



# The Application of Strategic Environmental Assessment in Regional Planning and Practice: Sahand Region \*

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**ABSTRACT:** By the beginning of the third millennium, environment has become an issue of global importance. Changes arising from globalization has led to the formation of concerns that have inevitably been effective in the field of urban planning /design. New paradigms pertaining to urban policies have become pervasive all over the world, ignorant of the country's local context. Lack of attention to contextual compliance underlying some of these paradigms have caused extremes in some cases that intensifies local-global dualities. This is especially evident in developing countries: there are occasionally some proposals to employ international architectural consulting services with innovative/new approaches to design or plan for large cities with great local backgrounds. In these circumstances, the adaptability of international planning/design paradigms to local context is highlighted as a point of concern. In this research, firstly, 'contextualism' is reviewed as a theory underlying urban development. Secondly, three recent international urban development paradigms: New Urbanism, Urban Villages and Urban Renaissance and the adaptability of their proposed solutions to urban context will be analyzed. An analytical method for comparative research is used to describe the main ideas of research. In each section, with an overview of the most important related literature, a multi-step process and logical reasoning, the strategies of each paradigm are compared within a model (multiple dimensions of urban design). To compare the adaptability of strategies to the context, 'contextualism' conceptual framework has been utilized. It is concluded that each paradigm has more emphasis on a specific dimension of contextualism which traces back to specific economic, political, cultural, etc. Circumstances from which that paradigm has been originated. Thus, when applying an international planning/design paradigm to a new environment, it will bring about practical changes only if it is calibrated to the local area's context initially.

**Keywords:** Strategic Environmental Assessment, Regional Environmental Assessment, Sustainable Development, Sahand Region.

## INTRODUCTION

Cities and their surrounding areas especially in developing countries are naturally the first areas to undergo numerous changes in their environment and this is more apparent in the various regions of developing countries that are faced with significant environmental challenges. Accelerating the development process and

environmental restrictions has caused considering "assessment of the developmental effects on the environment" as a part of 'development activities'. The idea that environmental considerations at 'high' levels of planning can mitigate environmental problems and instability has led to the emergence of a new approach

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known as Strategic Environmental Assessment (SEA) and after several decades of international implementation, SEA currently faces increasing pressure from planners and decision makers regarding its value (Li et al., 2015). In this approach, the process and type of development is determined under the influence of the possibilities and limitations of the environment (Partidario, 1994 & 1996).

Strategic environmental assessment as one of the key instruments applied to integrate the environmental issues into a spatial planning process effectively (Hegazy, 2015) and is a new tool in the environmental decision-taking system which evaluates the environmental consequences of decision-taking at different levels of planning including policy determination, legislation, planning and operational planning, which are classified overall as strategic levels (Partidario, 1998). In this conceptual framework, SEA must be considered not only as a descriptive and sectoral analysis related to the impacts generated by planning policies on the environmental resources, but also as a process that follows through and eventually identifies itself with the decision-making and implementation phases of plans and programs; that is with the definition and attainment of their strategies (Floris & Zoppi, 2015).

Regional Environmental Assessment (REA) or R-SEA (Gunn & Noble, 2009) is one of the forms of strategic environmental assessment on the basis of which the environmental consequences resulting from multi-sectoral development activities in a specific geographic area can be assessed and defined over time (Therivel & Partidario, 1996; Brown, 2008). The overall objective of REA is to inform the preparation of a preferred development strategy and environmental management framework for a region (Gunn & Noble, 2009).

In most developing countries, such as Iran, environmental degradation occurs due to paying less attention to the environment and sustainable development and a failure to apply the principles of sustainable development in planning. Sahand region located in East Azerbaijan Province of Iran enjoys great potentials in the areas of tourism, nature, etc. due to its location and specific environmental conditions and this should be taken into consideration in regional development planning to provide regional sustainable development in its various dimensions. Regarding to increased growth and development, economic change and its spatial organization parallel to the construction of new industry, this studied area is faced with several issues, which include:

- Absorption of rural labor into industry and reduction

of agricultural activities in comparison with industrial activities;

- Environmental degradation and pollution due to the activity of major industries at the regional level;
- Construction of new settlements, regardless of environment ability or observation of the adjacency principle.

This research aims at strategic environmental assessment of the regional strategic plan to analyze and interpret the causes of environmental threats and problems associated with current plans and to develop and implement a comprehensive methodology obtained from evaluating the regional environment in Sahand region. Aligned with the purposes, the following questions are raised: How can the combination of SEA and REA methods be used to push the process towards sustainable development? Is environmental sustainability considered in the strategic planning process to develop strategic plan in the region of Sahand? Are the environmental opportunities and constraints properly identified in this plan and have they had a good influence on the direction of the plan? Regarding to the analyzing and interpreting the past unsustainable economic and environmental patterns and the causes of environmental problems in Sahand, this research aims to develop conservation and development strategies and practical programs in line with achieving sustainable development.

