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TPOLOGY ANALYSIS AND SELECTION OF ENVIRONMENTAL PERFORMANCE INDICATORS IN SMALL AND MEDIUM ENTERPRISES

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Abstract: The small and medium enterprises of Romania are requiring support allowing them to cross a first step towards the integration of the environmental issues, providing the basis to continue the environmental approach to the implementation of a comprehensive Environmental Management System, its eventual certification and to become aware of the consequences of their activities on the environment. In this purpose, the article aims to analyze some methods of environmental performance evaluation, the type and construction framework of the environmental performance indicators, based on applicable ISO standards. The results can enable the companies to build a self-contained system of performance improvement, or provide the basis for the continuation of the environmental approach towards the establishment of a certified environmental management system.

Keywords: environment, performance indicator, small and medium enterprise

1. INTRODUCTION

Small and medium-sized enterprises (SMEs), which are one of the links in the chain of human activities, must incorporate new environmental protection criteria in their operation. In the immediate future, it is asked the acquisition of new skills, the change in their organization, by the integration of environmental concerns, non-existent until now, followed by a change in the culture of the company [6, 7]. Nowadays, Romanian SMEs are facing difficulties in the integration of the environmental protection issues, particularly in the implementation of the Environmental Management Systems (EMS). These management tools define the organization that must adopt the company in order to achieve an integrated management of the environment, allowing the continuous improvement of its environmental performance.

It can be noticed, in Romania especially, the gap between the requirements of the EMS and the level of integration of the environment in SMEs. Gaps are important: a general under-information level, non-compliances and frequent malpractice, no or little formalization of information. Given this shift, a transitional phase seems necessary before considering the implementation of an EMS. This transition is based on an assessment of the existing balance in the company, allowing to identify the consequences of its activity on the environment, and ways to control them so that it crosses a first step towards the environmental integration and could consider the establishment of a complete management system.

Study of evaluation methods today proposed to business allow seeing that they are not satisfactory for SMEs: those that are simple enough to be used by the company remain at the level of awareness, those that lead to concrete results are complex or too heavy [9].

Environmental Performance Assessment (EPA) is defined by the ISO TC/207 as “*process aimed at choosing environmental indicators and to measure, analyze, evaluate, make account of and communicate the environmental performance of an organization comparing it with environmental performance criteria*”, while the so-called environmental performance are defined as “*results of an organization’s management concerning its environmental aspects*” [4].

2. ISO APPROACH OF ENVIRONMENTAL PERFORMANCE ASSESSMENT

The environmental performance assessment is based on the following grounds [5]:

- ✓ **acquisition of quantitative data** on the company situation with regard to the environment,
- ✓ **data interpretation**, by the construction of indicators ranging them from performance criteria, so as to identify gaps related to these criteria,
- ✓ **summary of results** for communication.

An ISO 14031:1999 standard [3] was developed on the theme of the assessment of the environmental performance. EPA is defined as “*a continuous internal process and management tool; it uses environmental indicators to compare the current environmental performance from the enterprise with environmental performance criteria*”. Indeed, ISO 14001 “*aims the environmental aspects of the activities, products and services: it is therefore not only the product non-intentional, namely the nuisance and pollution, but also potentially the intent product of the business*” [10]. EPA is designed as complementary to the EMS tool, but can also be used independently, as shown by the differences in definition of “environmental performance” from one standard to another. As part of an EMS, the benchmarks to compare the measured results are necessarily those of the objectives defined by the EMS, while in the case of the ISO 14031, evaluation is not necessarily performing as part of an EMS, criteria may be different. The proposed assessment structure is as follows (see Figure 1):

