APPLICATION OF COMBINED ANALYTIC HIERARCHY PROCESS (AHP) AND SWOT FOR INTEGRATED WATERSHED MANAGEMENT

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ABSTRACT

The most critical issue in watershed management is the active involvement of a range of stakeholder groups in the process. This paper offers an integrated approach to contribute to the integrated watershed management (IWM) process by using the Analytic Hierarchy Process (AHP) and SWOT (Strengths, Weaknesses, Opportunities, and Threats) methods. The paper looks at Beyşehir Lake Basin (BLB), the largest freshwater lake and drinking water reservoir in Turkey, and focuses on the most critical stage of IWM. This critical stage determines the optimal and agreed upon watershed management strategy from all of the stakeholder's perspective. This strategy is referred to in this study as the 'Collaborative Watershed Management (CWM) Strategy'. The combined AHP and SWOT methodology is applied to the real-life problems of: i) how to identify differences among the knowledge, experiences, values and interests of three different stakeholder groups including local communities, local authorities and experts regarding the agreed upon watershed management strategy, and ii) how to determine the CWM strategy that meets the expectations of all stakeholders in BLB. The methodology is carried out via stages including describing SWOT factors, comparing these SWOT factors pair by pair to determine the relative weights of each, developing strategies based on those factors, evaluating each strategy alternative with respect to each SWOT factor, and performing final calculations. The study illustrates the feasibility of combining AHP and SWOT to incorporate stakeholder preferences in the decision making process of IWM.

Keywords: Integrated watershed management, stakeholder-based decision making, analytic hierarchy process (AHP), AHP-SWOT, Beyşehir Lake Basin

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1. Introduction

Integrated watershed management (IWM) has emerged as a new model for watershed planning following the trend towards more holistic and participatory approaches to natural resource management (DeSteiguer et al., 2003). IWM is the process of managing human activities and natural resources in an area defined by watershed boundaries, and aims to protect and manage natural resources for present and future generations. Considering the integrity of the environment, economy and communities and using adaptive environmental management approaches, IWM offers an integrated interdisciplinary approach.

IWM recognizes the importance of the human dimension. Instead of focusing exclusively on biophysical processes and human impacts, IWM includes stakeholder participation, adaptive management, and experimentation that are compatible with critical ecosystem functions and services.

Stakeholders are the people that directly and/or indirectly take part in watershed planning and management activities in the area and are affected by the actions in the basin. Key stakeholders of a watershed may include people who can influence land management decisions, such as individual landowners, farmers, local government officials, representatives from environmental and community groups etc. (Bonnell and Baird, 2010). IWM is a process-oriented approach that provides a chance for stakeholders to balance diverse goals, and considers how their cumulative actions may affect long-term sustainability of watershed resources (Qianxiang et al., 2005). IWM as a decision-making process makes it possible to address multiple issues and objectives, and enables planning in a very complex and uncertain environment. Decision making in IWM typically involves several stakeholders with conflicting views. Effective participation and conflict resolution are the most important challenges of the IWM approach (Sharma et al., 2005). The related literature emphasizes the importance of consensual decision making in collaboration. Margerum (1999) states that consensus is important not only for reaching an acceptable decision, but also for building long-term trust and support for outcomes. Beierle (2002) suggests that it is the more intensive stakeholder processes that are more likely to result in higher-quality decisions. In order to succeed, IWM must be participatory, integrating all the relevant scientific knowledge/data and user-supplied information regarding the social, economic and environmental processes affecting natural resources at the watershed level.

This paper offers an integrated approach to contribute to the IWM process by using the Analytic Hierarchy Process (AHP) and SWOT (Strengths, Weaknesses, Opportunities, and Threats) methods. The paper addresses Beyşehir Lake Basin (BLB), the largest freshwater lake and drinking water reservoir in Turkey, and focuses on the most critical stage of IWM, where the optimal and agreed upon watershed management strategy is determined by all of the stakeholders. This is referred to in this study as 'Collaborative Watershed Management (CWM) Strategy'. Identifying the CWM strategy is an important stage as it represents the culmination of the IWM process and sets the course for the future of the watershed. Within this context, the differences among the knowledge, experiences, values and interests of three different stakeholder groups (local communities, local authorities and experts) with regard to the optimal and agreed upon watershed management strategy are assessed with the goal of protecting and restoring aquatic ecosystems, human health and other natural resources in BLB. The paper consists of five sections. Following a brief review of the stakeholder participation in IWM approach given in the Introduction, Section 2 describes the methodology of the combined use of AHP-SWOT. Section 3 focuses on the empirical study and describes the case study area and the survey methodology. In this section, the participatory SWOT analysis for BLB and the strategy formulation on the basis of SWOT analysis are also presented. Next, Section 4 explains the AHP-SWOT application steps and discusses the empirical results. The last section evaluates the application of combined AHP and SWOT as a tool for stakeholder-based decision making in IWM and discusses future research directions.

2. Methodology: Combined use of AHP and SWOT as a tool for stakeholder-based decision making in IWM

The methodological framework includes the combined use of AHP and SWOT in developing CWM strategies, tallying SWOT factors, and prioritizing them with the pairwise comparison technique available with AHP.

2.1 AHP

The multitude of watershed planning and management objectives inevitably leads to conflicts among watershed stakeholders or interest groups. It is often impossible to aggregate the objectives into a single criterion or performance measure in the alternative ranking and selection process. Thus, multi-criteria (or multi-objective) decision support methods are widely applied in water policy planning and evaluation, strategic watershed planning and management, and infrastructure development. Multiple criteria analysis techniques have been used by water resource practitioners to select or to design alternatives in areas such as river basin planning and development, water resources development, land use management, groundwater/surface water allocation, watershed restoration and water resources quality (Mirchi et al., 2010).

Since AHP is fairly well known for the audience of this journal we will only briefly introduce the methodology. AHP is a mathematical method for analysing complex decisions with multiple criteria. It has been translated into the level of analysis by Thomas Saaty. The technique has become a widely known and used for solving discrete multiple criteria problems. It has been successfully applied to many complex planning, resource allocation and priority setting problems in business, energy, health, marketing, natural resources and transportation (Saaty, 2001).

AHP is applied to the decision problem after it is structured hierarchically at different levels, each level consisting of a finite number of elements. Fundamentally, AHP works by developing priorities for alternatives and the criteria are used to judge the alternatives. The estimation of the priorities from pairwise comparison matrices is the major component of the AHP. The importance or preferences of the decision elements are compared in a pairwise manner with regard to the element preceding them in the hierarchy. The priority vector can be derived from these pairwise comparison matrices using different techniques. The most commonly used technique is the Eigenvector Method (Mikhailov, 2000).

First of all, priorities are derived for the criteria in terms of their importance to achieve the goal, and then priorities are derived for the performance of alternatives on each criterion. These priorities are derived based on pairwise assessments using the judgement or ratios of measurements from a scale if one exists. Finally, a weighting and adding process is used to obtain overall priorities for alternatives as to how they contribute to the goal. By additive aggregation AHP finally computes the priorities of the elements at the bottom level of the hierarchy, usually known as the alternatives. Their priorities are interpreted with respect to the overall goal at the top of the hierarchy and elements at upper levels such as criteria, sub-criteria etc. are used to mediate comparison process (Srdjevic, 2005). With the AHP, a multidimensional scaling problem is thus transformed to a uni-dimensional scaling problem.

Saaty (2001) suggests AHP as a formal method for rational and explicit decision making. It is a useful tool to analyse decisions in complex social and political problems. AHP is also useful when many interests are involved and a number of people participate in the judgement process. AHP is a straightforward and transparent method that is also able to consider subjective and judgemental information. The technique provides the objective mathematics to process the inescapably subjective and personal preferences of an individual or a group in making a decision. AHP can deal with qualitative as well as quantitative attributes.

2.2 SWOT

SWOT analysis is a commonly used strategic planning method to evaluate the Strengths (S), Weaknesses (W), Opportunities (O), and Threats (T) involved in a project or business venture. Generally SWOT is a list of statements or factors with descriptions of the present and future trends of both the internal and external environment; the expressions of individual factors are general and brief which describe subjective views. However, SWOT is a convenient and promising way of conducting a situational assessment (Wickramasinghe and Takano, 2009).

2.3 Combined use of AHP-SWOT

The use of AHP in SWOT analysis supports the strategic planning process quantitatively by providing analytical priorities to the SWOT factors. The combined use of the AHP and SWOT analysis has been widely used to support strategic decision-making processes such as institutional situation analysis and strategy selection (Arslan, 2010; Gürbüz, 2010), economical structure analysis (Çelik and Murat, 2008), stakeholder analysis in environmental management

(Dwivedi and Alavalapati, 2009), strategy selection in defense sector (Kandakoğlu et al., 2007), developing and selecting strategy in forest management (Kurttila et al., 2000; Leskinen et al., 2006; Masozera et al., 2006; Shrestha et al., 2004), developing collaborative strategy in the health sector (Osuna and Aranda, 2007), selecting strategy in natural resource management (Pesonen et al., 2001), project management (Stewart et al., 2002), strategy development in industry sector (Shinno et al., 2006; Taşkın and Güneri, 2005), developing and selecting strategy in tourism planning (Kajanus et al., 2004; Wickramasinghe, 2008), collaborative project evaluation (Yılmaz, 2007), selection of the optimal reconstruction solution of a water intake structure within a regional hydro-system (Srdjevic et al., 2012), and decision making in information technology (Hacımenni, 1998).The technique has been also referred as A'WOT in some studies (Gürbüz, 2010; Kajanus et al., 2004; Leskinen et al., 2006; Pesonen et al., 2001; Taşkın and Güneri, 2005; Yılmaz, 2007).

The first AHP-SWOT applications (Kurttila et al., 2000, Shrestha et al., 2004) have only focused on weighting the SWOT factors. The method has been developed by involving the evaluating processes of the strategy alternatives according to each SWOT factor and general priority calculations for the strategy alternatives. Making pairwise comparisons forces the decision–makers to think over the weights of the SWOT factors and to analyze the situation more precisely and in more depth than the standard SWOT does. By integrating AHP with SWOT, not only the mutual weighting of SWOT factors, but also the evaluation of alternative strategic decisions can be integrated with ordinary SWOT analyses. In this way, the most crucial weakness of SWOT can be avoided (Kangas et al., 2001; Kangas et al., 2003; Saaty and Vargas, 2001, cited in Dwivedi and Alavalapati, 2009; Yılmaz, 2007). The AHP-SWOT method increases and improves the information basis of the strategic planning processes, and not only provides a robust decision support, but also an effective framework for learning in strategic decision support. AHP-SWOT can be used as a communication and educational tool in the decision making processes if more than one decision maker exists. In addition, separate AHP-SWOT applications for individuals or interest groups can provide a good basis for examining the vision and expectation differences of different stakeholders regarding a particular decision-making process (Kangas et al., 2001).

The AHP-SWOT combination is carried out in five stages (Figure 1) (Kangas et al., 2001 and Yılmaz, 2007).