## LITERATURE REVIEW

Many definitions of SEA have been proposed by experts (e.g. Brown & Therivel, 2000; Therivel, 2010; Partidario & Clark, 2000; Sadler & Verheem, 1996; Duinkerand Greig, 2007). One group has tried to define it as an ex ante and ongoing assessment (Floris & Zoppi, 2015) as well as the environmental assessment of the comprehensive and practical policies and plans (Noble, 2000; von Seht, 1999; Sadler and Verheem, 1996; Dalal-Clayton and Sadler, 1999). A rather new and comprehensive definition which is proposed by Therivel et al. (Therivel & Partidario, 1996; Therivel et al., 1992) is as follows:

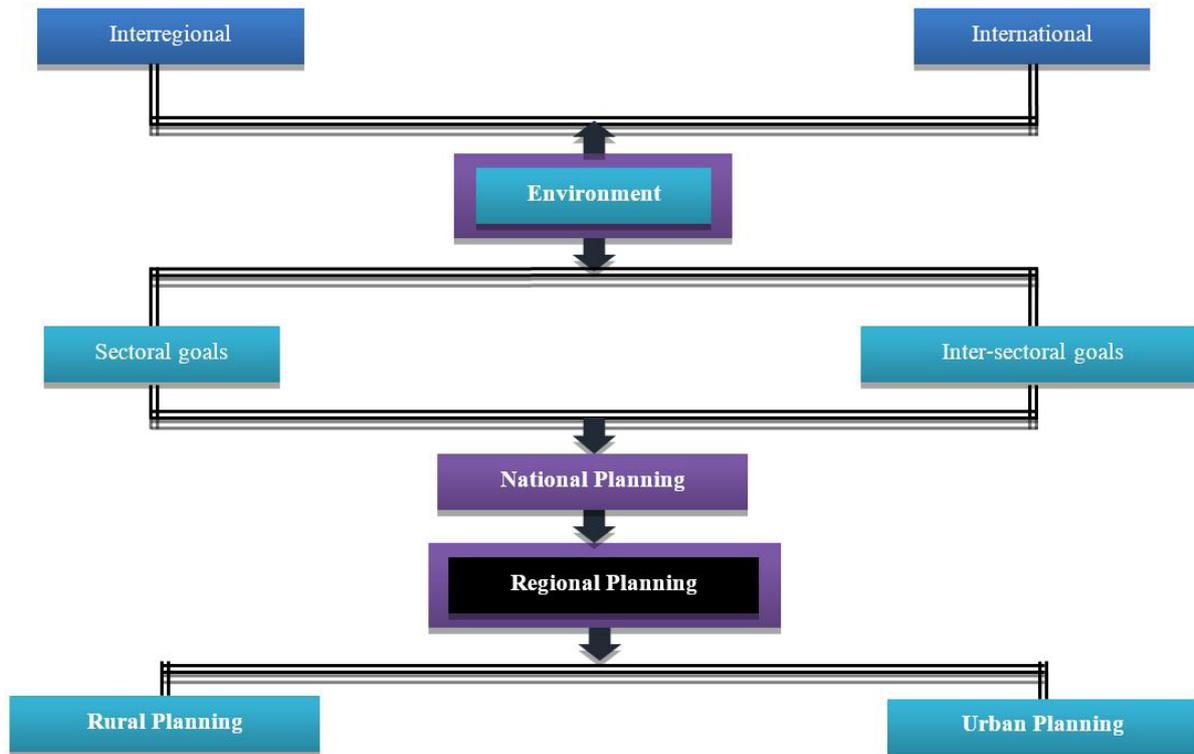
“SEA is a systematic process for evaluating the environmental consequences of proposed policy, plan or programme initiatives in order to ensure they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations.”

Resolving the environmental crisis requires active strategic provisions and timely predictions at the



policy-making, planning and action plan levels as the carrying capacity of the environment is affected by all micro, macro, repeated and varied activities, not just by major developmental ones. To fix this defect,

SEA has been proposed and developed in the regional planning literature. Figure 1 illustrates the position of environmental protection and regional planning in the planning process (Hooked, 1992).



**Fig. 1. The Position of Environmental Protection and Regional Planning in the Planning Process**

Achieving sustainable development at the regional level requires the application of all environmental potential of the region for the rational utilization of natural resources while all aspects of development should be considered in national and regional development plans. Achieving regional sustainable development requires a clear understanding of the current environmental relationships in the given region: In other words, it is necessary to know, what relationship could exist between ‘ecological activities’ in a region and the specific conditions of the region. To implement construction and

regional sustainable development projects, Hooke (1992) provides an option which is possible through reformation and adaptation with the environment. Regarding to his viewpoint, establishing a precise balance between local factors plays an important role in improving and implementing the plans (Hooked, 1992).