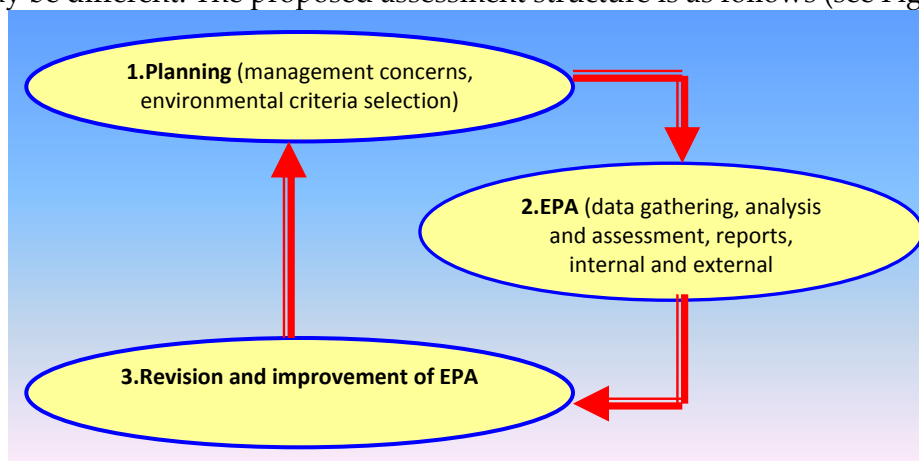


Figure1. Stages of the environmental performance assessment proposed by ISO 14031:1999 [1]

The standard provides aid and advice on the selection and construction of environmental indicators. We first introduce some general concepts on environmental indicators, specifying the function, mode of construction, and in particularly addressing the problems of aggregation and weighting. We then establish the construction framework of environmental performance indicators.

3. TYPOLOGY, SELECTION CRITERIA AND CONSTRUCTION FRAMEWORK OF THE ENVIRONMENTAL PERFORMANCE INDICATORS

Many documents related to the environmental assessment proposed criteria for selecting indicators. Based on documents of ISO [1], OECD [8] and IFEN [11], we extract the following criteria:

i) Relevance

- ✓ **relevance/needs**: indicators must provide information answering a need of the company or interested parties;
- ✓ **objective**: each indicator must be linked to an objective to which it compares;

- ✓ **readability:** ease of interpretation and understanding, clarity;
- ✓ existence of a **consensus** of the stakeholders as to the validity of the indicator.

ii) Accuracy of analysis

- ✓ **representativeness:** correct and synthetic representation of the situation the phenomenon in which there is interest;
- ✓ **accuracy of analysis:** construction on a healthy scientific and technical base. Objectivity and clarity of results;
- ✓ **consistency in time and in space,** to allow comparison (between site, at the national level, international etc), monitoring and emphasize of trends;
- ✓ existence of **reference values** to locate the indicator.

iii) Data

- ✓ **measurability:** accessibility of data at reasonable cost-benefit, reliable procedures.
- ✓ **sensitivity:** variation of the indicator for a little variation of the observed phenomenon and with an acceptable response time;
- ✓ **accuracy:** acceptable error margin;
- ✓ indicators must be **quantitative** where possible.

In practice, it is often difficult to meet all of these criteria, but it is advisable to approach up to get really useful and reliable indicators. The choice of criteria selection allows to verify the validity of an indicator, but does not constitute a real aid in its construction. Literature offers a method of indicators construction, which attaches to the monitoring of the different stages to achieve the final definition of an indicator [2]. The proposed method aims specifically to the development of indicators for the management of production, but the principles and the steps remain perfectly appropriate for environmental indicators. We further follow these basic steps:

- ✓ an indicator is quantitative, obtained from data resulting from a measure. The first step is therefore the *definition of the measuring field*, i.e. the domain in which there is interest and on which will carry the measure;
- ✓ once the measurement field is defined, we pass to the definition of the purpose sought to be achieved in this field. It is the next step, the *choice of objectives*. At this stage of the reflection, the objectives do not need to be quantified, their definition in fact allows to move to the next step, the *identification of the variables*. We are looking for the necessary elements to follow in order to reach the objectives;
- ✓ these variables must be translated into measurable parameters, which can be many and among which it is necessary to make sorting according to the importance of the parameter or its accessibility. This is the stage of *selection of the measurable parameters*;
- ✓ once this settings selection is carried out, it is necessary to transcribe them in quantifiable data, and possibly to combine to get a global indicator. This is the stage of *indicators selection*;
- ✓ prior to implementation, it is best to check their consistency and relevance. This is the stage of *selected indicators validation*. The reading of the indicator must allow unambiguously, to make the point about the measurement range selected. At this stage, we actually realize a simple verification of the consistency in the follow-up to the previous steps. An in-depth audit must be regularly performed during actual use of the indicator, especially to check its validity in time;
- ✓ there is finally obtained a set of indicators, *a priori* relevant. To make it a genuine tool for communication, it is necessary to organize them in a presentation providing a good visualization of the results. It is the last step, the *development of the dashboard*, consolidated document which should present the results in a legible and easily understandable shape. It must be dated, and can present various indicators in the form of graphics, such as pie, curve x-y, spider-shape etc. At this level, it is desirable to specify the

different attributes of each indicator. Indeed, an indicator should have a *name*, a *definition*, a *method of calculation*, a *unit of measurement*, an *updating frequency*, a *source* and a *mesh of validity*.

