP which is one of the primary goals of the protected natural areas (Steven et al., 2013; Bulatović and Tripković Marković, 2015). Reducing tensions and disagreements that arise as a consequence of the interaction between the tourism industry, the visitors, the environment and the local community, contribute to the preservation of the natural values in the protected areas. The primary precondition for this is the appropriate legislation and other documentation relevant to the planning and the organized management of the protected natural areas (Grošelj et al., 2015). Furthermore, the important segment of this scenario is the education about nature and cultural heritage, which aims to increase the awareness of all entities in this region.

4.2. Phase 2

The participatory forming of the elements in the supermatrix was realized in this phase. Output elements from the first phase were used for the definition of the SWOT analysis which was used in the second phase. As a result, the SWOT analysis shown in Table 3 was performed with the local weights within each SWOT factor (W_{43} matrix within the supermatrix).

The comparison between the SGs and SWOT factors was done in this phase (W_{23} within the supermatrix). The results are presented in Table 4. The results of the comparison between the SGs and the NPD's vision are also given in this table (W_{21} matrix within the supermatrix). The realization of the first strategic goal SG_1 - conservation of biodiversity and cultural heritage contributes to the greatest extent to the fulfilment of the defined vision. The next two SGs are SG_5 - Sustainable use of natural resources and SG_3 - responsible behavior of the population, tourists and economy towards the NPDJ. The impact of SWOT factor on the defined strategic goals (W_{32} matrix within the supermatrix) was also determined in this phase and the results are presented in Table 5.

4.3. Phase 3

The determination of the interdependences within the SWOT factors in regards to the alternative scenarios (W_{54} matrix within the supermatrix) was done in this phase. Due to the volume of the obtained results, the results for each cluster were not presented in detail. The Super Decisions software (Super Decisions, 2000) was used for the presentation of the interdependences between the mentioned clusters. The gathered data represent the input parameters for the next phase.

The derived priority vectors together with priority vectors from Tables 3–5 were gathered in weighted supermatrix (Appendix A1 of

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[1] National Park Djerdap, official webpage (http://www.npdjerdap.org/?lang=en).

Table 3
Priorities of SWOT factors and SWOT subfactors.

SWOT factors	SWOT subfactors	Local priorities	Critical values of stability intervals
Strengths	S$_1$-Unique ecosystems and international importance of the protected bio- and geo-diversity values	**0.296**	0.870[a]
	S$_2$-Cultural - historical heritage of world values	**0.296**	–
	S$_3$-The favorable geographical position in the pan-European corridor VII and easy arrival from Belgrade airport	0.180	0.920[b]
	S$_4$-Large forest wealth	0.112	0.730[a]
	S$_5$-The hydropower potential of the Danube	0.070	0.890[b]
	S$_6$-Favorable conditions for organic production	0.046	–
Weaknesses	W$_1$-Lack of knowledge in the field of tourism and promotion of NP potential	**0.311**	0.714[a]
	W$_2$-Insufficient investment in infrastructure in the wider area of the NP	0.222	0.670[b]
	W$_3$-Poor cooperation between Management of NP and the most important stakeholders from surrounding municipalities	0.155	0.638[b] 0.790[a]
	W$_4$-Degradation of biodiversity	0.035	0.714[a]
	W$_5$-The lack of a Management Plan for visitors	0.074	0.714[a]
	W$_6$-The low level of economic development of municipalities	0.108	0.770[b]
	W$_7$-Inadequate wastewater treatment and communal landfills	0.022	0.714[a]
	W$_8$-Poor demographic situation	0.022	0.910[b]
	W$_9$-Insufficient education of the population on the development of environmental awareness	0.051	0.714[a]
Opportunities	O$_1$-Creation of unique tourist product (brand)	**0.354**	–
	O$_2$-The potential of the Danube, which is an integral part of the NP	0.240	0.890[b]
	O$_3$-The development of partnership with SMEs in the region	0.104	0.654[b] 0.840[a]
	O$_4$-Cross-border cooperation in order to realize projects from EU funds	0.159	–
	O$_5$-Product offers of local character (organic foods)	0.068	0.714[a]
	O$_6$-Investments of Diaspora	0.045	–
	O$_7$-Development of energy production from renewable sources	0.031	0.587[a] 0.851[b]
Threats	T$_1$-Slow Serbia's EU bid and disrespect of EU standards	0.159	0.587[a]
	T$_2$-Unfavorable economic situation in the country	**0.354**	0.930[b]
	T$_3$-Disrespect of regulations to protect sensitive sites and biodiversity in NP	0.240	0.770[a]
	T$_4$-Inefficient fight against the gray economy	0.068	0.677[b] 0.840[a]
	T$_5$-Creating a bad image due to poor visitor experience with infrastructure of NP	0.104	–
	T$_6$-Unplanned use the resources of NP	0.045	0.650[a]
	T$_7$-The lack of interest of investors to invest in this region	0.031	–