Development of the REA methodological steps has influenced on project experiences in many countries (World Bank, 1996). The general methodology for regional environmental assessment studies is shown here in Fig. 2.

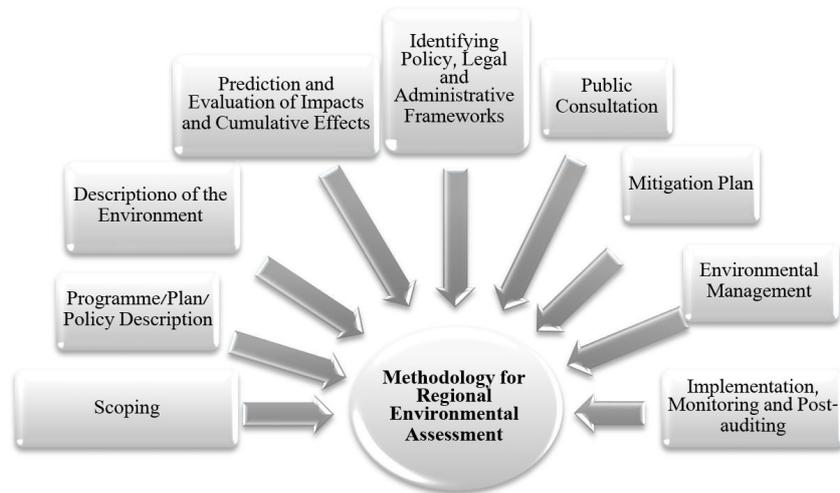


Fig. 2. Methodology for REA. Adapted from Braun (2004)

## TECHNICAL FRAMEWORK: SEA & REA

Both the strategic and the regional environmental assessment processes consist of a series of activities which constitute the process steps. At each stage of the process, according to the needs of each stage, some tools and accessories are used as ‘techniques’ and ‘method’ for undertaking the specific activity of each stage. Utilizing techniques in the SEA process can be a tool for achieving a special purpose and goal in the overall process of evaluation that is surely the achievement of sustainability.

Many techniques and methods are available to be used in SEA as Lee (2006) refers to 350 methods and techniques which were identified in a study conducted in the German governmental organizations in the early 1980s. Despite the existence of a broad choice, only a limited range of methods and techniques are applicable. The most common techniques and methods of SEA include:

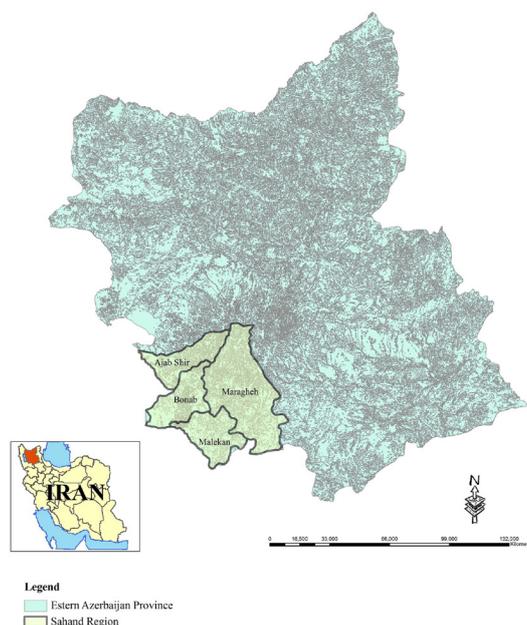
A. Descriptive methods and techniques – using indicators, checklists, impact matrices and impact triangles;

B. Analytical methods and techniques – employing impact trees/cause–effect diagrams or networks, multi-criteria/cost–benefit analyses, overlay maps, SWOT analysis;

C. Involvement (consultative and participative) methods and techniques – based on visioning exercises, workshops and expert surveys (Fischer, 2007).

## STUDY AREA AND REGIONAL PLAN

Because of their natural and human environment, the regions of Maragheh, Malekan, Bonab and Ajabshir have been chosen to form the study region in the furthest Southwest of Azerbaijan Province which are covering an area of over 4701.87 km and comprise 10.3% of the total area of the province. It is located between 36° 55’ to 37° 40’ northern latitude and between 45° 30’ to 46° 48’ of the East of the Greenwich Meridian (Fig. 3). Relative population density based on the above data is 103.1 persons per square kilometer which is compared with the relative density of population at the national level, displays a dense coverage of population in this region. The number of urban centers across the study region is more than six cities which, in total, include a population of 345,780 people. In terms of urban hierarchy and communication functions, the city of Maragheh is the regional center and the largest city in which 53.8% of the total urban population of this region reside. Bonab, Malekan and Ajabshir are three average-sized cities which are also responsible for tackling the first two political functions of the regional center: In total, over 43.3% of the urban population is settled in them. Kharaju and Leylanare are small cities but center of their areas in which currently, only 2.8 percent of the urban population is living (Aban Consulting Engineers, 2001).