These successive stages are represented in Figure 2.

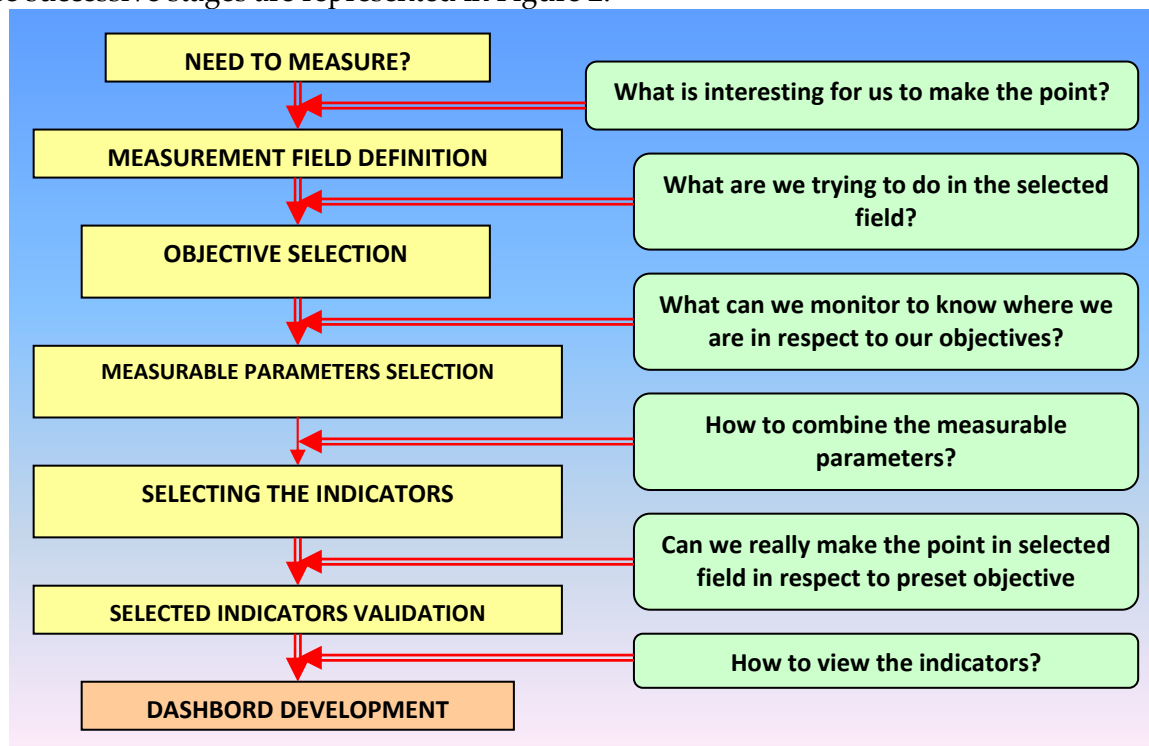


Figure 2. Process for the preparation of an environmental performance indicators dashboard.

Adapted from [2]

4. ADAPTATION OF THE PRESSURE-STATE-RESPONSE MODEL TO SME'S

The pressure-state-response model, or model PSR (See Figure 3) form a framework to develop indicators. It is used for the work of the Group on the State of the Environment of the OECD [8].: The PSR model is based on the next cycle "human activities exert *pressures* on the environment and alter the quality and quantity of natural resources (*state*). The society responds to these changes by adopting measures of environment, economic and sector policy (*societal response*). The latter act retroactively on *pressures* through human activities." [8].