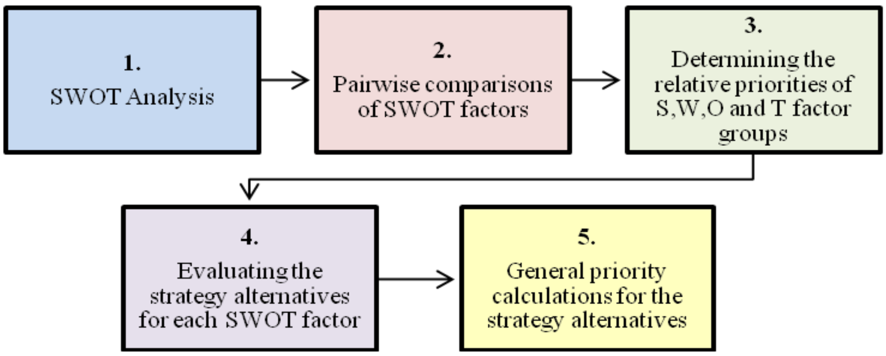


Figure 1. Application stages of AHP-SWOT

Stage 1−SWOT analysis: The SWOT groups (**S**trengths, **W**eaknesses, **O**pportunities and **T**hreats) are created. SWOT factors of each SWOT group that will be included in the analysis are ranked as neutral as possible.

Stage 2−Pairwise comparisons between SWOT factors are performed using Saaty's (2008) nine point scale (Table 1) separately within each SWOT group. The comparisons are used as input to the scope, and then the relative priorities of SWOT factors are calculated using the eigenvector approach of AHP technique.

Table 1
Scale of two-paired comparison at AHP (Saaty, 2008)

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate Importance	Experience and judgment slightly favour one activity over another
5	Strong Importance	Experience and judgment strongly favour one activity over another
7	Very Strong Importance	An activity is favoured very strongly over another; its dominance demonstrated in practice
9	Extreme Importance	The evidence favouring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate Values	Intermediate values

Stage 3− The next stage is the calculation of a list of the relative weights, importance, or value of the S, W, O and T factor groups (technically, this list is called an eigenvector). In this process, if S is absolutely more important than W and is rated at 9, then W must be absolutely less important than S and is valued at 1/9. These pairwise comparisons are carried out for all SWOT factors to be considered, and the matrix is completed. Relative priorities of S, W, O and T factors are based on eigenvector values of the pairwise comparisons.

Stage 4−In this stage the strategy alternatives for each SWOT factor are evaluated. Here, the relative priority value of each SWOT group is separately multiplied by the relative priority of each of the SWOT factors in this group. Thus, the overall priority value of each SWOT factor in the related SWOT group is derived. This process is repeated for each of the SWOT groups. Finally, the overall priority values of all the SWOT factors (of which total value is equal to 1) are obtained.

At the end of each AHP calculation stage there is a need to calculate a Consistency Ratio (CR) to measure how consistent the judgments have been relative to large samples of purely random judgments. Saaty has proved that the consistent reciprocal matrix, the largest Eigen value is equal to the size of the comparison matrix, or $\lambda max – n$. The measure of consistency, called the Consistency Index (CI), is a deviation or degree of consistency using the following formula:

$$CI=(\lambda max–n) / (n–1) \quad (1)$$

Saaty proposes that CI be used by comparing it with the appropriate one. The appropriate CI is called the Random Consistency Index (RI) (Table 2).

Table 2
Random consistency index (Teknomo, 2006)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Then, he proposes what is called CR, which is a comparison between CI and RI:

$$CR= CI / RI \quad (2)$$

If the value of CR is smaller or equal to 0.1, the inconsistency is acceptable. If the CR is greater than 0.1, the judgments are untrustworthy because they are too close to randomness. The subjective judgment is valueless or must be repeated. Saaty suggests that if that ratio exceeds 0.1 the set of judgments may be too inconsistent to be reliable. A CR of 0 means that the judgments are perfectly consistent.

Stage 5−This stage includes general priority calculations for the strategy alternatives. AHP uses a principle of hierarchic composition to derive composite priorities of alternatives with respect to multiple criteria from their priorities with respect to each criterion. It consists of multiplying each priority of an alternative by the priority of its corresponding criterion and adding over all the criteria to obtain the overall priority of that alternative (Saaty, 2003).

In this study, weights of strategy alternatives are calculated using the following formula adapted from Osuna and Aranda (2007):

$\mathbf{V_j}$ *: The global (relative) value of the Strategy j (j = 1, 2, ..., n)*

$$V_j = W_S \sum_{i=1}^{i-ms} Si\, U_{Si,j} + W_W \sum_{i=1}^{i-mw} W_{Wi} U_{Wi,j} + W_O \sum_{i=1}^{i-mo} W_{Oi} U_{oi,j} + W_T \sum_{i=1}^{i-mt} W_{Ti} U_{Ti,j} \quad (3)$$

Normalized value of the Strategy Weights:

$$N_j = \frac{V_j}{\sum_{j-1}^{n} V_j} \quad (4)$$

Where N_j *: Normalized weight of the* j^{th}*strategy,* ***m:*** *Number of SWOT factors,* ***n:*** *Number of strategies.*

3. Empirical study: stakeholder-based decision making in BLB's management

This study aims to provide a better understanding of i) the critical problems of the BLB, ii) the most important advantages of the basin in terms of 'Strengths' and 'Opportunities', iii) the problems regarding BLB's management, iv) the most important disadvantages of the basin in terms of 'Weaknesses' and 'Threats', v) the possible strategies that would ensure major positive changes towards the basin's sustainability, vi) knowledge, perceptions and behaviours of the stakeholders (individual and institutional level), and vii) the optimal adaptive watershed management strategy that would be sensitive to the views of all stakeholders in the basin within the context of the field work in BLB. Household, local government and expert questionnaires are performed to achieve these purposes.

3.1 The case study area: Beyşehir Lake Basin (BLB)

Beyşehir Lake, located in the southwest of Konya Closed Basin, is the largest freshwater lake and drinking water reservoir in Turkey. The basin, belonging to the Konya and Isparta province borders (Figure 2), is significant both for humans as a source of fresh water, and the environment, due to its wetland ecosystem (Babaoğlu, 2007). The lake has international importance according to the Ramsar Convention criteria. It also holds the statuses of Important Bird Area (IBA) and Important Plant Area (IPA). Various zones of the lake and its basin are protected under the 1st, 2nd and 3rd Degree Natural Site statuses, and the area has several declared National Parks namely, Beyşehir Lake and Kızıldağ. Also, archaeological sites exist in the basin, and Beyşehir Lake has a drinking and potable water conservation area character.

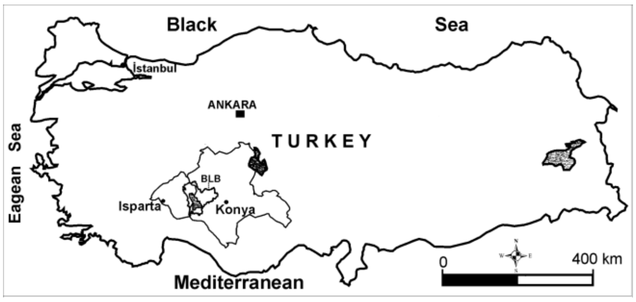


Figure 2. Location of BLB in Turkey

In recent years, BLB has suffered from some environmental and socio-economic problems. Inappropriate water policy and non-point source pollution in the lake which have led to variations in water levels have become striking environmental issues at the basin.

3.2. Participatory SWOT Analysis

The ultimate success of a watershed management largely depends on the accuracy of an effective situational assessment. To assess the BLB substantially, first a participatory SWOT analysis was conducted through expert interviews including a civil engineer, forest engineer, urban planner, hydrologist, geologist and tourism experts. The local authority interviews included the mayor, village headman and an employee, and household interviews were also conducted. Next, the judgments of experts, local authorities and local communities regarding SWOT factors were aggregated. This aggregation helped cope with the difficulty resulting from the original long list of SWOT factors in AHP technique. The experts' SWOT judgments that were close to each other were combined thematically to reduce the number of factors, and in this way BLB's current status was summarized on the basis of a comprehensive and detailed SWOT analysis. Consequently, six Strengths, seven Weaknesses, six Opportunities and eight Threats factors were obtained. The SWOT analysis performed for BLB is presented in Table 3.

Table 3
Participatory SWOT analysis for BLB

Weaknesses [W]	**Strengths [S]**
[W1] Inequalities in water use **[W2]** Lack of importance attached to tourism as an instrument in the development of the basin **[W3]** Lack or inadequacy of infrastructure services **[W4]** Scarcity of employment opportunities **[W5]** Problems in the institutional structure and legal system related to problem solving and management in the basin **[W6]** Inadequacy of financial resources for activities to protect the lake **[W7]** Limitations to construction facilities in the basin with National Park statuses, inability to efficiently benefit from the lakeshore	**[S1]** Geographical position and accessibility **[S2]** Water supply **[S3]** The environmental importance of the Beyşehir Lake **[S4]** Supporting means of subsistence such as agriculture, animal husbandry, fishing **[S5]** Historical importance **[S6]** Suitable environment for nature friendly economic activities
Opportunities [O]	**Threats [T]**
[O1] Positional advantage **[O2]** Construction of New Konya- Antalya (Gembos) Motorway **[O3]** Derebucak Derivation Tunnel **[O4]** Its suitability in terms of tourism development **[O5]** Plans and projects to protect and develop the basin **[O6]** Presence of financial resources such as the European Union Grant Projects, World Bank Credits etc.	**[T1]** Migration of the population to the outside of the basin **[T2]** Climate changes **[T3]** Decline in the amount of lake water **[T4]** Water pollution **[T5]** Overhunting **[T6]** Destruction of the lake ecosystem **[T7]** High taxes against the rise of the local economy **[T8]** Interventions to basin's water system from outside the basin

3.3 Survey methodology

In this study, we structured an analytical hierarchy for the BLB's IWM process based on a SWOT analysis. We also used AHP to estimate a global value for each of the strategy alternatives. Initially, we used TOWS matrix, developed by Weihrich (1982), to describe watershed management options based on the SWOT factors. TOWS matrix provides means to develop strategies based on logical combinations of SWOT factors related to internal strengths (or weaknesses) with factors related to external opportunities (or threats) (Wickramasinghe, 2008). TOWS matrix identifies four conceptually distinct strategic groups to create the strategy alternatives including, i) Strength-Opportunity (SO), ii) Strength-Threats (ST), iii) Weaknesses-Opportunities (WO), and iv) Weaknesses-Threats (WT). In this context, considering the expert views, we have proposed six strategy alternatives (ALT). These alternatives consider the advantages of the Strengths and Opportunities while also reinforcing the Weaknesses in order to develop the best defence strategy to the Threats (Table 4).

Table 4
Strategy formulation using TOWS matrix

Strategy groups	**Strategy alternatives**
SO Strategies: Maxi-Maxi *Strategies use strengths to maximize opportunities*	**[ALT 1]** Agricultural development **[ALT 2]** Environment friendly tourism development: rural tourism
WO Strategies: Mini-Maxi *Strategies reduce internal weaknesses or develop missing strengths are used to minimize external threats*	**[ALT 3]** Collaborative watershed management
ST Strategies: Maxi-Mini *Strategies use internal strengths to minimize threats*	**[ALT 4]** Decreasing the water consumption in urban area
WT Strategies: Mini-Mini *Strategies reduce the internal weaknesses to avoid external threats (defensive strategy, worst case scenario)*	**[ALT 5]** Improving water quality-control invasive pollutant **[ALT 6]** Improving water usage in rural areas and agriculture

AHP begins with the development of a decision hierarchy including a *main goal*, *sub-objectives and strategy alternatives.* Figure 3 and Table 3 show the decision hierarchy used in the study. The hierarchy for the described problem was structured in four levels. The top level refers to the main goal, to develop the best watershed management strategy that enables both the environmental and socio-economic sustainability of the BLB. The next level consists of decision objectives that take advantage of the Strengths (S), to reinforce the Weaknesses (W), to use the advantage of Opportunities (O) and to develop the best defense to the Threats (T). SWOT factors, described in SWOT analysis, take part in the third level. Finally, the fourth level consists of the strategy alternatives (ALT). How important are the internal Strengths & Weaknesses and the Opportunities & Threats arising from the external environment, or to what extent should they be ignored to achieve the specified purposes? What are the *most important* problems of the basin? What is *the safest course* that would lead to improvement of the lake's environmental conditions and the basin residents' living conditions? AHP and SWOT integration has been used to answer these research questions from the perspectives of stakeholders.

