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ENVIRONMENTAL BENCHMARKING ANALYSIS USING AHP: SPREADING BEST PRACTICES BETWEEN ITALIAN AND ALBANIAN SME'S

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Abstract:
This article presents the results of the environmental benchmarking activity performed within the A.D.A. project "positive actions for the diffusion of good environmental routines in Albania", financed within the E.C. program INTERREG IIIA Italy-Albania.

After an initial analysis of the state of the art in Albania on environmental politics and strategies, the planning and implementation of the environmental benchmarking analysis is described within a selected sample. A new benchmarking model was adapted to this aim for the diffusion of good environmental practices in Albania.

The model use was supported by the Analytical Hierarchy Process (AHP), for prioritizing the perceptions of stakeholders on their relative severity of environmental routines.

Key Words: Environmental Benchmarking, Environmental Management Systems, Performance Measurement, Analytical Hierarchy Process

1. INTRODUCTION

The delicate balance of environmental system and humankind is a long lasting subject of many international discussions, since the Kyoto protocol, recently comes into force (16th February 2006). The main attention is on human activities that alter the original equilibrium; since the environment plays a fundamental role for the existence of the humanity as a whole. Economic activities and demographic development represent the main factors influencing this equilibrium.

Sustainable development of human activities is defined as that balancing of the fulfilment of human needs with the safeguard of the natural environment so that future generation may have the same chance like us to determine their future. The term was used by the Brundtland Commission which coined what has become the most often-quoted definition of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." [1]

The objective to maintain a development compatible with the social equity and the ecosystems, in a sort of stable environmental equilibrium belongs to the sustainable economies, as also pointed out by Herman Daly. Stressing on the necessity "to allow the future generations to have at least the same opportunities had by ours" [2]. The strong relationship between economy and ecology, still unclear, governs the dynamic of this sustainable equilibrium.

Particularly in new capital economies like Albanian, this equilibrium nature-environment-man is subject to strong solicitations, where elevated impacts of the increasing productive and economic activities strongly press on the environment, (either in terms of urban and industrial centers or waters). The increasing rate of the industrial activities makes air and water pollution dangerous for people; one of the emergent problems is the uncontrolled presence of indisposed toxic materials coming from different industrial activities, whose polluting effects result everyday more visible.

Like any young capitalist economies, in Albania the environmental issue is perceived as a danger for competitiveness of the national economy. This trend is in opposition with the general intent expressed by several mature capital economies, conscious that environmental problems have to be managed effectively.

This scenario motivated the project (A.D.A. "Positive Actions for the diffusion of good environmental routines in Albania") and its research activities performed by different partners (Italian and Albanian) within INTERREG IIIA frame.

The results of the research in this work provide useful guidelines for the identification and transfer of good environmental praxis from Italy to Albania.

The vision of the project was: "Benchmarking and performance evaluation are among the key elements that are essential for reengineering a firm's business processes" [3] [4].

2. A BRIEF REVIEW OF BENCHMARKING

2.1 Benchmarking principles

There are several definitions of benchmarking, all based on the idea of evaluation of the performances of any given organization (e.g. manufacturing units, firms, or part of it) by comparing these with those of the best performing companies (Strongest competitors, companies leaders in the field).

"Benchmark is a mark on a fixed and enduring object (as on an outcropping of rock or a concrete post set into the ground) indicating a particular elevation and used as a reference in topographical surveys and tidal observation. A benchmark is thus a point of reference from which measurements of any sort may be made" (the Webster dictionary). One of the most accepted definition of benchmarking is: "continuing search, measurement and comparison of product, processes, procedures, ways to operate, best practices that other companies have developed to obtain an output and global performances, with the aim of improving the company performances." [5].

The expected result of benchmarking actions is the availability of a mean implement changes, more then a tool for merely evaluating company performances . The decision making process and the related set of performance indicators, suitable in depicting the company's behaviour, is a cornerstone of the benchmarking process. According to that, benchmarking decisions focus on a tactical level, related to organizational constraints, procedures and practices [5]. Adapting the best practices into one's own circumstances is the way most valuable for the company to identify business trends, and it serves as an early detection device for bad news [6].