**Fig. 3. Map of East Azerbaijan Province - Location of Sahand Region**

The main land uses of the study area consist of a set of agricultural lands including irrigated and dry lands, pasture lands, urban, industrial, and military lands and salt marshes. A large area of the lands of the region in the study area and the related counties is devoted to pastureland so that the area of these pastures with 302,091.8 hectares is equivalent to 64.2 percent of the total area of the region. The second major land use regarding to the spatial occupation of the study area comprises agricultural lands and wetlands. The distribution of land in the southern and western parts of the region and also beside the river is greater than other parts. The total area of agricultural lands of the region is 151,366 hectares which is equivalent to 32.3 percent of the region's lands of which 82,108 hectares are irrigated and 69,258 hectares are dry (non-irrigated) lands (Aban Consulting Engineers, 2001 & Peyghami, 2008).

The regional development plan of Sahand was prepared in 2001 by consulting engineers for the time period of 2002-2017. This plan has been developed with the aim of supporting regional development more with the purpose of setting a strategic approach.

## RESEARCH METHODOLOGY

This research has been conducted in two main phases. In the first phase, a comprehensive regional environmental assessment methodology for Sahand region was

developed and implemented and, in the second phase, a strategic environmental assessment of the studied plan and the sustainability of the available strategies in Sahand regional planning and their compliance with sustainable development viewpoint was precisely calculated.

### *Phase I: Regional Environmental Assessment Methodological Approach*

Regional environmental assessment can play an important role in the implementation of 'local sustainability' in areas such as Sahand. The output of REA does not present 'the decision', but rather the results of a systematic assessment of options such that a strategic direction can be identified for the region of concern and informed PPP decisions can be made (Gunn & Noble, 2009). This specific region has been selected as a sample case study for the application of REA methodology. According to the study and literature review as well as REA purposes, the 'Iranian-matrix method' and the 'cyclic graph (problem-analysis tree)' have been selected for evaluation.

The first phase of REA is to review the preliminary data obtained from the scientific observations of the region. The survey data was based on the available secondary data and some of the preliminary data obtained from objective observations and interview with the staff of the related organizations. A list of influencing factors



was developed that comprised twelve indicators (SEA process and method, public participation, information and data, decision-making institute, legislation and political context, and international experience (Wu et al., 2011 & Therivel, 2009).

After the main environmental problems in the region were observed and listed, the primary negative effects which are caused by the existing problems were analyzed. The matrix lists the main activities and procedures which lead to the creation of environmental problems and also considers the negative impacts on air, water, soil quality, flora and fauna and the impacts on landscape, human

health, people’s quality of life and economic loss which have emerged from resource depletion.

The matrix designed with 11 activities and processes in columns and 12 environmental factors in rows was given values with numbers ranging between ±5 and was assessed qualitatively. The next step after completing the matrix tables is to do mathematical summation in which the number of positive values of the algebraic sum, the ratio of positive values and average rating were determined, respectively. Then, mathematical summation was used to determine the status of the activities and to deduce the problems.

**Table 1. Matrix of Environmental Problems in Sahand Region**

Activities and Processes		Impact on the Environment											
		Air	Water	Soil	Fauna	Flora	Landscape	Human Health	Quality of Life	Ground Water	Urmia Lake	Thermal Pollution	Sensitive Area
Environmental Problems	Kavesoda Glassworks	-2.16	-4.12	-4.42	-2.25	×	-2.2	-1.12	-1.18	-2.25	-1.16	-0.080	×
	Thermal Powerhouse	-3.86	-2.25	-1.11	×	×	×	-1.12	+3.86	×	-3.55	-3.35	×
	Mining	-0.25	×	-1.25	×	×	-2.56	×	×	×	×	×	×
	Desertification	×	-0.55	-2.58	-3.88	-0.25	-2.66	×	-1.11	×	-0.55	×	-0.12
	Agriculture	×	-1.25	-3.58	-0.25	-0.98	×	-2.25	+3.56	-2.45	-3.58	×	-0.25
	Pasturage	×	-1.24	-4.44	-3.36	-1.12	-2.66	×	×	-0.22	×	×	-0.12
	Road Development	×	0.56	-0.12	-1.25	-0.60	-2.45	+1.12	+2.25	×	-0.22	×	×
	Sanitation	-0.6	-4.58	-3.56	-2.66	-0.12	-4.55	-2.22	-1.12	-3.47	-2.22	×	×
	Waste Materials	-2.25	-4.66	-3.32	-0.22	×	-3.88	-3.56	-1.22	-0.16	-0.6	-1.12	×
	Dams	×	×	×	×	×	+1.22	×	+3.55	-1.24	-4.88	×	×
Implementation of Water and Sewerage Systems	×	-1.12	×	-0.6	×	-1.12	-1.14	+2.56	×	-1.36	×	×	