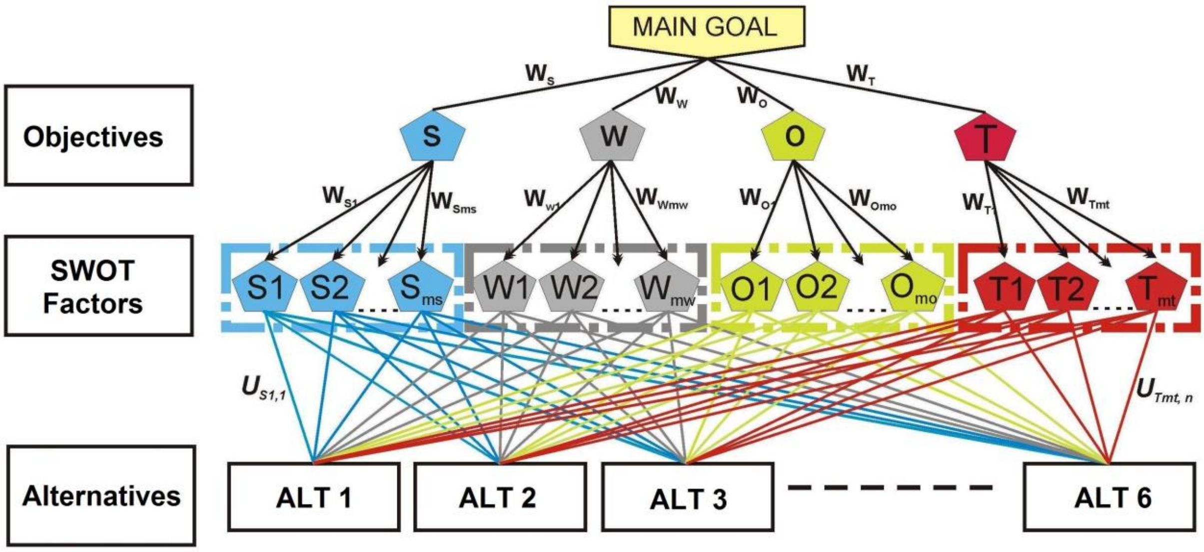


Figure 3. Hierarchical structure to prioritize the SWOT factors of BLB's sustainability

W_S, W_W, W_O **and** W_T: relative importance of each group of factors (S, W, O and T) for the achievement of the strategic objective
(W_{S1}, W_{S2}, …, W_{Sms},): relative importance of the Strengths factors (S1, S2, ..., Sms) within their group (S)
(W_{W1}, W_{W2}, …, W_{Wmw},): relative importance of the Weaknesses factors (W1, W2, ..., Wmw) within their group (W)
(W_{O1}, W_{O2}, …, W_{Omo},): relative importance of the Opportunities factors (O1, O2, ..., Omo) within their group (O)
(W_{T1}, W_{T2}, …, W_{Tmt},): relative importance of the Threats factors (T1, T2, ..., Tmt) within their group (T)
For any Strategy j (j = 1, 2, ..., n); degree of relationship between Factor and Strategy :
$U_{Si,j}$: Efficiency of Strategy j in taking the advantage of the Strength factor Si (i= 1, 2, ..., ms)
$U_{Wi,j}$: Efficiency of Strategy j in lessening the effects of the Weakness factor Wi (i = 1, 2, ..., mw)
$U_{Oi,j}$: Efficiency of Strategy j in taking the advantage of the Opportunity factor Oi (i = 1, 2, ..., mo)
$U_{Ti,j}$: Efficiency of Strategy j in facing the Threat factor Ti (i = 1, 2,…, mt)

The data for the analysis was gathered from a survey conducted in 44 different settlements in BLB in March and April of 2010. In order to determine the CWM strategy from the perspective of the stakeholders the following questionnaires were performed: i) 457 household (approximately 1.7 % sample size) questionnaires, ii) 27 local authorities (mayor, village headman and employee) questionnaires, and iii) 22 expert (civil engineer, forest engineer, urban planner, hydrologist, geologist, tourism expert, etc The household and local authority questionnaires were performed face to face by visiting all of the settlements, whereas the expert questionnaires were conducted using different channels such as phone calls and e-mails in addition to face to face interviews. Following a pilot study by the authors, a professional survey team was trained and the rest of the survey was completed by this professional team. The survey sheet was designed in order to be appropriate to the AHP-SWOT technique, and the decision hierarchy has been developed for BLB (see for further information Appendix A). For pairwise comparisons, the questionnaire consists of two parts: i) comparison of the two factors in order to determine environmental and socio-cultural sustainability of BLB (Goal), the most dominant factor (in the case of strength and opportunity) or the least favourable factor (in the case of weakness and threat), and ii) the intensity of importance. In this context, the survey sheet consists of tables comparing each factor in a particular SWOT category with other factors in the same category. Survey participants were asked to compare the stated factor to other factors and evaluate their importance from their perspective. For example, during the pairwise comparisons of S1 and S2 factors, under the Strengths heading, the responder first decided which factor was more important, then evaluated their relative importance on a scale of 1-9. The success of any SWOT factors in determining the best strategy was measured on a scale of 0-9. Reliability of the responses to the questionnaire was tested with the "consistency ratio" (CR) formula (Formula 1 and Formula 2) as prescribed by the AHP technique. The CRs of the matrices were below the limit value of 0.1. Therefore, the judgments are acceptably consistent.

Table 5 shows the sampling sites, household size and number of local authority questionnaires, and Figure 4 shows the study area and sampling sites.

Table 5
Sampling sites and the sizes of household and local authority questionnaires

Settlement:	H	LA	Settlement:	H	Q	Settlement:	Q	LA	Settlement:	H	LA
Akburun	6	-	Çiftliközü	4	-	Hüyük	12	2	Sağlık	4	1
Bademli	4	-	Derbent	13	1	İlmen	4	-	Sarıkabalı	4	-
Belceğiz	5	-	Doğanbey	13	-	İmrenler	5	-	Selki	6	-
Beyşehir	131	-	Emen	5	-	Karadiken	4	-	Sevindik	3	-
Budak	6	1	Gedikli	4	1	Karayaka	3	-	Ş.karaağaç	48	2
Burunsuz	5	-	Gencek	5	1	Kıreli	9	1	Tolca	5	1
Çamlıca	6	1	Göçeri	5	-	Kızılören	5	2	Üstünler	7	1
Çarıksaraylar	10	1	Gölkaşı	5	1	Kurucuova	6	-	Üzümlü	20	-
Çavuş	4	2	Gölkonak	5	-	Kuşluca	6	1	Yenidoğan	6	1
Çiçekpınar	7	2	Gölyaka	3	1	Mutlu	4	1	Y.bademli	12	1
Çiflikköy	3	-	Huğlu	13	-	Sadıkhacı	12	1	Yeşildağ	10	-
									TOTAL:	**457**	**27**

* H: household, LA: local authory

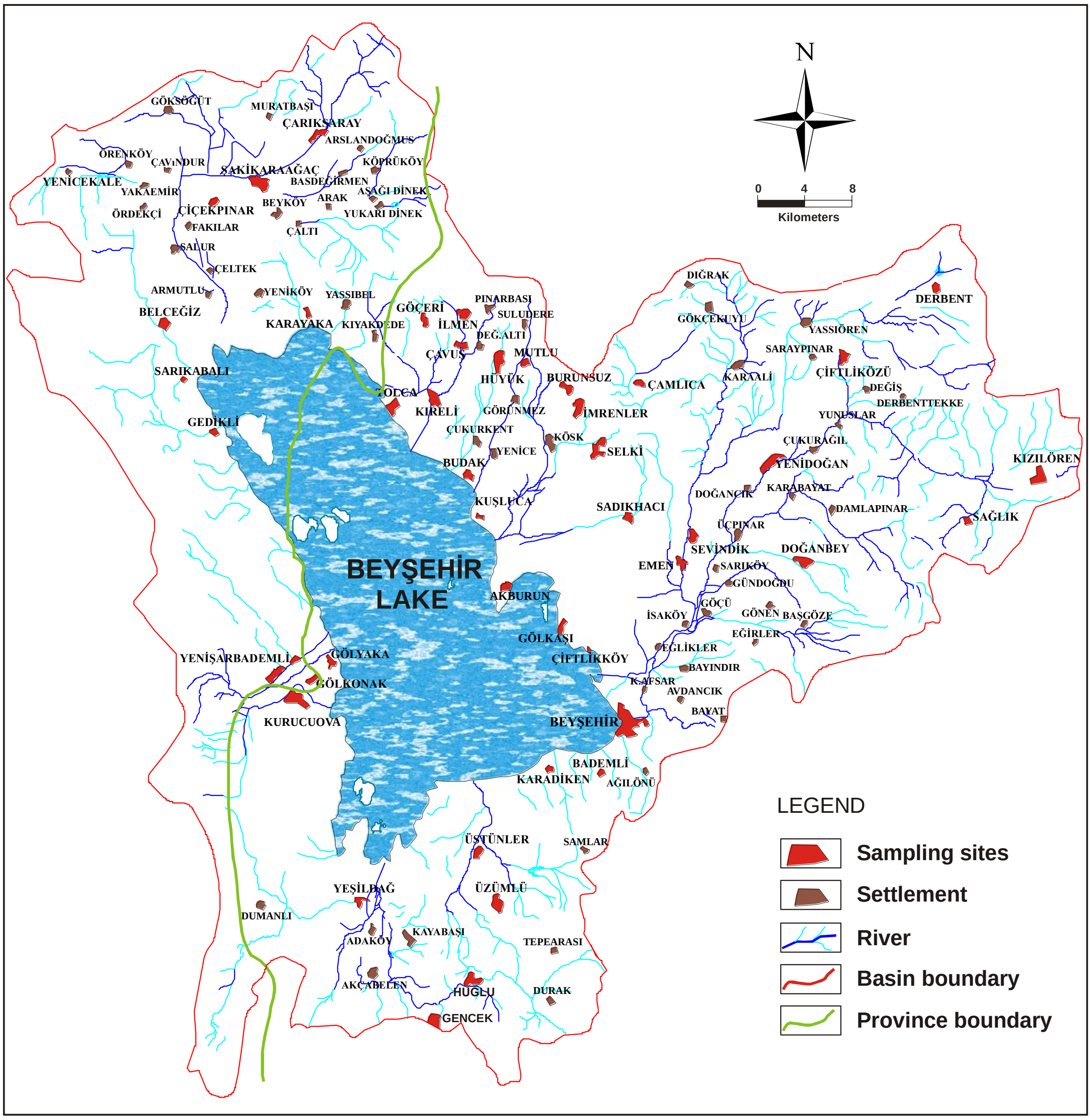


Figure 4. Study area and sampling sites

4. Empirical Results and Discussion

An Excel worksheet was used to perform AHP calculations. This section presents the empirical results according to the AHP-SWOT application steps consecutively.