Several approaches to benchmarking exist; amongst all, the more interesting to the present research are:

- goal benchmarking: to investigate the possibility, based on the improvement of performance indicators.
- organizational benchmarking: to study the possibility of replacing activities with other activities belonging to the excellent companies.
- integration benchmarking: to examine the possibility of changing the interconnection pattern for the same activity. Several work units should be examined simultaneously to identify the best performers [7].
- implementation benchmarking: to identify the possibility of redesign process or logistic units [5].

Generally speaking, any benchmarking process consists of the following steps:

- study of the process to be improved,
- identification of a best practice process in order to try to match two parts of the processes which have analogies,
- change the interconnection, structures or behaviour of the part to be improved using the analogy with the best transformation process.

Benchmarking steps deal with identification of what (the result will be the definition of analogous process parts), why (in terms of performance indicators) and how

(interconnections, structure or behaviour of the part to be improved have to be defined for the organization:), practices of leader companies, having conquered leadership position, can be transferred [5].

2.2 Environmental benchmarking

In the last years, there has been an increasingly intensive interest in assessing, evaluating, measuring and documenting the environmental performance in several fields of manufacturing [8] [9] [10] [11] [12].

Different benchmarking notions of environmental benchmarking are available in literature [13]. The idea and methodology of environmental benchmarking do not differ from other benchmarking processes. Environmental benchmarking is a structured approach of rigorously examination and comparison environmental perspective of the processes supporting different business activities [14]. It is mainly an environmental management tool that can provide a substantial contribution to the improvement of environmental performances by highlighting the identification of the gaps between company performances and target performances.

It also could be questionable whether the term ‘environmental benchmarking’ should be used at all. Expressions like ‘benchmarking of environmental performance’, ‘benchmarking for continuous environmental improvement’, ‘benchmarking for cost improvement in waste management’ or ‘benchmarking of environmental strategies’, might be more appropriate to use depending on the scope of the benchmarking process.

The main issues to be addressed for implementing an environmental benchmarking approach is to identify and assess the abilities and attitudes of a organization to excel in business and environmental performance simultaneously, bearing in mind that any process or business activity can be a candidate for environmental benchmarking.

Whenever environmental benchmarking is perceived as an improvement tool, it should involve analysis of the practices which lead not only to superior environmental performance (CO2 emission, water consumption, energy consumption, total waste etc).

Environmental benchmarking for continuous improvement is about finding out how ‘best-in-class’ organizations achieve high performances in managing the environment or eco-efficiency, and about trying to adapt these superior practices to the own organization.

All organization’s activities having influence on “environmental behavior” should be encompassed; not only to manufacturing processes. The object of interest in environmental benchmarking should be: development, resource assessment, environmental accounting, environmental performance measurement and data management systems, energy management, waste prevention and minimization, emergency response systems, environmental education and training systems, customer service, environmental policy development, or auditing practices.

In the paper, we present a general approach to environmental benchmarking, particularly adapted to spreading best practices into Albania. The decision making process and its link with the value of a set of performance indicators, suitable in depicting the company’s behavior, were carefully selected to this aim.

3. THE ENVIRONMENTAL SYSTEM SCENERY IN ALBANIA

Speaking about a true Environmental Management Systems (EMS) is not appropriate in the Albanian context. The EMS planning and implementation, according to the ISO 14001 standard [15], are still complex for most of the firms, although many governmental actions to promote EMS culture have been carried out, such as the "environmental permission" for the conformity of procedures to the prescriptions of law [16] [17] [18].

From the data collected it results that around the 70% of the Albanian Industries (AIs) has got the “environmental permission” or it is in course of application. (http://www.instat.gov.al/).