**Problem Analysis Tree**

By applying a flow diagram known as ‘Problem Analysis Tree’ (PAT), Cumulative Environmental Assessment –the temporal and spatial accumulation of change in environmental systems in an interactive manner

(Noble, 2010)- was developed to conduct REA. This tool is a part of the analytical planning method called ZOPP (objectives-oriented project planning). ZOPP includes steps such as Participation Analysis, Problem Analysis and Goal Analysis. Fig. 4 describes the analytical tool of this method.

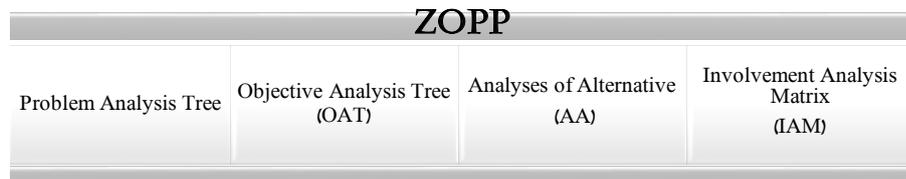


Fig. 4. Analysis Tools of the ZOPP Method (Braun, 2004 & Pfeiffer, 1997)

The information required to generate Sahand’s PAT is provided on the basis of the observations, the matrix results and interviews with Sahand’s authorities. In the Problem Analysis Tree, the first level depicts the primary causes of environmental problems which are activities and processes listed in the matrix of environmental problems

in Sahand. The second level reveals the secondary causes of the environmental problems and the third level shows the tertiary background causes as the primary effects which have assisted the main problem. Figure 5 shows the details.

Fig. 5. Problem Analysis Tree of Sahand Region

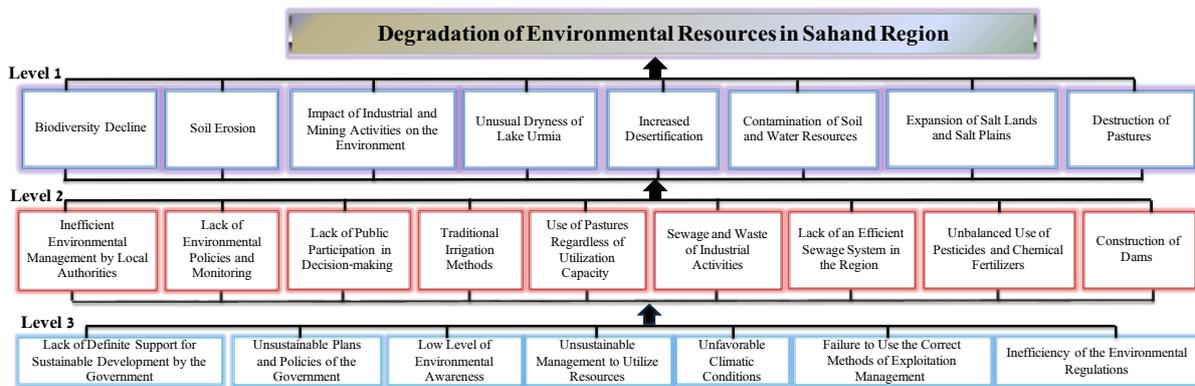


Fig. 5. Problem Analysis Tree of Sahand Region

**Deduction of Goals from the Problems Raised In Sahand and Development of Strategic Planning**

After determining and analyzing problems at the earlier stages, the goals resulting from the problems thrown up by the completed questionnaire and interviews conducted with officials and decision makers in Sahand were considered. They were then categorized according to the fields of ‘activity’, ‘environment and decision-taking structures’; the final statement of the goals plus the strategic outcomes are shown in Table 3. One of the main findings of REA is a better understanding of the environmental measures required to minimize environmental problems and promote local sustainable development. REA will eventually lead to strategic outcomes (Sot) to develop local environmental plans and

projects linked to local Agenda 21 in the region. Strategic outcomes create a direct relationship with the analyses conducted in the flow diagram PAT. This provides a comprehensive problem solving process (Brown, 2008).

**Phase II: Strategic Environmental Assessment of Sahand Regional Plan**

After developing the strategies resulting from phase I, strategic environmental assessment of Sahand’s regional plan and a more exact the determination of the sustainability of strategies in the regional plan and their compliance with sustainable development were considered. Figure 6 shows the basic stages of this process all together.