4.1 Priorities of SWOT factor groups

Table 6 shows the AHP priorities of the SWOT factor groups in terms of three stakeholder groups. ‘To develop the best defence to Threats’ [T] is the most highly rated SWOT factor group from the perspective of *local communities* (40.1%), and also the basic determinant of *local authority* views (46.0%). Contrary to the local community and local authority views, ‘to use the advantage of Opportunities’ [O] is dominant (35.0 %) in the holistic perceptions of the experts. While the other two stakeholder groups define [T] category as their primary decision objective, [T] is ranked second in priority by the experts (28.4%). CWM strategy considers the common benefit of all stakeholders and is responsive to their expectations. Consequently, we derived the CWM strategy for BLB by congregating stakeholder groups' assessments that were made separately. [T] is the highest overrated SWOT factor group of the CWM strategy priorities calculated from the geometric means of three stakeholder group priorities (37.4 %), and 'to take the advantage of Strengths [S]' is the least rated category (13.6%) (Appendix-B, C, D, E).

Table 6
Weights of the decision objectives from the perspectives of stakeholders

	Stakeholder groups			
Weights	Local communities	Local authorities	Experts	**Overall stakeholders ***
to take the advantage of **S**trengths	0.102	0.117	0.209	**0.136**
to reinforce the **W**eaknesses	0.281	0.221	0.157	**0.214**
to use the advantage of **O**pportunities	0.216	0.202	0.350	**0.248**
to develop the best defence to **T**hreats	0.401	0.460	0.284	**0.374**

* Each value is the geometric mean of the row.

4.2 Priorities of the SWOT factors

Local weight dispersions regarding SWOT factors explicitly show the importance of [T4] 'water pollution' and [T3] 'decline in the amount of lake water' factors from the perspective of *local communities*. *Local authorities* emphasized the importance of [T] category like local communities, and more highly rated the [T4] 'water pollution' and [T6] 'destruction of the lake ecosystem' [T] factors. *Experts* emphasized the importance of the [O] category. This group rated [O5] 'plans and projects to protect and develop the basin', and [O4] 'its suitability in terms of tourism development' the highest. While [T] is accepted as the most important overall SWOT category with respect to *CWM strategy*, all of the stakeholders rated [T4] 'water pollution', [T3] 'decline in the amount of lake water' and [T6] 'destruction of the lake ecosystem' the highest factors in this category (Appendix-B, C, D, E). Figure 5 shows the differences in the SWOT factor prioritizations of the three stakeholder groups. The most important differences observed in the weight dispersions of SWOT factors are: i) Experts supported the [O] factors with the highest scores and, ii) Local authorities supported the [T] factors with the highest scores compared to other stakeholders.

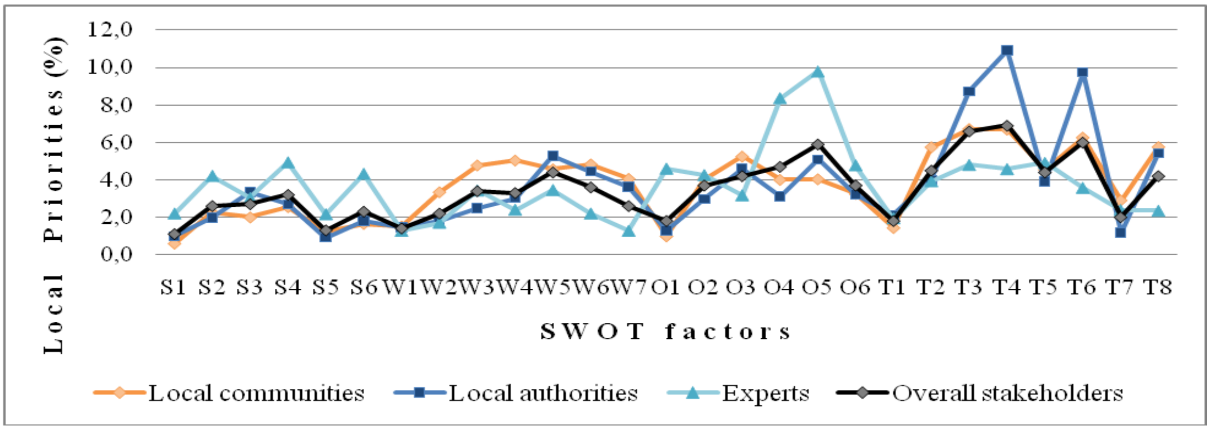


Figure 5. Priorities of the SWOT factors from the perspectives of stakeholders

4.3 Global weight dispersions of strategy alternatives with respect to CWM strategy

Our findings suggest that amongst six strategy alternatives, the 'Collaborative Watershed Management (Public-Corporate-Experts Cooperation) [ALT 3], 'reduces internal weaknesses or develops missing strengths to minimize external threats', is perceived as the most important approach (17.4 %) by all stakeholders to solve the basin's problems (for further information see Appendix-F, G). This preference points out that all stakeholders are aware of the necessity of coordination and cooperation to gain effective watershed planning and management activities.

Stakeholders agree that 'the suitability of the basin to the development of tourism' [O4] is an important opportunity. Thus, they rated the 'Environment friendly tourism development: rural tourism' [ALT 2] strategy, uses strengths to maximize opportunities, after [ALT 3] (16.9 %). This preference points out the importance of providing income sources, sensitive to the basin's natural resources, for the local people.

'Improving water usage in rural areas and agriculture' [ALT 6] strategy, reduces the internal weaknesses to avoid external threats, is rated third by the stakeholders (16.8 %). While [T4] 'water pollution' is perceived as the primary threat to the sustainability of the basin, 'improving water quality-control invasive pollutant' [ALT 5] strategy, reduces the internal weaknesses to avoid external threats, is ranked fifth in stakeholders' priorities (16.4 %).

'Decreasing the water consumption in urban areas' [ALT 4] strategy, uses internal strengths to minimize threats, is the lowest rated (% 16.1) strategy. Despite the fact that stakeholders rated [T3] 'decline in the amount of lake water' (6.6 %) more highly, and [T6] 'destruction of the lake ecosystem' (6.0 %) factors, they have not supported [ALT 4], 'developed to improve the amount of water in the basin' enough. Priorities of the stakeholders for the alternatives/strategies developed to restore the water amount show that 'rural areas' and the 'agricultural water consumption' are perceived as the main reasons for the decrease in water amount.

4.4 Comparison of the stakeholders' alternative preferences

Table 7 and Figure 6 show the results of the sensitivity analysis of each watershed management option. This analysis demonstrates how the strategy alternatives were prioritized relative to other alternatives with respect to each objective as well as the overall objective from the perspective of stakeholders. According to the sensitivity analysis, the experts have the same prioritization with the CWM strategy which represents a shared view of all stakeholders. However, local authorities have the same prioritization with the CWM strategy, only regarding their preferences of ALT 3 and ALT 2 at the first and second row.

Table 7
Global priorities of the strategic alternatives from the perspectives of stakeholders

Strategic Alternatives	Stakeholders			
	Local communities	Local authorities	Experts	Overall stakeholders*
[ALT 1]	0.1634	0.1660	0.1640	0.1645
[ALT 2]	0.1613	0.1686	0.1784	0.1693
[ALT 3]	0.1689	0.1713	0.1817	0.1739
[ALT 4]	0.1690	0.1654	0.1487	0.1608
[ALT 5]	0.1679	0.1651	0.1576	0.1635
[ALT 6]	0.1696	0.1635	0.1697	0.1676

***** Each value is the geometric mean of the row.

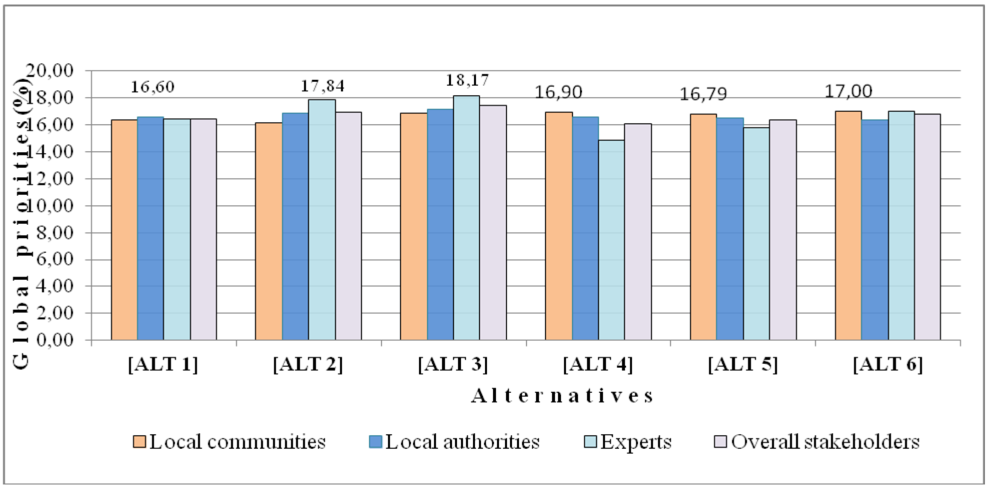


Figure 6. Sensitivity analysis

While comparing the global weight dispersions of alternatives in terms of stakeholder groups, we have determined the differences presented below (Figure 6):

i) 'Agricultural development' [ALT 1] strategy was supported at the highest level (16.60 %) by the *local authorities*.
ii) 'Environment friendly tourism development: rural tourism' [ALT 2] strategy was supported at the highest level (17.84 %) by the *experts*.
iii) 'Collaborative watershed management' [ALT 3] strategy was supported at the highest level (18.17 %) by the *experts*.
iv) 'Decreasing the water consumption in urban area' [ALT 4] strategy was supported at the highest level (16.90 %) by the *local communities*.
v) 'Improving water quality- control invasive pollutant' [ALT 5] strategy was supported at the highest level (16.79 %) by the *local communities*.
vi) 'Improving water usage in rural areas and agriculture' [ALT 6] strategy was supported at the highest level (16.97 %) by the *experts*.
Amongst the alternatives (Mini-Mini, Mini-Maxi, Maxi-Maxi and Maxi-Mini) aiming to provide sustainability of BLB, local authorities mostly preferred 'Maxi-Maxi' and 'Mini-Mini' strategies whereas an aggregate of the stakeholders mostly preferred 'Mini-Maxi' strategies (Table 8). However, any significant difference in other stakeholder groups' preferences was not observed.