Within the frame of the ADA project a preliminary analysis has been done about the environmental systems of several Albanian Industries (AIs) in possession of the

"environmental permission" and the environmental management system certification according to the international standard ISO 14001. The outcome of this wide analysis, some interesting analogies and differences resulted, here listed without any priority order:

- the “environmental permission” is compulsory for the AIs, while the ISO 14001certification is a voluntary commitment, recognized in UE;
- the environmental system of most of AIs has mainly the characteristics of a control system in order to respect the legislation on the environmental pollution; while the ISO 14001 certification means the implementation of a management system that implicitly satisfies with effectiveness and efficiency the norms requirements;
- the environmental system of the AIs provides only some principal management phases (planning, organization, implementation, control), dealt in less exhaustive way in comparison to the environmental management system model;
- the environmental system of the AIs doesn't underline requirements related to the declaration of the environmental politics, to the definition of goals and objectives and to the documentation structure.

To come to the point, an environmental system for the AIs at the state, mainly aims, through a series of systematic processes, at maintaining under control the environmental impacts, without focusing on the continuous improvement of processes and environmental performances.

4. THE BENCHMARKING MODEL FOR PROCESSES MEASUREMENT

4.1 Description of the model

With the scope of determine the actual level of global performances of Albanian organizations with respect to Italian ones a wide set of performance measures has been identified.

Many indicators are used to measure the environmental performance of organizations (say amount of waste, energy use, etc.) or the state of the environment as such (e.g. air quality, water quality) [19].

Even though the focus of ADA project was on environmental aspects, the performances addressed concerned the whole managerial action. This was done to consider also those weak effects on overall environmental efficiency deriving from different areas of the organization.

To this aim the following goals were deployed to build a frame for the designed environmental benchmarking action:

- G1. to analyze the state of art as concern certification according to internal standards on Environmental Management System;
- G2. to verify the state of the art on environmental aspects;
- G3. to identify quality management issues supporting environmental questions;
- G4. to evaluate global and technical performances;
- G5. to evaluate interest to certification and conformity to environmental norms;
- G6. to assess quality and environmental management system;
- G7. to evaluate bent for cooperation between Albanian and Italian companies on quality and environmental issues.

The resulting frame for benchmarking consists of seven main items; these were deployed into specific requirements, as shown in table, to form a reference model for benchmarking.

The model for performances evaluation is illustrated in Figure 1, where the main items are stylized according to an “E” letter, to stress the concept of environment. Two section are important: the first represents the core structure of the model (items 1 to 4), while the second one allows to take into account continuous improvement issues. The general purpose of this model is to give an exhaustive picture of the AS IS scenario (say static picture, given by items 1-4) and of the dynamic behaviour of the organisation (TO-BE), provided by items 5-7.

4.2 The sample selection for Benchmarking partners identification

After a preliminary preparation of the benchmarking partners though dedicated brochures, meetings and videoconferences, the interviews have been developed in parallel in Albania and Italy on a final sample of 30 firms. The selection process of organizations to be involved for the project a deeper analysis of documents of government corporate body and accredited corporate bodies, of press and mass-media studies has been conducted. As a result, the benchmarking partners have been classified in two groups:

- "client partners": the Albanian Industries;
- "reference partners": the Italian Industries.

Table I: Deployment of the model (from the goal to the requirements).

GOALS	MODEL ITEMS	REQUIREMENTS
G1	***1. Certification***	***R1=norms***
		R2=certification body
		R3= related standards
		R4=standards conformity
G2	***2. State of the art***	***R1=compatibility of referring standards***
		R2=environmental strategies implementation
		R3=to have a bent for environmental systems
		R4=good praxis interest
		R5= key processes mapping
G3	***3. Quality support***	***R1= compatibility of quality and environment***
		R2=quality and environment integration
G4	***4. Performance***	***R1=to have quality performances measure***
		R2=measuring and monitoring of quality performances
G5	***5. Sensibility***	***R1=sensibility of and towards stakeholders***
		R2=knowledge of requirements
		R3=economic benefits
		R4=management ability
		R5=strategic sensibility
G6	***6. Planning and strategy***	***R1=relationships between management and environmental processes***
		R2=management rules
		R3=environmental strategy
G7	***7. Cooperation***	***R1=cooperation aptitude***
		R2=to be in line with environment management system
		R3=internationalization