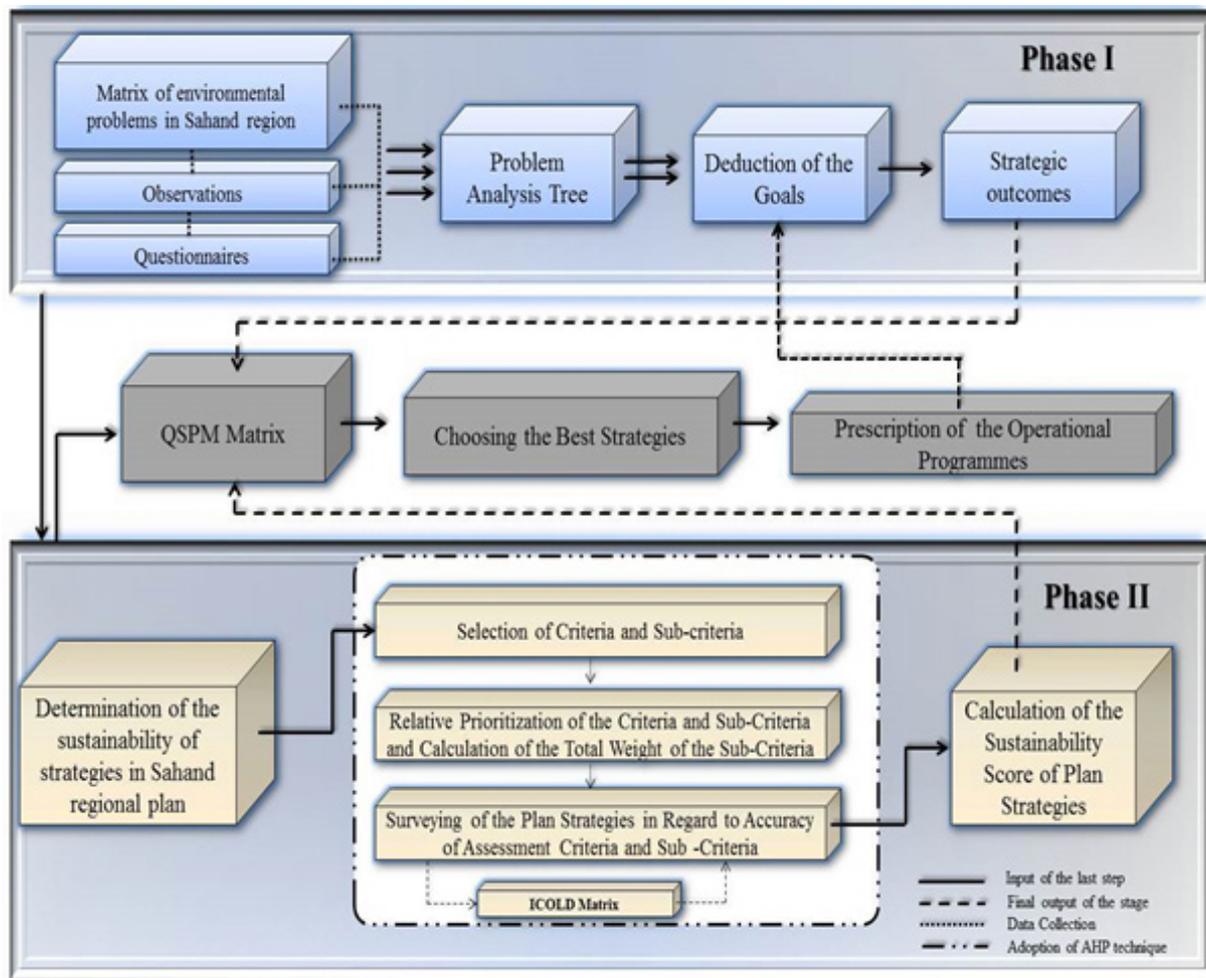


Fig. 6. The Two Phases of the Research Process

To do this, first some general criteria and sub-criteria towards which planning strategies are required to lead at this scale (to achieve sustainable development) have been determined. These criteria are within the main frameworks of sustainable development. Meanwhile, the role of the sub-criteria associated with the above criteria is very crucial. After this step, an attractive score will be determined for the selected criteria and sub-criteria using the Delphi method. The above scores are important because, firstly, “in a plan such as Sahand regional plan in regard with the extent and severity of the factors affecting it, paying the same amount of attention to all the criteria and sub-criteria may not be correct and some may have

more or less importance in comparison with others”. Secondly, “this way, the opinion of some other experts is used in the plan analysis and assessment process and unidirectional judgment will be reduced in this assessment”. These cases provide the necessary ground for the application of the AHP (Analytical Hierarchy Process) Technique.