Table 8
Rankings by different stakeholders regarding alternatives

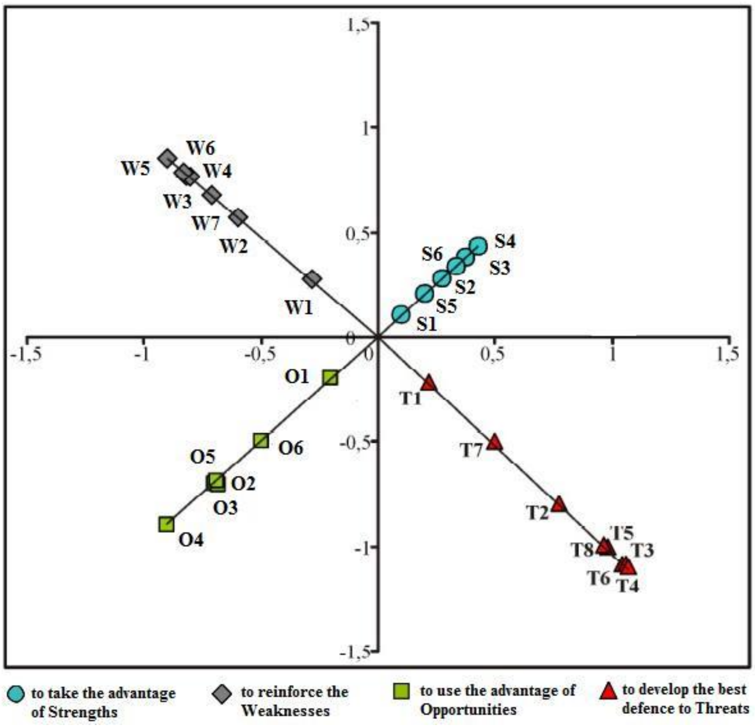
Ranking	Local communities	Local authorities	Experts	Overall stakeholders (CWM strategy)*
1	[0.1696] ALT 6: Mini-Mini	[0.1713] ALT 3: Mini-Maxi	[0.1817] ALT 3: Mini-Maxi	[0.1739] ALT 3: Mini-Maxi
2	[0.1690] ALT 4: Maxi-Mini	[0.1686] ALT 2: Maxi-Maxi	[0.1784] ALT 2: Maxi-Maxi	[0.1693] ALT 2: Maxi-Maxi
3	[0.1689] ALT 3: Mini-Maxi	[0.1660] ALT 1: Maxi-Maxi	[0.1697] ALT 6: Mini-Mini	[0.1676] ALT 6: Mini-Mini
4	[0.1679] ALT 5: Mini-Mini	[0.1654] ALT 4: Maxi-Mini	[0.1640] ALT 1: Maxi-Maxi	[0.1645] ALT 1: Maxi-Maxi
5	[0.1634] ALT 1: Maxi-Maxi	[0.1651] ALT 5: Mini-Mini	[0.1576] ALT 5: Mini-Mini	[0.1635] ALT 5: Mini-Mini
6	[0.1613] ALT 2: Maxi-Maxi	[0.1635] ALT 6: Mini-Mini	[0.1487] ALT 4: Maxi-Mini	[0.1608] ALT 4: Maxi-Mini

***** Each value is the geometric mean of the row.

'Agricultural development' [ALT 1] is a strategy that was preferred at a medium and low degree by all stakeholders. 'Environment friendly tourism development: rural tourism' [ALT 2] is a strategy that was more highly rated by experts and local authorities while ignored by local communities. 'Collaborative watershed management' [ALT 3] is a strategy that was highly rated by all stakeholder groups. 'Decreasing the water consumption in urban area' [ALT 4] is a strategy that was more highly rated by the local communities, however preferred by the local authorities and experts at a medium and low degree. 'Improving water quality- control invasive pollutant' [ALT 5] is a strategy that was adopted as a medium and low degree preference by all stakeholders. 'Improving water usage in rural areas and agriculture' [ALT 6] is a strategy the local authorities seriously protested.

4.5 Performance of the agreed upon watershed management strategy for BLB [ALT 3] on SWOT factors

It is a commonly held view among stakeholders that 'Collaborative watershed management' [ALT 3] is the most successful at: **i)** developing the best defence to threats of [T4] 'water pollution', [T6] 'destruction of the lake ecosystem', [T3] 'decline in the amount of lake water', [T5] 'overhunting', and [T8] 'interventions to basin's water system from outside the basin', **ii)** using the advantage of opportunities of [O4] 'its suitability in terms of tourism development', [O3] 'addition of water to the Beyşehir Lake through the Derebucak Derivation Tunnel', [O2] 'construction of New Konya- Antalya (Gembos) Motorway', and [O5] 'plans and projects to protect and develop the basin', and **iii)** reinforcing the weaknesses of [W5] 'problems in the institutional structure and legal system related to problem solving and management in the basin', and [W6] 'inadequacy of financial resources for activities to protect the lake'. However, the [ALT 3] approach is not considered the most successful at taking advantage of strengths (Figure 7).



* Negative values are symbolical and should be ignored.

Figure 7. Performance of the agreed upon watershed management strategy [ALT 3] by stakeholders' shared views on SWOT factors

5. Concluding remarks and recommendations for future research

This study evaluated the perceptions of three stakeholder groups—local people, local authorities, and experts—towards the successful watershed management in BLB, and explored how professionals/experts and local communities can combine their abilities to resolve the basin's problems, and how they can work in collaboration to achieve the objectives of joint management. As a methodology, a combination of AHP and SWOT analysis was used i) to describe the most appropriate watershed management strategies from the perspectives of different stakeholders, and ii) to determine the CWM strategy as an agreed upon strategy that met expectations of all stakeholders and considered their benefits equally. The results of the study show that amongst a set of proposed strategy alternatives 'collaborative watershed management' [ALT 3] was assumed as the optimal approach to solve the BLB's problems by all stakeholders. Their joint strategy preferences show that 'cooperation between community and public institutions' is the key to success in watershed management.

This study presents a 'knowledge-based, stakeholder-oriented and comprehensive decision support system' which provides assistance for water resource planning. The applied AHP-SWOT approach yields a better understanding of participatory planning and more effective decision-making in IWM studies. AHP-SWOT i) enables the development of guidelines for effective collaboration between stakeholders, thus reduces conflicts, ii) provides a simple, transparent and rapid decision-making process, iii) provides some insights on what can be done to enhance the likelihood of watershed management success, and iv) provides a mechanism to determine an agreed upon watershed management strategy (in this study CWM). Such a transparent decision-making process leads to more sustainable watershed planning and management decisions, encourages increasing community capacity to address the important issues in a constructive way, and therefore greatly increases the acceptability of the policy decisions by the public. Nevertheless, this study is limited with determining an agreed upon watershed management strategy. Due to the independent and hierarchical structure of AHP, watershed management strategies are considered to be independent and the connections among the strategies as well as the strengths, weaknesses, opportunities and threats cannot be evaluated. In order to highlight the interaction and dependence among the strategies, the combined use of ANP (Analytic Network Process) and SWOT can be applied in future studies.

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APPENDICES

APPENDIX–A: Survey sheet

1. Please state the most dominant or the least favorable factor (in the case of **S**trength) in order to perform environmental and socio-cultural sustainability of BLB, and compare two factors' intensity of importance.

Strengths (S)	**1=** Equal Importance; **3=** Moderate Importance; **5=** Strong Importance; **7=** Very Strong Importance; **9=** Extreme Importance																	Strengths (S)
S1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**S2**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**S3**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**S4**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**S5**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**S6**

2. Please state the most dominant or the least favorable factor (in the case of **W**eakness) in order to perform environmental and socio-cultural sustainability of BLB, and compare two factors' intensity of importance.

Weaknesses (W)	**1=** Equal Importance; **3=** Moderate Importance; **5=** Strong Importance; **7=** Very Strong Importance; **9=** Extreme Importance																	Weaknesses (W)
W1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W2**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W3**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W4**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W5**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W6**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**W7**

3. Please state the most dominant or the least favorable factor (in the case of **O**pportunity) in order to perform environmental and socio-cultural sustainability of BLB, and compare two factors' intensity of importance.

Opportunities (O)	**1=** Equal Importance; **3=** Moderate Importance; **5=** Strong Importance; **7=** Very Strong Importance; **9=** Extreme Importance																	Opportunities (O)
O1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**O2**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**O3**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**O4**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**O5**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**O6**

4. Please state the most dominant or the least favorable factor (in the case of **T**hreats) in order to perform environmental and socio-cultural sustainability of BLB, and compare two factors' intensity of importance.

Threats (T)	**1=** Equal Importance; **3=** Moderate Importance; **5=** Strong Importance; **7=** Very Strong Importance; **9=** Extreme Importance																	Threats (T)
T1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T2**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T3**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T4**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T5**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T6**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T7**
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**T8**

5. Please evaluate the importance of Strengths, Weaknesses, Opportunities and Threats of the basin to reach the goal of "to develop the best watershed management strategy enables BLB's environmental and socio-economic sustainability together".

1= Equal Importance; **3=** Moderate Importance; **5=** Strong Importance**; 7=** Very Strong Importance; **9=** Extreme Importance																				
S	to take the advantage of the Strengths	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	to reinforce the Weaknesses	**W**
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	to use the advantage of Opportunities	**O**
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	to develop the best defense to the Threats	**T**

Please evaluate the performances of the strategy alternatives (ALT 1, ALT 2, ALT 3, ALT 4, ALT 5, ALT 6) to take the advantage of the **S**trengths, to reinforce the **W**eaknesses, to use the advantage of **O**pportunities or to develop the best defense to the **T**hreats via the following scale:
[*Degree of relationship:* 0: No; **1:** Very weak; **3:** Weak; **5:** Medium; **7:** Strong; **9:** Very strong]

6. How much successful is the "Agricultural development" strategy (ALT 1);							
6.1. …to take the advantage of the **S**trengths?		**6.2.** …to reinforce the **W**eaknesses?		**6.3.** …to use the advantage of **O**pportunities?		**6.4.** …to develop the best defense to the **T**hreats?	
ALT 1−S1		**ALT 1−W1**		**ALT 1−O1**		**ALT 1−T1**	
ALT 1−S2		**ALT 1−W2**		**ALT 1−O2**		**ALT 1−T2**	
ALT 1−S3		**ALT 1−W3**		**ALT 1−O3**		**ALT 1−T3**	
ALT 1−S4		**ALT 1−W4**		**ALT 1−O4**		**ALT 1−T4**	
ALT 1−S5		**ALT 1−W5**		**ALT 1−O5**		**ALT 1−T5**	
ALT 1−S6		**ALT 1−W6**		**ALT 1−O6**		**ALT 1−T6**	
		ALT 1−W7				**ALT 1−T7**	
						ALT 1−T8	

7. How much successful is the "Environment friendly tourism development" strategy (ALT 2);							
7.1. …to take the advantage of the **S**trengths?		**7.2**. …to reinforce the **W**eaknesses?		**7.3.** …to use the advantage of **O**pportunities?		**7.4.** …to develop the best defense to the **T**hreats?	
ALT 2−S1		**ALT 2−W1**		**ALT 2−O1**		**ALT 2−T1**	
ALT 2−S2		**ALT 2−W2**		**ALT 2−O2**		**ALT 2−T2**	
ALT 2−S3		**ALT 2−W3**		**ALT 2−O3**		**ALT 2−T3**	
ALT 2−S4		**ALT 2−W4**		**ALT 2−O4**		**ALT 2−T4**	
ALT 2−S5		**ALT 2−W5**		**ALT 2−O5**		**ALT 2−T5**	
ALT 2−S6		**ALT 2−W6**		**ALT 2−O6**		**ALT 2−T6**	
		ALT 2−W7				**ALT 2−T7**	
						ALT 2−T8	

8. How much successful is the "Collaborative watershed management" strategy (ALT 3);							
8.1. …to take the advantage of the **S**trengths?		**8.2.** …to reinforce the **W**eaknesses?		**8.3.** …to use the advantage of **O**pportunities?		**8.4.** …to develop the best defense to the **T**hreats?	
ALT 3−S1		**ALT 3−W1**		**ALT 3−O1**		**ALT 3−T1**	
ALT 3−S2		**ALT 3−W2**		**ALT 3−O2**		**ALT 3−T2**	
ALT 3−S3		**ALT 3−W3**		**ALT 3−O3**		**ALT 3−T3**	
ALT 3−S4		**ALT 3−W4**		**ALT 3−O4**		**ALT 3−T4**	
ALT 3−S5		**ALT 3−W5**		**ALT 3−O5**		**ALT 3−T5**	
ALT 3−S6		**ALT 3−W6**		**ALT 3−O6**		**ALT 3−T6**	
		ALT 3−W7				**ALT 3−T7**	
						ALT 3−T8	

9. How much successful is the "Decreasing the water consumption in urban area" strategy (ALT 4);			
9.1. …to take the advantage of the	**9.2.** …to reinforce the **W**eaknesses?	**9.3.** …to use the advantage of **O**pportunities?	**9.4.** …to develop the best defense to the **T**hreats?