Based on this model, it is possible to distinguish three categories of indicators:

- ✓ *indicators of pressures*: they describe the pressures on the environment, i.e. levies and emissions due to human activity. They can be direct, for example when considering the emission of polluting substances, waste generation or consumption of natural resources, or indirect, if they relate to human activity resulting in direct pressure;
- ✓ *indicators of condition or state*: they reflect the state of the environment and its evolution.. However, the distinction between the state of the environment and the pressure on him is sometimes ambiguous, and approaches to measure the state of the environment are often impassable or very expensive. In practice, therefore, are used more easily the pressure as the status indicators;
- ✓ *indicators of societal response*: they reflect the extent to which society meets the concerns in the environmental field and must reflect the efforts implemented to treat a given environmental problem.

The PSR by OECD model focuses on the representation of the interaction between society and the environment, and allows the construction of "global" indicators assessing the effects of this interaction. In the case that interests us, the objective is to build an assessment of the environmental effects due to the SME' s activity, and not society as a whole.

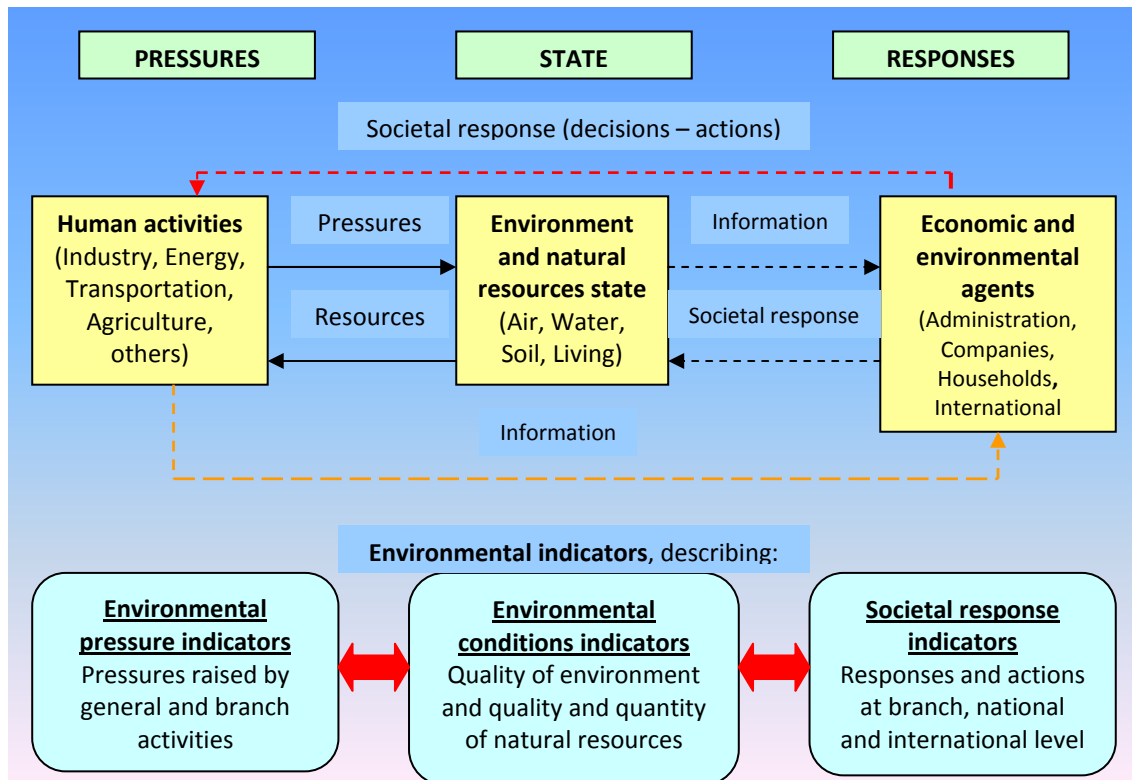


Figure 31. The diagrammatic layout of PSR model. [8]

However, the types of indicators to express these effects remain the same. To express the respective positions of these indicators in the business, we construct a PSR model of the SME by analogy with the general PSR model (see FigureFigure 4).