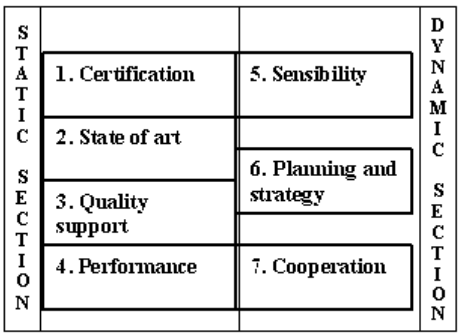

Figure 1: The model of performance analysis.

The careful choice of the industries typology was made to compare the critical success factors of client partners with those of the of reference partners. 30 voluntary industries were collected over a group of 100 ones.

As regards the client partners, the Albanian Industries (AIs) have been classified in:

- AIs with the environmental permission.
- AIs without the environmental permission.

The reference partners were instead distinguished as:

- with ISO 14001 certification (and/or EMAS [20]);
- without possession of ISO 14001 certification.

The criterions adopted for selecting the client partners' were technical, economic and managerial conditions, as well as the possession of an environmental system.

On the basis of the effected surveys and also of gathered information, the Albanian Industries with the environmental permission resulted more suitable for an effectiveness and efficient course of the project activities, because they also have a general management system environment oriented. The Albanian Industries without environmental permission were identified as secondary benchmarking target and therefore potential future users of the project results in a second phase, consequently were not included in the sample.

A second step was to select the potential reference partners for the AIs, amongst those certified according to the ISO 14001. The choice of the industrial sector was the civil constructions, the most important sector for the Albanian economy where in the last 10 years it contributes to the 13-14% of the gross inside product (Instat Albania dates, 2007).

4.3 Benchmarking technicalities

A benchmarking group made of 10 experts was built, afferent to the Polytechnic of Bari and the Polytechnic of Tirana, with a right training about the environmental themes and on the formalities of the interviews management (Table II).

Table II: Facilitators' protocol and tasks.

Facilitators' protocol	***Facilitators' tasks***
good knowledge of benchmarking's basis	To be an active actor during the questionnaire submission
good knowledge of the field of analysis	to conduct personally the interview to compile the questionnaire
to be informed on the kinds of environmental performances	to furnish in advance a notebook of the meeting, pointing out the scheduling and the places
good knowledge of the processes with meaningful environmental impact	to use an universal language
good knowledge of the questionnaire to effect the analysis of benchmarking	to finish the meetings respecting the pre-arranged times

The data, collected through ad hoc questionnaire, designed deploying the discussed requirements into specific questions, have been verified with the purpose to identify possible incongruities before being analyzed in definitive form. In order to carry out the analysis for the single area the weights for each requisite have been opportunely defined, getting an evaluation expressed in cents for each item of the model.

Figure 2 represents one of the possible results carried out for comparing model items, evaluated for a specific Italian partner, belonging to the final sample to ones of the defined Albanian partner. The radar chart underlines a good situation as regard the As is section for the Italian partner in opposite with the Albanian partner, however the gap in the To-Be section is not so evident. In fact the Albanian partner has shown a relatively high-quality of sensibility towards the environmental issues based on a promising planning and strategies. An open point results the attitude to cooperation, which could be improved, implementing specific politics and plans.

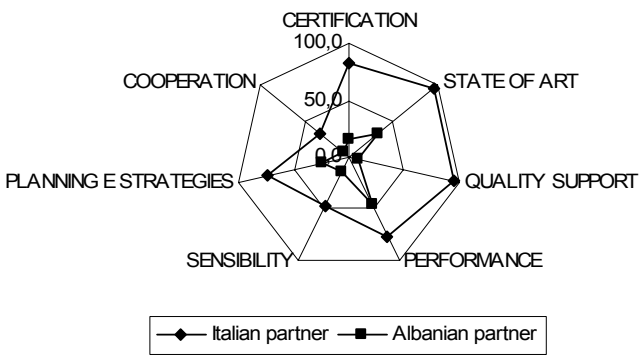

Figure 2: A starting pair-wise comparison analysis.