The bold numbers represent subfactors with the most significance.
[a] Change at the first ranking position.
[b] Change at second ranking position.

Table 4
Priorities of Strategic goals with respect to vision and with respect to SWOT groups.

	NPDJ vision	Strengths	Weaknesses	Opportunities	Threats
SG$_1$	0.350	0.354	0.074	0.123	0.198
SG$_2$	0.055	0.068	0.114	0.198	0.035
SG$_3$	0.144	0.159	0.277	0.035	0.198
SG$_4$	0.062	0.104	0.277	0.198	0.316
SG$_5$	0.242	0.240	0.042	0.051	0.123
SG$_6$	0.109	0.045	0.040	0.316	0.051
SG$_7$	0.037	0.031	0.176	0.078	0.078

Table 5
Priorities of SWOT groups with respect to strategic goals.

	SG$_1$	SG$_2$	SG$_3$	SG$_4$	SG$_5$	SG$_6$	SG$_7$
Strengths	0.415	0.084	0.078	0.141	0.300	0.098	0.086
Weaknesses	0.244	0.232	0.492	0.263	0.443	0.244	0.178
Opportunities	0.098	0.546	0.125	0.455	0.159	0.415	0.462
Threats	0.244	0.138	0.306	0.141	0.098	0.244	0.274

Supplementary Material).

4.4. Phase 4

The final ranking of the alternative scenarios was determined in the last phase of the proposed model by the overall synthesis of the results obtained in the previous phase using the ANP method. The results are

Table 6
Final priorities of alternatives of National Park Djerdap development.

Alternatives	Final priorities	Rank
A$_1$ - Status quo	0.132	4
A$_2$ - Sustainable development	0.341	1
A$_3$ - Forcing intensive sectoral development	0.233	3
A$_4$ - Going green	0.294	2

shown in Table 6.

5. Discussion of Results

Based on the SWOT analysis, the local weights were obtained (Table 3) which indicate that the most important subfactors within the strengths SWOT factors are unique ecosystems and international importance of the protected bio- and geo-diversity values (0.296) and cultural-historical heritage of world values (0.296), while the subfactors with the greatest impact within weaknesses SWOT factors are lack of knowledge in the field of tourism and promotion of NP potential (0.311) and insufficient investment in infrastructure in the wider area of the National Park (0.222). The most important opportunity from the environment which should be used is the creation of unique tourist product - brand (0.354). The greatest threat for the development of the NPDJ is the unfavorable economic situation in the country (0.354).

The difference between the first three ranked SGs is not great. This fact emphasizes the importance of the impact of various defined goals on the realization of the NPD's vision by 2026. The most important
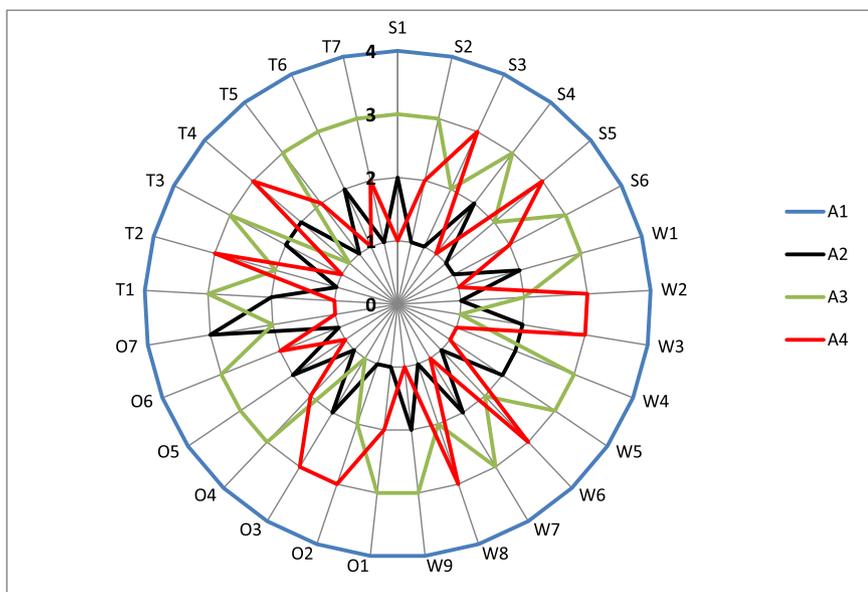
Fig. 5. Sensitivity analysis of alternative ranking orders considering the changes in importance of SWOT subfactor weights.