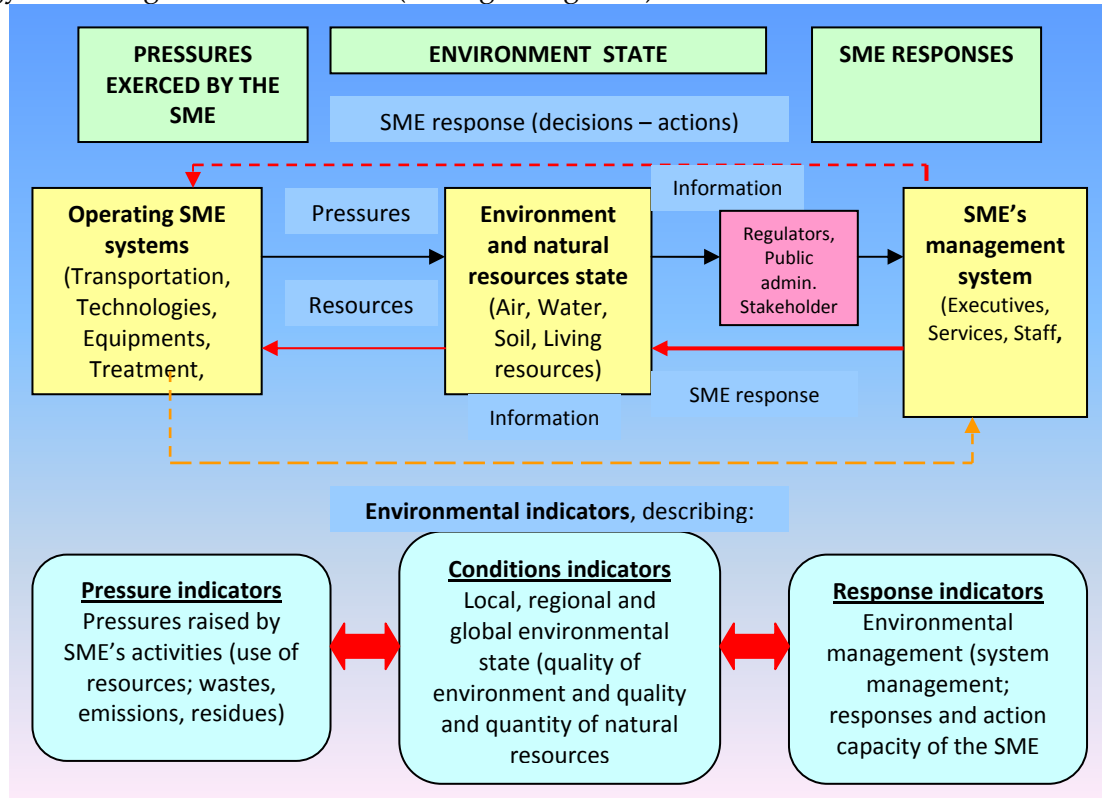


Figure 4. Adapted PSR model for SME's

The considered cycle is more complex: the activity of the company exerts *pressures* on the environment and modifies the quality and quantity of natural resources (*state of the environment*). The company responds to these changes by actions (*responses by society*), which some apply

directly to companies: political control, various local, economic, financial pressures etc. In response, the company program actions (*responses by the company*) that change *pressures* on the environment by its activity (e.g. reduction of the flow of pollutants).

There are found again the three types of previous indicators, except that they are this time targeted at enterprise level:

- ✓ pressure indicators: direct, which evaluate the pressures that the company exerts on the environment (removal of material and discharges, noise). The indirect ones assess the management the activities of the company, likely to be at the origin of direct pressures. Under our approach, pressure indicators assess the direct impact factors (flow) and indirect ones (practices) of the company.
- ✓ indicators of response from the SME: they assess the company ability to meet its environmental issues (proposal for action, efficiency of programmed actions).
- ✓ condition indicators: they reflect the state of the environment and its evolution. Their measure is usually not the responsibility of the company. It should simply be noted that when the company rejects large amounts of certain toxic substances, it is bound to a control of the water or air quality in its immediate environment.

There can be emphasized in this indicators typology the indicators considered by the ISO 14031 standard (Table 1) :

Table 1. Correspondence of the indicator's typology with the ISO 14031 standard

PSR model	ISO 14031 standard
Pressure indicators →	Environmental performance indicators provide information on the environmental performance of operations
Response indicators →	Environmental management indicators provide information on the results of ongoing managerial efforts aimed to amend the environmental performance of the company
Condition indicators →	Environmental status indicators provide information on the condition of the environment

Figure 5 represents, at the level of the undertaking, the scope of each type of indicator. The assessment of the environmental performance is a complementary approach of the Life Cycle Assessment. The latter aims to compare different systems (product, process or service) that provide the same service, by the assessment of impacts associated with each system throughout its life cycle.