Strengths?							
ALT 4−S1		**ALT 4−W1**		**ALT 4−O1**		**ALT 4−T1**	
ALT 4−S2		**ALT 4−W2**		**ALT 4−O2**		**ALT 4−T2**	
ALT 4−S3		**ALT 4−W3**		**ALT 4−O3**		**ALT 4−T3**	
ALT 4−S4		**ALT 4−W4**		**ALT 4−O4**		**ALT 4−T4**	
ALT 4−S5		**ALT 4−W5**		**ALT 4−O5**		**ALT 4−T5**	
ALT 4−S6		**ALT 4−W6**		**ALT 4−O6**		**ALT 4−T6**	
		ALT 4−W7				**ALT 4−T7**	
						ALT 4−T8	

10. How much successful is the "Improving water quality- control invasive pollutant" strategy (ALT 5);							
10.1. …to take the advantage of the **S**trengths?		**10.2**. …to reinforce the **W**eaknesses?		**10.3.** …to use the advantage of **O**pportunities?		**10.4.** …to develop the best defense to the **T**hreats?	
ALT 5−S1		**ALT 5−W1**		**ALT 5−O1**		**ALT 5−T1**	
ALT 5−S2		**ALT 5−W2**		**ALT 5−O2**		**ALT 5−T2**	
ALT 5−S3		**ALT 5−W3**		**ALT 5−O3**		**ALT 5−T3**	
ALT 5−S4		**ALT 5−W4**		**ALT 5−O4**		**ALT 5−T4**	
ALT 5−S5		**ALT 5−W5**		**ALT 5−O5**		**ALT 5−T5**	
ALT 5−S6		**ALT 5−W6**		**ALT 5−O6**		**ALT 5−T6**	
		ALT 5−W7				**ALT 5−T7**	
						ALT 5−T8	

11. How much successful is the "Improving water usage in rural areas and agriculture" strategy (ALT 6);							
11.1. …to take the advantage of the **S**trengths?		**11.2.** …to reinforce the **W**eaknesses?		**11.3**…to use the advantage of **O**pportunities?		**11.4.** …to develop the best defense to the **T**hreats?	
ALT 6−S1		**ALT 6−W1**		**ALT 6−O1**		**ALT 6−T1**	
ALT 6−S2		**ALT 6−W2**		**ALT 6−O2**		**ALT 6−T2**	
ALT 6−S3		**ALT 6−W3**		**ALT 6−O3**		**ALT 6−T3**	
ALT 6−S4		**ALT 6−W4**		**ALT 6−O4**		**ALT 6−T4**	
ALT 6−S5		**ALT 6−W5**		**ALT 6−O5**		**ALT 6−T5**	
ALT 6−S6		**ALT 6−W6**		**ALT 6−O6**		**ALT 6−T6**	
		ALT 6−W7				**ALT 6−T7**	
						ALT 6−T8	

APPENDIX–B: AHP matrices of local communities

SWOT group weights matrix of local communities

	Strengths	Weaknesses	Opportunities	Threats	Weights
Strengths	1.00	0.36	0.47	0.26	0.102
Weaknesses	2.74	1.00	1.30	0.70	0.281
Opportunities	2.11	0.77	1.00	0.54	0.216
Threats	3.91	1.42	1.86	1.00	0.401
CR = 0.0016 Consistent (Lambda max=3.99565, RI =0.9, CI=0.00145)					

Strengths matrix of local communities

	S1	S2	S3	S4	S5	S6	Weights
S1	1.00	0.27	0.30	0.24	0.49	0.36	0.006
S2	3.72	1.00	1.12	0.88	1.84	1.35	0.022
S3	3.33	0.90	1.00	0.78	1.65	1.21	0.020
S4	4.25	1.14	1.28	1.00	2.10	1.54	0.026
S5	2.02	0.54	0.61	0.48	1.00	0.73	0.012
S6	2.75	0.74	0.83	0.65	1.36	1.00	0.017
CR= 0.0008 Consistent (Lambda max=5.99505, RI =1.24, CI =0.00099)							

Weaknesses matrix of local communities

	W1	W2	W3	W4	W5	W6	W7	Weights
W1	1.00	0.45	0.32	0.30	0.33	0.31	0.37	0.015
W2	2.20	1.00	0.70	0.66	0.73	0.69	0.82	0.033
W3	3.14	1.43	1.00	0.95	1.05	0.99	1.18	0.048
W4	3.32	1.51	1.05	1.00	1.10	1.04	1.24	0.050
W5	3.01	1.37	0.96	0.91	1.00	0.95	1.13	0.046
W6	3.18	1.44	1.01	0.96	1.06	1.00	1.19	0.048
W7	2.67	1.21	0.85	0.81	0.89	0.84	1.00	0.041
CR = 0.0012 Consistent (Lambda max=6.990747, RI=1.32, CI=0.00154)								

Opportunities matrix of local communities

	O1	O2	O3	O4	O5	O6	Weights
O1	1.00	0.25	0.19	0.25	0.25	0.30	0.010
O2	4.08	1.00	0.77	1.01	1.00	1.24	0.040
O3	5.29	1.30	1.00	1.31	1.30	1.61	0.052
O4	4.04	0.99	0.76	1.00	0.99	1.23	0.040
O5	4.07	1.00	0.77	1.01	1.00	1.24	0.040
O6	3.28	0.80	0.62	0.81	0.81	1.00	0.033
CR = 0.0022 Consistent (Lambda max=6.01386, RI=1.24, CI=0.002772)							

Threats matrix of local communities

	T1	T2	T3	T4	T5	T6	T7	T8	Weights
T1	1.00	0.25	0.21	0.21	0.32	0.23	0.49	0.25	0.014
T2	4.00	1.00	0.86	0.86	1.27	0.92	1.98	1.00	0.057
T3	4.67	1.17	1.00	1.00	1.48	1.07	2.31	1.17	0.067
T4	4.65	1.16	1.00	1.00	1.47	1.07	2.30	1.16	0.067
T5	3.16	0.79	0.68	0.68	1.00	0.73	1.56	0.79	0.045
T6	4.36	1.09	0.93	0.94	1.38	1.00	2.15	1.09	0.063
T7	2.02	0.51	0.43	0.43	0.64	0.46	1.00	0.50	0.029
T8	4.00	1.00	0.86	0.86	1.27	0.92	1.98	1.00	0.058
CR = 0.0021 Consistent (Lambda max=7.97885, RI=1.41, CI=0.00302)									

Performances of the strategy alternatives on SWOT factors from the view point of local communities

Factors	[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
S1	6.99	6.91	7.22	7.33	7.21	7.25
S2	6.99	6.91	7.22	7.33	7.21	7.25
S3	6.99	6.91	7.22	7.33	7.21	7.25
S4	6.99	6.91	7.22	7.33	7.21	7.25
S5	6.99	6.91	7.22	7.33	7.21	7.25
S6	6.99	6.91	7.22	7.33	7.21	7.25
W1	6.83	6.73	7.10	7.11	6.92	7.12
W2	6.83	6.73	7.10	7.11	6.92	7.12
W3	6.83	6.73	7.10	7.11	6.92	7.12
W4	6.83	6.73	7.10	7.11	6.92	7.12
W5	6.83	6.73	7.10	7.11	6.92	7.12
W6	6.83	6.73	7.10	7.11	6.92	7.12
W7	6.83	6.73	7.10	7.11	6.92	7.12
O1	7.19	6.99	7.22	7.27	7.40	7.24
O2	7.19	6.99	7.22	7.27	7.40	7.24
O3	7.19	6.99	7.22	7.27	7.40	7.24
O4	7.19	6.99	7.22	7.27	7.40	7.24
O5	7.19	6.99	7.22	7.27	7.40	7.24
O6	7.19	6.99	7.22	7.27	7.40	7.24
T1	6.99	6.97	7.31	7.26	7.24	7.36
T2	6.99	6.97	7.31	7.26	7.24	7.36
T3	6.99	6.97	7.31	7.26	7.24	7.36
T4	6.99	6.97	7.31	7.26	7.24	7.36
T5	6.99	6.97	7.31	7.26	7.24	7.36
T6	6.99	6.97	7.31	7.26	7.24	7.36
T7	6.99	6.97	7.31	7.26	7.24	7.36
T8	6.99	6.97	7.31	7.26	7.24	7.36

Strategy evaluation matrix of local communities

Factors	[ALT1]	[ALT2]	[ALT3]	[ALT4]	[ALT5]	[ALT6]
S1	0.001	0.001	0.001	0.001	0.001	0.001
S2	0.004	0.004	0.004	0.004	0.004	0.004
S3	0.003	0.003	0.003	0.003	0.003	0.003
S4	0.004	0.004	0.004	0.004	0.004	0.004
S5	0.002	0.002	0.002	0.002	0.002	0.002
S6	0.003	0.003	0.003	0.003	0.003	0.003
W1	0.002	0.002	0.003	0.003	0.003	0.003
W2	0.005	0.005	0.006	0.006	0.006	0.006
W3	0.008	0.008	0.008	0.008	0.008	0.008
W4	0.008	0.008	0.009	0.009	0.008	0.009
W5	0.007	0.007	0.008	0.008	0.008	0.008
W6	0.008	0.008	0.008	0.008	0.008	0.008
W7	0.007	0.007	0.007	0.007	0.007	0.007
O1	0.002	0.002	0.002	0.002	0.002	0.002
O2	0.007	0.007	0.007	0.007	0.007	0.007
O3	0.009	0.008	0.009	0.009	0.009	0.009
O4	0.007	0.006	0.007	0.007	0.007	0.007
O5	0.007	0.007	0.007	0.007	0.007	0.007
O6	0.005	0.005	0.005	0.005	0.006	0.005
T1	0.002	0.002	0.002	0.002	0.002	0.002
T2	0.009	0.009	0.010	0.010	0.010	0.010
T3	0.011	0.011	0.011	0.011	0.011	0.011
T4	0.011	0.011	0.011	0.011	0.011	0.011
T5	0.007	0.007	0.008	0.008	0.008	0.008
T6	0.010	0.010	0.011	0.011	0.011	0.011
T7	0.005	0.005	0.005	0.005	0.005	0.005
T8	0.009	0.009	0.010	0.010	0.010	0.010
Total Weight	0.1634	0.1613	0.1689	0.1690	0.1679	0.1696
Ranking	5	6	3	2	4	1