The benchmarking process was conducted through the support of a decision-aiding method, the Analytical Hierarchy Process (AHP) aimed at selecting the most suitable partners for a deeper environmental benchmarking analysis.

5. APPLICATION OF THE AHP IN ENVIRONMENTAL BENCHMARKING

5.1 The Analytical hierarchy process (AHP)

The paper has presented the AHP as a decision-making method that allows the consideration of multiple criteria. AHP can be seen as a useful tool for systematically analysing the environmental performances and the routines of several groups of industries in diverse country and in impact assessment study in future.

The Analytical Hierarchy Process (AHP) is a decision-aiding method developed by Saaty [21]. It is a general theory of measurement and it is used to derive ratio scales from both discrete and continuous paired comparisons. These comparisons may be taken from actual measurements or from a fundamental scale which reflects the relative strength of preferences and feelings. The AHP has a special concern with departure from consistency, its measurement and on dependence within and between the groups of elements of its structure. It aims at quantifying relative priorities for a given set of alternative on a ratio scale, based on the judgment of the decision-maker, and stresses the importance of the intuitive judgments of a decision-maker as well as the consistency of the comparison of alternatives in the decision-making process [22].

The AHP is a means for modelling unstructured problems in the economic, social, and administrative sciences. It has found its widest applications in multicriteria decision making, planning and resource allocation and in conflict resolution [23] [24] [25] [26]. The strength of this approach is that it organizes tangible and intangible factors in a systematic way, and provides a structured yet relatively simple solution to the decision-making problems.

Ramanathan highlighted several advantages of using the AHP as a tool while carrying out an environmental impact assessment, which can help the authorities in prioritising their environmental management plan [27].

In our study the AHP has been seen and used as a useful tool for systematically and advantageously supporting environmental benchmarking analysis by selecting the most suitable partner and comparing all sample partners according to the static and dynamic section.

5.2 AHP for Environmental benchmarking analysis

The AHP involves three basic steps: (i) problem decomposition; (ii) comparative judgments on each decomposed levels; (iii) synthesis of data through eigenvectors measuring relative importance.

The first step includes decomposition of the decision problem into elements according to their common characteristics and the formation of a hierarchical model with different levels. Each level in the hierarchy corresponds to the common characteristic of the elements in that level. The topmost level is the 'focus' of the problem. The intermediate levels correspond to criteria and sub-criteria, while the lowest level contains the 'decision alternatives'. To our scopes, by following the AHP procedure, the hierarchy of the environmental benchmarking problem can be developed as shown in Figure.3 which illustrates the simplest hierarchy involving goal, criteria and alternatives. The topmost level is the Focus of Goal 'Selecting the most suitable partner of environmental benchmarking'. The goal is characterised by several criteria, and the second level indicates these. The criteria considered are the seven items of our model: Certification, State of art, Quality support, Performance, Sensibility, Planning and strategy, Cooperation.

The last level represents the alternatives, which are the different partners, chosen for their higher scores in the preliminary analysis; three Italian industries (I1, I2, I3) and three Albanian industries (A1, A2, A3).

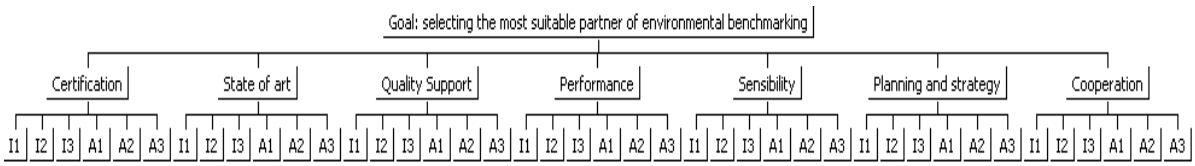

Figure 3: Hierarchy of the environmental benchmarking example.