Based on what has been mentioned above, along with the techniques selected to analyze impacts through a search in SEA samples and sustainable development indicators at the international level, 23 indicators (sub-criteria) have been selected within the framework of four general criteria

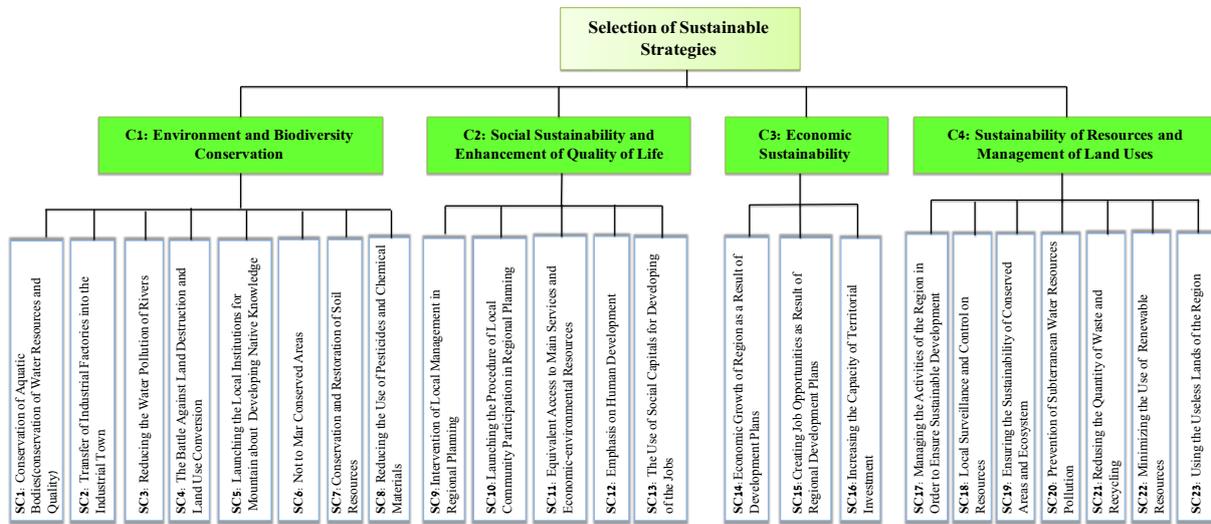


Fig. 7. Criteria and Sub-criteria Selected

The next step is to conduct a relative prioritization of the criteria and sub-criteria and calculate the total weight of the sub-criteria. For this, a hierarchical structure of criteria has been used. Then, in regard with the importance of each criterion and sub-criterion from the viewpoint of experts and specialists and with the use of Expert Choice software, the total weight and importance of the sub-criteria is determined. Next, the score was calculated for each sub-criterion on development strategies.

After the calculation of the total weight of the criteria and sub-criteria in the decision-taking hierarchy, the accuracy of the Sahand regional plan's criteria and sub-criteria should be determined and, after that, the total score of the plan needs to be calculated. The assessment method is based on the ICOLD Matrix. As a matter of fact, a team of specialists assessed the sustainability of each of the strategies in proportion to the developed sub-criteria (Table 2) on the basis of the descriptions given.

### Calculation of the Sustainability Score of Plan Strategies

According to the analyses, the relative importance of the evaluation criteria and sub-criteria, and also the plan's accuracy with regard to each of the above sub-criteria in achieving sustainable development and the SEA goals, the sustainability of the plan's strategies can be calculated. This value is the total average of the sizes measured by the plan's strategies in terms of each of the sub-criteria in

relation to the sustainability of these strategies. As Table 2 illustrates, the sustainability of the plan strategies index in regard to the accuracy of the assessment criteria and sub-criteria is 5/271, to be compared with a maximum possible score of nine. From the perspective of the factors affecting in this study, we can say that the attention paid by the plan to the criteria for sustainable development is more than 50% of total score. This is indicative of a rather average level of attention given to sustainable development and the SEA goals.



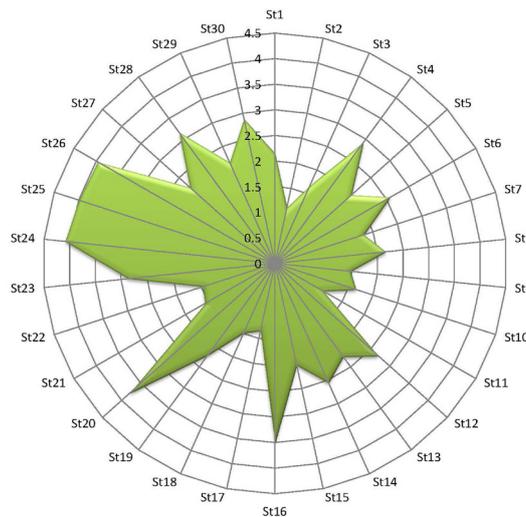
**Table 2. Calculation of the Sustainability of Strategies Index of Sahand Regional Plan**