APPENDIX–C: AHP matrices of local authorities

SWOT group weights matrix of local authorities

	Strengths	Weaknesses	Opportunities	Threats	Weights
Strengths	1.00	0.53	0.58	0.25	0.117
Weaknesses	1.89	1.00	1.09	0.48	0.221
Opportunities	1.73	0.92	1.00	0.44	0.202
Threats	3.93	2.08	2.27	1.00	0.460
CR= 0.0009 Consistent (Lambda max=3.99756, RI=0.9, CI=0.00081)					

Strengths matrix of local authorities

	S1	S2	S3	S4	S5	S6	Weights
S1	1.00	0.50	0.30	0.37	1.09	0.55	0.010
S2	2.00	1.00	0.59	0.74	2.18	1.10	0.020
S3	3.39	1.69	1.00	1.25	3.70	1.86	0.033
S4	2.72	1.36	0.80	1.00	2.97	1.49	0.027
S5	0.92	0.46	0.27	0.34	1.00	0.50	0.009
S6	1.82	0.91	0.54	0.67	1.99	1.00	0.018
CR = 0.0024 Consistent (Lambda max=6.01504, RI=1.24, CI=0.0030)							

Weaknesses matrix of local authorities

	W1	W2	W3	W4	W5	W6	W7	Weights
W1	1.00	0.82	0.59	0.48	0.28	0.33	0.40	0.015
W2	1.23	1.00	0.72	0.59	0.34	0.40	0.49	0.018
W3	1.70	1.39	1.00	0.83	0.47	0.56	0.69	0.025
W4	2.06	1.69	1.21	1.00	0.57	0.68	0.83	0.030
W5	3.61	2.95	2.12	1.75	1.00	1.19	1.46	0.053
W6	3.04	2.48	1.78	1.47	0.84	1.00	1.23	0.044
W7	2.48	2.02	1.45	1.20	0.69	0.82	1.00	0.036
CR= 0.0024 Consistent (Lambda max=7.01918, RI=1.32, CI=0. 0032)								

Opportunities matrix of local authorities

	O1	O2	O3	O4	O5	O6	Weights
O1	1.00	0.43	0.28	0.41	0.25	0.40	0.013
O2	2.32	1.00	0.65	0.96	0.58	0.92	0.030
O3	3.59	1.54	1.00	1.48	0.90	1.43	0.046
O4	2.43	1.05	0.68	1.00	0.61	0.97	0.031
O5	3.98	1.71	1.11	1.64	1.00	1.58	0.051
O6	2.51	1.08	0.70	1.04	0.63	1.00	0.032
CR= 0.0015 Consistent (Lambda max=6.00941, RI=1.24, CI=0.1518)							

Threats matrix of local authorities

	T1	T2	T3	T4	T5	T6	T7	T8	Weights
T1	1.00	0.53	0.24	0.19	0.54	0.22	1.81	0.39	0.021
T2	1.89	1.00	0.46	0.37	1.03	0.41	3.41	0.74	0.040
T3	4.12	2.18	1.00	0.80	2.24	0.90	7.44	1.62	0.087
T4	5.15	2.73	1.25	1.00	2.80	1.12	9.29	2.02	0.109
T5	1.84	0.98	0.45	0.36	1.00	0.40	3.32	0.72	0.039
T6	4.59	2.43	1.11	0.89	2.49	1.00	8.28	1.80	0.097
T7	0.55	0.29	0.13	0.11	0.30	0.12	1.00	0.22	0.012
T8	2.55	1.35	0.62	0.50	1.39	0.56	4.60	1.00	0.054
CR= 0.0019 Consistent (Lambda max=8.01884, RI=1.41, CI=0.002692)									

Performances of the strategy alternatives on SWOT factors from the view point of local authorities

SWOT Factors	[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
S1	6.43	6.71	7.29	7.29	7.14	6.96
S2	6.33	6.73	7.00	7.27	7.00	6.73
S3	6.60	8.07	7.40	7.00	7.40	6.53
S4	7.53	6.60	7.00	7.40	7.00	7.00
S5	7.40	7.67	7.53	6.47	6.87	6.60
S6	6.73	7.00	7.40	7.00	7.13	6.73
W1	6.57	6.86	7.50	7.07	7.46	7.32
W2	6.60	7.00	6.73	6.47	6.33	6.47
W3	7.40	7.93	7.27	7.67	7.40	7.33
W4	6.73	6.73	7.27	7.00	7.00	7.53
W5	6.20	6.87	7.00	6.20	6.33	7.00
W6	6.73	7.40	7.53	6.73	6.73	7.40
W7	5.93	6.87	6.60	6.87	7.13	7.20
O1	7.00	7.07	7.43	7.25	7.39	6.93
O2	7.13	7.00	6.87	5.87	7.00	6.07
O3	7.13	7.40	7.53	7.27	7.27	6.87
O4	7.40	7.27	7.53	7.40	7.53	6.73
O5	7.53	7.53	7.40	6.87	7.27	7.53
O6	6.93	6.40	6.20	6.53	6.53	6.27
T1	6.36	6.71	7.07	6.75	7.14	7.04
T2	5.93	5.40	5.80	5.93	6.07	5.80
T3	7.00	6.73	7.27	7.27	6.67	7.13
T4	7.27	7.27	7.53	6.80	7.00	6.73
T5	6.73	7.13	6.73	6.33	6.33	6.40
T6	7.13	6.73	7.00	7.13	6.73	6.00
T7	5.47	6.07	5.93	5.53	5.13	6.07
T8	6.87	7.07	6.87	6.86	6.36	6.86

Strategy evaluation matrix of local authorities

SWOT Factors	[ALT1]	[ALT2]	[ALT3]	[ALT4]	[ALT5]	[ALT6]
S1	0.002	0.002	0.002	0.002	0.002	0.002
S2	0.003	0.003	0.003	0.003	0.003	0.003
S3	0.005	0.006	0.006	0.005	0.006	0.005
S4	0.005	0.004	0.004	0.005	0.004	0.004
S5	0.002	0.002	0.002	0.001	0.001	0.001
S6	0.003	0.003	0.003	0.003	0.003	0.003
W1	0.002	0.002	0.003	0.002	0.003	0.002
W2	0.003	0.003	0.003	0.003	0.003	0.003
W3	0.004	0.004	0.004	0.004	0.004	0.004
W4	0.005	0.005	0.005	0.005	0.005	0.005
W5	0.008	0.009	0.009	0.008	0.008	0.009
W6	0.007	0.008	0.008	0.007	0.007	0.008
W7	0.005	0.006	0.006	0.006	0.006	0.006
O1	0.002	0.002	0.002	0.002	0.002	0.002
O2	0.005	0.005	0.005	0.004	0.005	0.005
O3	0.008	0.008	0.008	0.008	0.008	0.007
O4	0.005	0.005	0.005	0.005	0.005	0.005
O5	0.009	0.009	0.009	0.008	0.008	0.009
O6	0.006	0.005	0.005	0.005	0.005	0.005
T1	0.003	0.003	0.004	0.003	0.004	0.004
T2	0.007	0.006	0.007	0.007	0.007	0.007
T3	0.015	0.014	0.015	0.015	0.014	0.015
T4	0.019	0.019	0.019	0.017	0.018	0.017
T5	0.007	0.007	0.007	0.006	0.006	0.006
T6	0.017	0.016	0.017	0.017	0.016	0.014
T7	0.002	0.002	0.002	0.002	0.002	0.002
T8	0.009	0.009	0.009	0.009	0.008	0.009
Total weight	0.1660	0.1686	0.1713	0.1654	0.1651	0.1635
Ranking	3	2	1	4	5	6

APPENDIX–D: AHP matrices of experts

SWOT group weights matrix of experts

	Strengths	Weaknesses	Opportunities	Threats	Weights
Strengths	1.00	1.33	0.60	0.73	0.209
Weaknesses	0.75	1.00	0.45	0.55	0.157
Opportunities	1.68	2.23	1.00	1.23	0.350
Threats	1.36	1.81	0.81	1.00	0.284
CR = 0.0004 Consistent (Lambda max=3.99904, RI=0.9, CI=0.00032)					

Strengths matrix of experts

	S1	S2	S3	S4	S5	S6	Weights
S1	1.00	0.52	0.72	0.44	1.02	0.51	0.022
S2	1.92	1.00	1.39	0.85	1.95	0.97	0.042
S3	1.38	0.72	1.00	0.61	1.40	0.70	0.030
S4	2.25	1.17	1.63	1.00	2.29	1.14	0.049
S5	0.98	0.51	0.71	0.44	1.00	0.50	0.022
S6	1.97	1.03	1.43	0.88	2.00	1.00	0.043
CR= 0.0014 Consistent (Lambda max=6.00894, RI=1.24, CI=0.00178)							

Weaknesses matrix of experts

	W1	W2	W3	W4	W5	W6	W7	Weights
W1	1.00	0.74	0.37	0.53	0.36	0.57	1.00	0.013
W2	1.35	1.00	0.50	0.71	0.49	0.78	1.35	0.017
W3	2.72	2.01	1.00	1.43	0.99	1.56	2.71	0.034
W4	1.90	1.41	0.70	1.00	0.69	1.09	1.89	0.024
W5	2.74	2.03	1.01	1.44	1.00	1.58	2.73	0.035
W6	1.74	1.29	0.64	0.92	0.63	1.00	1.74	0.022
W7	1.00	0.74	0.37	0.53	0.37	0.58	1.00	0.013
CR= 0.0029 Consistent (Lambda max=7.02291, RI=1.32, CI=0.003818)								

Opportunities matrix of experts

	O1	O2	O3	O4	O5	O6	Weights
O1	1.00	1.08	1.45	0.55	0.47	0.96	0.046
O2	0.93	1.00	1.34	0.51	0.43	0.89	0.043
O3	0.69	0.75	1.00	0.38	0.32	0.66	0.032
O4	1.82	1.97	2.64	1.00	0.85	1.75	0.084
O5	2.13	2.31	3.09	1.17	1.00	2.05	0.098
O6	1.04	1.12	1.51	0.57	0.49	1.00	0.048
CR= 0.0008 Consistent (Lambda max=6.0051, RI=1.24, CI=0.00102)							

Threats matrix of experts

	T1	T2	T3	T4	T5	T6	T7	T8	Weights
T1	1.00	0.49	0.40	0.42	0.39	0.54	0.81	0.83	0.019
T2	2.03	1.00	0.82	0.86	0.80	1.10	1.65	1.68	0.039
T3	2.48	1.22	1.00	1.05	0.98	1.34	2.01	2.05	0.048
T4	2.36	1.16	0.95	1.00	0.93	1.28	1.92	1.95	0.046
T5	2.53	1.25	1.02	1.07	1.00	1.37	2.06	2.10	0.049
T6	1.84	0.91	0.74	0.78	0.73	1.00	1.50	1.52	0.036
T7	1.23	0.61	0.50	0.52	0.49	0.67	1.00	1.02	0.024
T8	1.21	0.60	0.49	0.51	0.48	0.66	0.98	1.00	0.023
CR= 0.0016 Consistent (Lambda max=7.8461, RI=1.41, CI=0.00219)									

Performances of the strategy alternatives on SWOT factors from the view point of experts