In the second step, the elements of a particular level are compared pair wise, with respect to a specific element in the immediate upper level. A judgmental matrix is formed and used for computing the priorities of the corresponding elements.

Then, the following activities were performed:

1. synthesizing the pair-wise comparison matrix;
2. calculating the priority vector for each criterion such as certification;
3. calculating the consistency index, (CI);
4. calculating the consistency ratio (CR);
5. checking the consistency of the pair-wise comparison matrix to evaluate whether the decision-maker's comparison were consistent or not.

In addition to the pair-wise comparison for decision alternatives, we also use the same pair-wide comparison procedure to set priorities for all the seven items in terms of importance of each in contributing to the overall goal. Criteria are compared pair-wise with respect to the goal. A judgmental matrix has been formed using the comparisons. Tables III-IV show the pair-wise comparison matrix and priority vector for the seven criteria divided in the two sections: four criteria for the area of the AS IS and three for the area of improvement (TO BE).

Numerical rating	***Verbal judgments of preferences***
9	Extremely preferred
8	Very strongly to extremely
7	Very strongly preferred
6	Strongly to very strongly
5	Strongly preferred
4	Moderately to strongly
3	Moderately preferred
2	Equally to moderately
1	Equally preferred

Figure 4: Pair-wise comparison scale for AHP preferences (Saaty, 1987).

The comparison of any two criteria Ci and Cj (say, for example, Certification and State of art) with respect to the goal is made using questions of the type: 'which of the two criteria Ci and Cj is more important with respect to the environment benchmarking and how much more?'. The 9-point semantic scale suggested by Saaty is used to transform the verbal judgments into numerical quantities (Figure 4) [21].

The values reported in the tables 3-4 are the means of numerical quantities expressed by benchmarking group. The priority vectors, separately calculated for the two sections (as is and to be), represent the specific weights of each criteria.

Table III: Pair-wise comparison for the four criteria in the AS IS section.

	Certification	*State of art*	*Quality support*	*Performance*	*Priority vector*
Certification	1	3	8	5	0.561
State of art	1/3	1	6	4	0.285
Quality support	1/8	1/6	1	1/3	0.049
Performance	1/5	1/4	3	1	0.105
					∑=1.00

λmax=4.14, CI=0.048, CR=0.053< 0.1 OK.

Table IV: Pair-wise comparison for the three criteria in the improvement (TO BE) section.

	Sensibility	*Planning and strategies*	*Cooperation*	*Priority vector*
Sensibility	1	1/2	3	0.309
Planning and strategies	2	1	5	0.582
Cooperation	1/3	1/5	1	0.109
				∑=1.00

λmax=3.003, CI=0.0018, CR=0.003< 0.1 OK.

Once the judgmental matrix of comparisons of criteria with respect to the goal was available, the local priorities of criteria are obtained and the consistency of the judgements was determined. As the value of CR is less than 0.1, the judgments are acceptable.

In order to reduce the number of alternatives in AHP analysis, a preliminary investigation was conducted based on the questionnaire scores of all benchmarking partners (see diagram in Figure 5), where the x axis represents the "AS IS" area, obtained as a simple weighted sum of the scores in the items Certification, State of art, Quality support and Performance, and the y axis represents the "TO BE" area, obtained as a simple weighted sum of the scores in the items Sensibility, Planning and strategies and Cooperation.