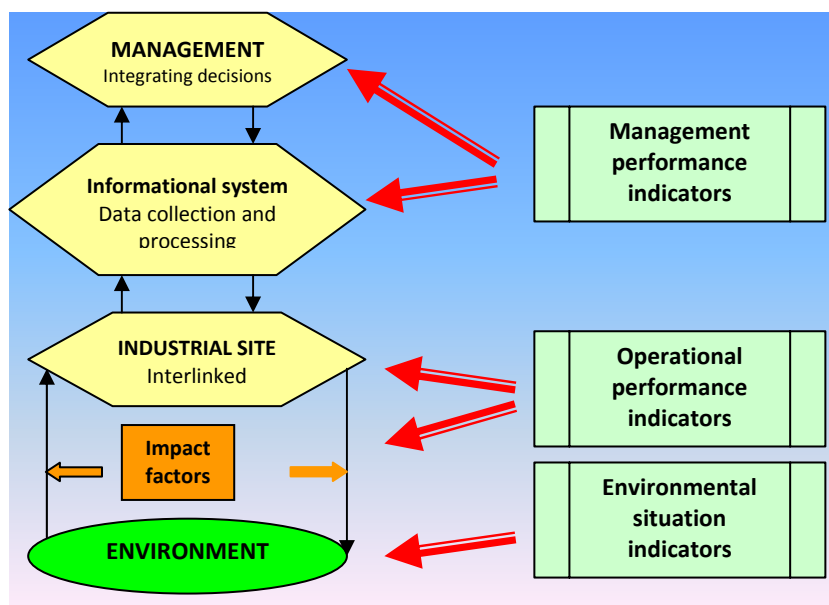


Figure 5. Performance indicators action level

The environmental performance assessment focuses on the assessment of impacts or environmental impact factors related to the activity of a site, from the operational (processes,

procedures and practices) and managerial viewpoint (management of personnel, information management). The approach is in this case associated not with a function but to a site. EPA does not take into account the stages of the life cycle off a site, but focuses instead on aspects of the site that are not studied in Life Cycle Assessment, either at the operational level (taking into account noise and the risk associated with facilities, practices and procedures...) or managerial (information management level of staff, programming of actions etc. We can also notice that site approach involves positioning in space (characteristics of the local environment) and temporally (historical site).

5. CONCLUSIONS

This analysis is based on the observation of the difficulties of implementation of an Environmental Management System - and more generally for the integration of the environment - in Romanian SMEs. The requirements of the EMS are too heavy for an immediate implementation in SMEs, but SMEs are however submitted, - or will soon be - to strong environmental issues which will lead them to implement the EMS. SMEs need support, enabling them to improve their impact factors, so identifying the actions necessary to bring them into compliance, minimum requirement that they rarely meet in Romania and then to the improvement of their environmental performance.

The existing methods of environmental evaluation study allowed us to identify two approaches with prospects of response to the needs of SMEs:

- ✓ multi-phase methods, which allow to achieve by step the different levels of objectives, awareness in the implementation of an integrated management system, and whose progressive aspect facilitates the use by non-specialists;
- ✓ evaluation of the environmental performance, which organizes the implementation of an environmental information management system, based on the construction of indicators synthesizing and interpreting environmental data of the company. In this, it is the complement of the EMS, thus offering a tool of day-to-day management of the system, allowing its management in the short and medium term.

On these bases, may be developed a method for integration of the environment combining the progressive aspect and the information processing (exploitation of the environmental data of the enterprise by the construction of indicators). The assessment of the environmental performance allows the collection and the formalization of the environmental data of the company, as well as the identification of non-compliances, by the construction of indicators, facilitating the internal and external exploitation of results, programmatic actions of correction of non-compliances. This approach could allow the company to build a self-contained system of improvement of its results, or be the basis for the continuation of the environmental approach towards the establishment of a certified environmental management system, organizing total environmental management in the company.

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