SWOT Factors	[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
S1	4.86	5.82	4.67	3.32	3.45	3.00
S2	5.00	4.00	4.90	5.41	5.14	5.41
S3	5.45	6.73	5.71	4.73	5.73	5.14
S4	6.59	5.00	5.57	4.55	4.36	5.91
S5	3.41	6.59	5.86	4.36	4.36	4.36
S6	4.48	6.64	5.76	4.05	4.73	5.50
W1	5.00	2.77	6.00	4.90	4.50	6.45
W2	4.14	5.86	6.09	3.59	3.77	4.50
W3	5.05	5.36	6.18	5.45	6.18	5.18
W4	5.29	4.59	4.86	3.27	3.27	4.00
W5	3.77	3.67	5.91	3.36	3.45	4.73
W6	4.09	5.36	5.45	4.68	5.05	5.36
W7	2.82	5.64	4.45	4.41	3.45	3.59
O1	4.62	6.09	4.95	3.09	3.64	4.05
O2	4.76	5.86	5.14	2.50	3.50	3.36
O3	5.52	4.18	5.18	4.76	4.82	5.55
O4	4.71	7.09	5.59	3.91	5.91	5.00
O5	5.05	5.45	5.82	5.23	5.64	5.59
O6	5.14	5.24	4.82	4.36	4.77	5.00
T1	4.81	4.77	4.00	2.77	3.09	4.18
T2	2.62	2.27	2.68	2.95	2.77	3.00
T3	6.05	4.36	5.50	5.82	5.00	6.45
T4	4.76	4.77	5.59	5.23	6.45	5.82
T5	4.14	4.55	5.05	3.55	3.45	4.64
T6	4.10	4.64	5.14	5.55	5.00	5.82
T7	2.10	2.43	2.77	2.55	1.59	2.14
T8	6.00	5.40	5.36	5.50	4.64	4.90

Strategy evaluation matrix of local experts

SWOT Factors	[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
S1	0.004	0.005	0.004	0.003	0.003	0.003
S2	0.007	0.006	0.007	0.008	0.007	0.008
S3	0.005	0.006	0.005	0.004	0.005	0.005
S4	0.010	0.008	0.009	0.007	0.007	0.009
S5	0.003	0.005	0.004	0.003	0.003	0.003
S6	0.006	0.009	0.008	0.006	0.007	0.008
W1	0.002	0.001	0.003	0.002	0.002	0.003
W2	0.003	0.004	0.004	0.002	0.002	0.003
W3	0.005	0.005	0.006	0.006	0.006	0.005
W4	0.005	0.004	0.005	0.003	0.003	0.004
W5	0.005	0.005	0.008	0.005	0.005	0.007
W6	0.003	0.004	0.004	0.003	0.004	0.004
W7	0.001	0.003	0.002	0.002	0.002	0.002
O1	0.008	0.011	0.009	0.005	0.006	0.007
O2	0.008	0.010	0.009	0.004	0.006	0.006
O3	0.006	0.004	0.005	0.005	0.005	0.006
O4	0.012	0.018	0.015	0.010	0.015	0.013
O5	0.015	0.016	0.017	0.016	0.017	0.017
O6	0.008	0.009	0.008	0.007	0.008	0.008
T1	0.004	0.004	0.003	0.002	0.003	0.003
T2	0.006	0.005	0.006	0.007	0.007	0.007
T3	0.009	0.006	0.008	0.008	0.007	0.009
T4	0.007	0.007	0.008	0.007	0.009	0.008
T5	0.008	0.009	0.010	0.007	0.007	0.009
T6	0.005	0.005	0.006	0.007	0.006	0.007
T7	0.004	0.004	0.005	0.004	0.003	0.004
T8	0.004	0.004	0.004	0.004	0.003	0.004
Total Weight	0.1640	0.1784	0.1817	0.1487	0.1576	0.1697
Ranking	4	2	1	6	5	3

APPENDIX–E: SWOT priorities with respect to different stakeholder groups and CWM strategy

	Local priorities				**Global priorities**			
	Local communities	**Local authorities**	**Experts**	**CWM strategy**	**Local communities**	**Local authorities**	**Experts**	**CWM strategy**
S1	0.006	0.010	0.022	0.011	0.001	0.001	0.005	0.002
S2	0.022	0.020	0.042	0.026	0.002	0.002	0.009	0.003
S3	0.020	0.033	0.030	0.027	0.002	0.004	0.006	0.004
S4	0.026	0.027	0.049	0.033	0.003	0.003	0.010	0.004
S5	0.012	0.009	0.022	0.013	0.001	0.001	0.005	0.002
S6	0.017	0.018	0.043	0.024	0.002	0.002	0.009	0.003
W1	0.015	0.015	0.013	0.014	0.004	0.003	0.002	0.003
W2	0.033	0.018	0.017	0.022	0.009	0.004	0.003	0.005
W3	0.048	0.025	0.034	0.034	0.013	0.006	0.005	0.007
W4	0.050	0.030	0.024	0.033	0.014	0.007	0.004	0.007
W5	0.046	0.053	0.035	0.044	0.013	0.012	0.005	0.009
W6	0.048	0.044	0.022	0.036	0.014	0.010	0.003	0.007
W7	0.041	0.036	0.013	0.027	0.011	0.008	0.002	0.006
O1	0.010	0.013	0.046	0.018	0.002	0.003	0.016	0.005
O2	0.040	0.030	0.043	0.037	0.009	0.006	0.015	0.009
O3	0.052	0.046	0.032	0.042	0.011	0.009	0.011	0.010
O4	0.040	0.031	0.084	0.047	0.009	0.006	0.029	0.012
O5	0.040	0.051	0.098	0.058	0.009	0.010	0.034	0.015
O6	0.033	0.032	0.048	0.037	0.007	0.006	0.017	0.009
T1	0.014	0.021	0.019	0.018	0.006	0.010	0.006	0.007
T2	0.057	0.040	0.039	0.045	0.023	0.018	0.011	0.017
T3	0.067	0.087	0.048	0.065	0.027	0.040	0.014	0.025
T4	0.067	0.109	0.046	0.070	0.027	0.050	0.013	0.026
T5	0.045	0.039	0.049	0.044	0.018	0.018	0.014	0.017
T6	0.063	0.097	0.036	0.060	0.025	0.045	0.010	0.022
T7	0.029	0.012	0.024	0.020	0.012	0.005	0.007	0.007
T8	0.058	0.054	0.023	0.042	0.023	0.025	0.007	0.016

* The SWOT priorities for the 'CWM strategy' are derived from the geometric means of three stakeholder group priorities.

APPENDIX–F: Strategy evaluation matrix for CWM strategy

SWOT	Weight	SWOT Factors		Local Weight	Global Weight	Strategy Alternatives					
						SO	WO		ST	WT	
						[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
Strengths	0,136	S1	6	0,011	0,002	◑	◑	◑	◑	◑	◑
		S2	3	0,026	0,003	◑	◑	◑	◑	◑	◑
		S3	2	0,027	0,004	◑	◕	◑	◑	◑	◑
		S4	1	0,033	0,004	◕	◑	◑	◑	◑	◑
		S5	5	0,013	0,002	◑	◕	◑	◑	◑	◑
		S6	4	0,024	0,003	◑	◑	◑	◑	◑	◑
Weaknesses	0,214	W1	7	0,014	0,003	◑	◑	◑	◑	◑	◑
		W2	6	0,022	0,005	◑	◑	◑	◑	◑	◑
		W3	3	0,034	0,007	◑	◑	◑	◑	◑	◑
		W4	4	0,033	0,007	◑	◑	◑	◑	◑	◑
		W5	1	0,044	0,009	◑	◑	◑	◑	◑	◑
		W6	2	0,036	0,007	◑	◑	◑	◑	◑	◑
		W7	5	0,027	0,006	◑	◑	◑	◑	◑	◑
Opportunities	0,248	O1	6	0,018	0,005	◑	◑	◑	◑	◑	◑
		O2	4	0,037	0,009	◑	◑	◑	◑	◑	◑
		O3	3	0,042	0,010	◑	◑	◑	◑	◑	◑
		O4	2	0,047	0,012	◑	◕	◑	◑	◑	◑
		O5	1	0,058	0,015	◑	◑	◑	◑	◑	◑
		O6	5	0,037	0,009	◑	◑	◑	◑	◑	◑
Threats	0,374	T1	8	0,018	0,007	◑	◑	◑	◑	◑	◑
		T2	4	0,045	0,017	◑	◔	◑	◑	◑	◑
		T3	2	0,065	0,025	◑	◑	◑	◑	◑	◑
		T4	1	0,070	0,026	◑	◑	◑	◑	◑	◑
		T5	5	0,044	0,017	◑	◑	◑	◑	◑	◑
		T6	3	0,060	0,022	◑	◑	◑	◑	◑	◑
		T7	7	0,020	0,007	◔	◑	◑	◑	◔	◑
		T8	6	0,042	0,016	◑	◑	◑	◑	◑	◑
Total Weight:						0,165	0,169	0,174	0,161	0,164	0,168
Normalized Relative Importance(%):						16,5	16,9	17,4	16,1	16,4	16,8
Ranking:						**4**	**2**	**1**	**6**	**5**	**3**

Degree of Relationship	Graphic Symbol	Number
No		0
Very Weak	○	1
Weak	◔	3
Medium	◑	5
Strong	◕	7
Very Strong	●	9

APPENDIX–G: Global weights for CWM strategy

SWOT factors	[ALT 1]	[ALT 2]	[ALT 3]	[ALT 4]	[ALT 5]	[ALT 6]
S1	0.002	0.003	0.002	0.002	0.002	0.002
S2	0.005	0.004	0.005	0.005	0.005	0.005
S3	0.004	0.005	0.005	0.004	0.005	0.004
S4	0.006	0.005	0.006	0.005	0.005	0.006
S5	0.002	0.003	0.003	0.002	0.002	0.002
S6	0.004	0.005	0.005	0.004	0.004	0.004
W1	0.002	0.002	0.003	0.002	0.002	0.003
W2	0.004	0.004	0.004	0.004	0.004	0.004
W3	0.006	0.006	0.006	0.006	0.006	0.006
W4	0.006	0.006	0.006	0.006	0.005	0.006
W5	0.007	0.007	0.008	0.007	0.007	0.008
W6	0.006	0.006	0.007	0.006	0.006	0.007
W7	0.004	0.005	0.005	0.005	0.005	0.005
O1	0.004	0.005	0.004	0.003	0.003	0.004
O2	0.007	0.007	0.007	0.005	0.006	0.006
O3	0.007	0.007	0.007	0.007	0.007	0.007
O4	0.008	0.010	0.009	0.007	0.009	0.008
O5	0.010	0.011	0.011	0.010	0.011	0.011
O6	0.007	0.006	0.006	0.006	0.006	0.006
T1	0.003	0.003	0.003	0.003	0.003	0.003
T2	0.007	0.007	0.008	0.008	0.008	0.008
T3	0.011	0.010	0.011	0.012	0.011	0.012
T4	0.012	0.012	0.013	0.012	0.013	0.012
T5	0.007	0.008	0.008	0.007	0.007	0.008
T6	0.011	0.011	0.011	0.011	0.011	0.011
T7	0.003	0.004	0.004	0.004	0.003	0.004
T8	0.008	0.008	0.008	0.008	0.007	0.008
Total Weight	0.1645	0.1693	0.1739	0.1608	0.1635	0.1676
Ranking	4	2	1	6	5	3

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