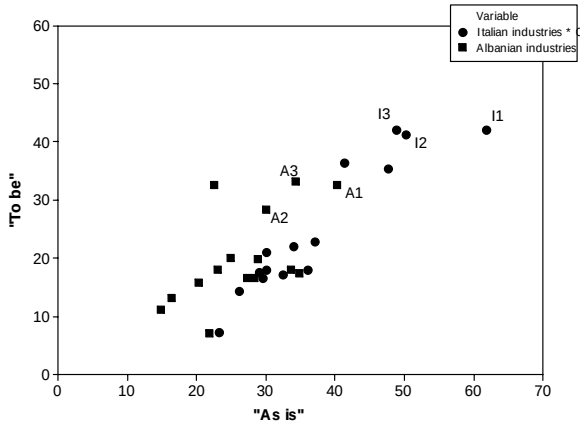

Figure 5: Benchmarking partners setting in the “AS IS” and “TO BE” areas.

Three Italian industries (I1, I2, I3) and three Albanian industries (A1, A2, A3) have higher positions in both the areas. These six marked industries were considered as alternatives in the ending analysis.

Using a very similar procedure used to set priorities for all seven criteria, the priorities of alternatives with respect to each criterion has been estimated. The comparison of any two alternatives Ai and Aj (say, for example, I1 and I2) with respect to each criterion has been made using the score on the questionnaire.

In Table V, the results of the pair-wise comparison matrix for criterion “Certification” are shown.

Table V: Pair-wise comparison matrix for certification.

Certification	I1	I2	I3	A1	A2	A3	Priority vector
I1	1	1.323	1.261	1.577	2.000	2.412	0.244
I2	0.756	1	0.954	1.192	1.512	1.824	0.185
I3	0.793	1.048	1	1.250	1.585	1.912	0.193
A1	0.634	0.839	0.800	1	1.268	1.529	0.155
A2	0.500	0.661	0.630	0.788	1	1.206	0.122
A3	0.415	0.548	0.523	0.654	0.829	1	0.101
							∑=1.00

λmax=6, CI=0 , CR=0 < 0.1 OK.

Once the local priorities of elements of different levels are available as outlined in the previous step, they are aggregated to obtain final priorities of the alternatives.

The calculations for finding the overall priority of industries (alternatives) are given below for illustration purposes for each area (AS IS and TO BE) (Tables VI-VII):

Table VI: Priority matrix for Italian and Albanian industries in the AS IS area.

	Certification (0.561)	State of art (0.285)	Quality support (0.049)	Performance (0.105)	Overall priority vector
I1	0.244	0.228	0.245	0.190	0.234
I2	0.185	0.191	0.213	0.190	0.188
I3	0.193	0.153	0.213	0.208	0.184
A1	0.155	0.143	0.117	0.187	0.153
A2	0.122	0.129	0.042	0.074	0.115
A3	0.101	0.156	0.170	0.151	0.126

Table VII: Priority matrix for italian and albanian industries in the TO BE section.

	Sensibility (0.309)	*Planning and strategies (0.582)*	*Cooperation (0.109)*	*Overall priority vector*
I1	0.181	0.203	0.137	0,189
I2	0.203	0.185	0.164	0,188
I3	0.135	0.214	0.192	0,187
A1	0.150	0.149	0.137	0,148
A2	0.109	0.131	0.178	0,130
A3	0.222	0.118	0.192	0,158

As example the calculation of overall priority of Italian industry I1 is reported in AS IS section
= 0,244 (0.561) + 0.228 (0,285) + 0.245(0.049) + 0.190 (0.105) = 0.234
and in improvement section
= 0.181 (0.309) + 0.203 (0.582) + 0.137 (0.109)= 0.189
Note that the above is a simple weighted summation. The final priorities, thus obtained, represent the rating of the alternatives in achieving the focus of the problem.

6. CONCLUSION

The benchmarking approach is widely adopted in both private and public organizations, to measure performances and to identify their position in the local or global market. The effectiveness and efficiency of waste services depend on a variety of parameters. Important benefits for both the service authority and the community might include effective monitoring of operations, better co-operation between authorities of different communities or greater areas, as well as in-depth analysis of related problems and enhanced elaboration of alternative solutions [28].

The aims of the proposed model for environmental benchmarking were:

- to individualize some reference standards;
- to fix some improvement objectives..