strategic goals are (SG$_1$) conservation of biodiversity and cultural heritage, (SG$_5$) sustainable use of natural resources and (SG$_3$) responsible behavior of the population, tourists and economy towards the National Park Djerdap whose weights are 0.350; 0.242; and 0.144 respectively.

The SWOT factor that refers to the internal weaknesses has the greatest impact on the SG$_3$ and SG$_5$. The opportunities SWOT factor should be utilized in the realization of the SG$_2$ and SG$_4$, as well as SG$_6$ and SG$_7$. The SWOT factor threat is not the most dominant for the realization of any of the strategic goals.

Applying this model based on the SWOT analysis offers the alternatives which include the maximization of the strengths and opportunities and minimization of the weaknesses and threats. Overall synthesis of the previous facts suggests that the only possible and logical alternative for the management of the NPDJ is the "sustainable development" alternative which offers the positive impact on the regional development focused on tourism. Nature conservation is the second generated alternative that emphasizes the environment protection, but it is not focused on the economic development of the entire region. The degree of the protection is greatly important for the sustainability of the natural potential due to the fact that the national park is in question. The intensive development of the small and medium-sized enterprises affects the short-term economic growth, but it does not emphasize the environment protection which is essential for the preservation of the natural areas for the needs of the future generations. Maintaining the status quo (going with the flow) is ranked as the last on the list of the alternative scenarios and it does not represent the efficient proposition because it does not encourage the interaction between the stakeholders in the region, and, without the synergy and mutual action, the common progress cannot be achieved.

Additionally, in order to test the sensitivity of obtained final ranking results for the alternative scenarios due to the changes of SWOT subfactor weight importance, sensitivity analysis was performed. Here, it must be taken into consideration that sensitivity analysis was done by each SWOT subfactor separately and the changes in the ranking positions of alternative scenarios considering each SWOT subfactor are shown in Fig. 5. Furthermore, critical values for each SWOT subfactor weight that cause the change in ranking order, are given in last column in Table 3. Generally, most of the changes are between alternative scenarios A$_2$ and A$_4$ at the first two ranking positions, while in only three cases (sensitivity analysis for W$_3$, O$_3$ and T$_4$ SWOT subfactors) the alternative A$_3$ has reached the first place. Finally, it can be concluded that final ranking order is sensitive to the change in importance of

particular SWOT subfactor only for its very high value of weight, therefore, final ranking results proposed by this study are stabile in relatively wide interval.

6. Conclusions

The management process in the national parks has changed over time and it continues to change according to the new requirements and expectations from the society. The management of the parks is expected to successfully overcome the challenges which are often complex and multidisciplinary. The SWOT analysis and the SGs offer sustainable development focused on the tourism as the only possible and logical strategy for the management of the National Park Djerdap. The realization of the alternative scenario which is based on the sustainable development is expected to achieve the defined developmental goals through the improvement of the standard of the local population and the development of the entire region. The authors of this paper believe that the obtained results can offer the empirical and practical contribution through the validation of the proposed model. The realization of the preferential alternative grants the possibility for achieving the defined vision and the strategic goals which are defined in the Management Plan for the period from 2011 to 2020 and in the proposed Management Plan for the period from 2017 to 2026.

Based on the results, the proposed model, applied on the example of the NPDJ, represents a suitable tool for decision-making and provides an operational framework for the sustainable development of the region in other national parks. The model proposed in this paper consists of four phases and is flexible in the sense that its hierarchical structure and rules allow minor adjustments for the purpose of applying it on the similar problems in the management of the environment in other protected areas. Further research should investigate the results obtained by the ANP method in the environment.

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