Criteria	C1					C2					C3			C4										
Sub-Criteria	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12	SC13	SC14	SC15	SC16	SC17	SC18	SC19	SC20	SC21	SC22	SC23	
Score of plan from sub-criteria(N <sub>i</sub> )	3	7	1	3	5	7	5	5	3	5	7	5	7	5	7	5	7	7	7	7	7	3	5	Sum
Final weight of each sub-criteria(W <sub>i</sub> )	W1=0.015	W2=0.04	W3=0.04	W4=0.06	W5=0.096	W6=0.018	W7=0.09	W8=0.181	W9=0.018	W10=0.009	W11=0.006	W12=0.015	W13=0.02	W14=0.02	W15=0.02	W16=0.013	W17=0.080	W18=0.04	W19=0.02	W20=0.07	W21=0.018	W22=0.01	W23=0.02	
Sustainability of plan strategies from each sub-criteria	0.045	0.28	0.04	0.18	0.48	0.126	0.45	0.905	0.054	0.045	0.42	0.075	0.14	0.1	0.14	0.065	0.56	0.28	0.14	0.49	0.126	0.03	0.1	5.271

**Selecting Best Strategies through the QSPM Matrix and Setting Operational Programs**

Decisions about acceptable strategies for the Sahand regional plan and strategies developed during first phase were taken using both scientific analysis and intuitive judgment. In the previous stages, the acceptable strategies were identified by applying ‘ZOPP’ and ‘AHP’ techniques. At this stage, the decisions were taken on reasonable strategies: The importance of each strategy was specified via a quantitative strategic planning matrix and strategies with a high importance were chosen to be emphasized and prioritized in Sahand regional planning.

According to the Agenda 21 approach and the achievement of economic, social and environmental sustainability in Sahand, developing strategies and the selection of strategies with a high importance in this sector requires special attention. The results obtained from QSPM revealed that some of the selected options are not sufficiently sustainable as strategies since there is no importance for the development of that strategy or they are of less importance (Karbasi et al., 2007). Fig. 8 is plotted according to the figures obtained: In this figure, the importance of strategies is compared in relationship with each of the internal and external factors.



**Fig. 8. Comparison of the Importance of the Developed Strategies in Relation to the Internal and External Factors**



As Figure 8 illustrates, paramount importance among the strategies developed is assigned to the strategy of 'Development of Local Agenda 21 and Promotion of Public Participation' with a score of 4/09. This indicates the positive approach of this strategy to the promotion of sustainability in the region and the importance of public participation in both the preparation and implementation of the plans. Strategies for 'Raising Environmental Awareness in the Region', 'Increasing the Financial Resources at Local level to Promote Sustainable Development' and 'Water Management of the Water Resources of Urmia Lake and Providing the Required Water Right' with scores of 4, 3.97 and 3.52, respectively, are also among the best strategies. Rising environmental awareness among people living in the region can help promote the qualitative level of the environment in the region and avoid much of the pollution which is unconsciously produced.

## DEBATE AND CONCLUSION

SEA and REA in Iran is still in its early stages of developments and remains largely unviewed. That said, the current presented REA framework is constructed from the best available knowledge and experience of international experts, practitioners and administrators with regard to SEA, regional assessment. The methodological approach implemented in this paper provides regional authorities, planners and the local communities involved in the planning process with a detailed perspective on conceptual and methodological framework of R-SEA in Iran.

This research attempts to provide a solution in order to make strategic environmental assessment contribute to regional planning by responding to the methodological shortcomings of previous research studies and offering techniques and methods within applicable stages. As an example, applying the problem-finding techniques for developing targets is mentioned in this paper. Through determination of problems, macro-planning objectives can be reached and the existence of a problem can be the sign of a target. This method is assessed on the basis of community participation and, by expressing the problems of the region, the goals are specified. Development of strategies and their assessment from the perspective of the strengths, weaknesses, opportunities and threats of Sahand region are other essential steps which must be taken to fill the previous methodological gaps. The research findings of this study can be summarized as follows:

- Providing a suitable method for assessing development strategies from the environmental perspective are among the important achievements of the present study. Although environmental studies enjoy a satisfying position in the country's urban and regional planning process, it is necessary for this to be promoted especially in decision-making processes in order for sustainable development to achieve its goals as far as possible.

- Combining the two processes of 'Strategic Environmental Assessment' and 'Regional Environmental Assessment' through the introduction and implementation of them in Sahand regional development plan's assessment process is possible according to the results obtained from the review of the theoretical, empirical and technical frameworks of the research subject, on the one hand, and consideration of the results derived from the environmental understanding and analysis of the case study, on the other.

The most important achievement of this study is to provide a practical example of the application of the strategic environmental assessment in regional development planning in Iran. This can be a starting point for improving this type of planning in the country and for paying more attention to the environmental restrictions in the regional planning process.



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