The application of the model to the reference sample allowed the evaluation of the environmental performances amongst Italian and Albanian companies, identifying those that can be defined good environmental routines.

This analysis has underlined a situation of substantial necessity of improvement of the most critical performances in the environmental field in Albania.

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REFERENCES

[1] United Nations. (2007). Report of the World Commission on Environment and Development. General Assembly Resolution 42/187, 11 December 1987. Retrieved: 2007-04-12.

[2] Daly H. E. (1999). Ecological economics and the ecology of economics : Essays in criticism Cheltenham, UK.

[3] Fisher B. (1996). Reengineering Your Business Process. Journal of Systems Management, Vol. 47, No. 1, 46–51.

[4] Talluri S. (2000). A Benchmarking Method for Business-Process Reengineering and Improvement. The International Journal of Flexible Manufacturing Systems, Vol. 12, 291–304.

[5] Lucertini M., Nicolò F., Telmon D. (1995). Integration of benchmarking and benchmarking of integration. International Journal of Production Economics Vol: 38, Issue: 1, March, 59-71.

[6] Daugherty P.J., Ellinger A.E., Gustin C.M. (1996). Benchmarking logistics in manufacturing firms. Supply Chain Management Vol. 1, No. 3.
[7] Nutt P. (2000). Surprising but true: half the decisions in organizations fail. IEEE Engineering Management Review, Vol. 28, No. 3, pp. 43–57.
[8] Jasch C. (2000) Environmental performance evaluation and indicators. Journal of cleaner production 8, 79-88.
[9] Kstad E., Hanssen OJ. (1997). Environmental performance indicators in industry, Confederation of Norwegian Business and Industry, Oslo, Norway.
[10] CERES. (1999) Global Reporting Initiative, Guidelines for corporate sustainability reporting, Boston.
[11] MEPI. (2000). Measuring Environmental Performance of Industry, SPRU—Science and Technology Policy Research, University of Sussex, Brighton, UK.
[12] Bennet M., James P. (1999). Sustainable measures. UK: Greenleaf Publishing Limited: Sheffield.
[13] European Environmental Benchmarking Network, Background. (2000). Fondazione Enrico Mattei.
[14] Szekely F., Vollmann T. & Ebbinghaus A. (1996). Environmental benchmarking. Becoming green and competitive. Business and the Environment-Practitioner Series, Stanley Thomas Ltd, Cheltenham.
[15] ISO 14001:2004. Environmental management Systems – Requirements and guide for the use
[16] Law n. 8897 of the 16.05.2002, Defense of the air from the pollution.
[17] Law n. 9115 of the 24.07.2003, Treatment of polluted waters.
[18] Government decree n. 249, of the 24.04.2003. Approval of the documentation for the environmental permission.
[19] ISO 14030: 1998, Environmental performance evaluation.
[20] Eco-Management and Audit Scheme. CE n. 761/2000
[21] Saaty T.L. (1980). The analytic hierarchy process. New York: McGraw- Hill.
[22] Saaty R.W. (1987). The analytic hierarchy process-what it is and how it is used, Mathl Modelling, Vol. 9, No. 3-5, 161-176.
[23] Saaty T.L. (1990). How to make a decision: the analytic hierarchy process. European Journal of Operational Research, 48, 9-26.
[24] Shim J.P. (1989). Bibliographical Research on the Analytical Hierarchy Process (AHP). Socio-Econ. Plann. Sci., Vol. 23, No. 3, 161-167.
[25] Al-Harbi K. M. Al-S.(2001). Application of the AHP in project management, International Journal of Project Management, 19, 19-27.
[26] Vaidya O. S., Kumar S. (2006). Analytic hierarchy process: An overview of applications. European Journal of Operational Research, 169, 1–29.
[27] Ramanathan R. (2001). A note on the use of the analytic hierarchy process for environmental impact assessment. Journal of Environmental Management, 63, 27–35.
[28] European Environmental Bureau, 2002, http://www.eeb.org/