

# Identification and assessment of the environmental aspects according to the ISO 14001 standard

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## 1. Introduction

The Environmental Management System accordant with the ISO 14001 standard is one of the most common standards for simplifying the management of a company based on the principle of balanced development. Its systemic consistency with other popular management systems simplifies their integration (formation of integrated management systems) and reduces the time of the system implementation into the company practice. The implementation of the Environmental Management System accordant with the ISO 14001 must be preceded with a multidimensional analysis of the company. The most important component of this analysis is identification and assessment of the environmental aspects. According to the standard [1], the environmental aspect is an element of organisation activities, products and services that can interact with the environment. Additionally, it was remarked that some of the environmental aspects may significantly impact the environment. These aspects were defined as significant and are required to be isolated from other environmental aspects. Thus, the significance of a proper identification and assessment of the environmental aspects results from their superior character in the system and direct interactions with key components of the Environmental Management System in the company, among others, with environmental politics, identification of legal and other requirements which the company obliged to observe, identification of personnel whose work may have an impact on the environment, determination of training needs, audit programme, procedures of information flow, rules of operation control and monitoring of environmental aspects themselves. Due to numerous references to the environmental aspects in many procedures of the Environmental Management System accordant with the ISO 14001 standard, it should be stated that proper elaboration of the procedure of identification and assessment of these aspects is the main issue when preparing the company for the system's implementation.

## 2. Stages of identification and assessment of the environmental aspects

The ISO 14001 standard requires creating and maintaining the procedure for identification of the environmental aspects [1] without stating a precise course. This topic was discussed in more details in the commentary to the standard [2] which recommends taking the following elements into consideration when identifying the environmental aspects:

- emission to air
- discharge to water
- sewage management
- use of raw materials and natural resources
- other issues related to the local environment and local society.

The commentary to the standard [2] and the work [3] also suggest the procedure for identifying and assessing the environmental aspects. Four main stages (Fig. 1) of the resultant character were distinguished, which at the end determine the significance of particular environmental aspects due to gradation of their impact on the environment.

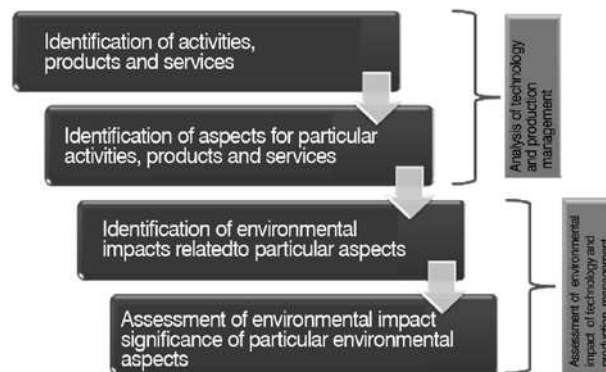


Fig. 1. Stages of identification and assessment of the environmental aspects

### Identification of activities, products and services

Before identifying the organisation activities, products and services, a border of the Environmental Management System should be established. It relates to the physical border (border of an area of the organisation activities) and the content related border for the system.

The standard [1] for providing total control over the potential environmental aspects expects from the company to impact also on suppliers, subcontractors, co-users/area occupiers, service, utilization and liquidation of goods, and customer's behaviour.

Once the system's borders are defined, the framework action plan should be created in the organisation, mostly with the use of functional and area criterion [3, 6], such as design – development – production – supply of raw materials and energy – logistics – maintenance of machines and devices – maintenance of area.

Activities, products and services can be identified in two ways [3÷5]. The first one is to divide main processes into smaller areas of activities and to assign to them the maximum number of identified environmental aspects. Most often, this method works well for separating the main technological stages related to particular parts of the production and describing them regarding the possibility of the environmental aspect occurrence.

The second way for identifying the organisation activities, products and services is so-called environmental assignment. This method is based on review of technology with the use of criterion of the affected environmental component. The resultant map of environmental components is parameterised with particular environmental aspects which are a consequence of the organisation activity.

The most often, publications [2, 3, 7] suggest creating a map of environmental components by the following key:

- impact on the air
- impact on the water
- impact on the soil
- impact on the landscape
- the environmental impact of waste
- release of energy to the environment (vibrations, noise, warmth, coldness, electromagnetic field).

The significant advantage of this method for identification of activities, products and services is the simplicity of connecting the achieved results with identification of the environmental aspects in

a logical way. Thus, maps of the environmental components enable to identify the same or similar environmental aspects occurring in different areas of the technological plant at the same time.

Taking into account the disadvantages and advantages of both presented methods, it can be stated that an ideal solution meeting all needs of the implemented Environmental Management System accordant with the ISO 14001 standard is to use both methods at the same time. This solution provides the supervisor of technological process an access to unambiguous information on its impact on the environments (fragmentation of processes) and to information about the overall technological impact on particular environmental aspects (method of environmental assignment which is particularly important for environmental protection).

### Identification of environmental aspects and impacts

Regarding identification of the environmental aspects, the standard [1] leaves no doubts because it unambiguously indicates that a company should identify all environmental aspects relating to its business activity. The following documents may be helpful:

- technical and process documentation of the plant
- material and energetic balance of conducted processes
- opinions and comments of the interested parties
- industry standards and guidelines
- scientific papers.

An additional parameter necessary to consider when identifying the environmental aspects is their circumstances. According to the standard [1], aspects occurring in normal circumstances of the installation and aspects occurring in the specific conditions (e.g. commissioning, maintenance) and in emergency situations should be identified. Due to the complexity of identification of the environmental aspects, the possible high number of aspects which will be assessed in the next step and which can differ by environmental impact significance, it is suggested to elaborate a detailed register of the environmental aspects as an attachment to the current procedure of identification and assessment of the environmental aspects [8].

Upon creating a list of the environmental aspects, another step of the procedure suggested in publications [2, 3] is to determine the environmental impacts caused by particular aspects. According to the standard [1], an environmental impact is the change in the environment, negative and positive, which is totally or partly caused by the environmental aspects of the company. Information on the environmental impacts is often outlined in the company's documentation. The following information should be particularly analysed regarding this aspect:

- reports on the environmental impact
- environmental audits (including initial environmental reviews if available)
- technical data and characteristics of products, services and raw materials
- reports on environmental incidents and failures
- analysis regarding the safety and protection of employees' health
- comments from interested parties.

It is suggested to attach identified environmental impacts to the procedure as for the environmental aspects. Due to the clear connections between particular environmental aspects, it is logical to prepare a common register. Regarding the environmental impacts, this register should be at least extended by the information on:

- impact character (negative or positive)
- connections with environmental components and local community
- impact timing (past, present or future).

It is important to remember that not all environmental aspects and impacts directly result from the organisation activities, products and services. They may also result from the activities of suppliers,

contractors, clients and other subjects related to the company [9]. If the environmental aspects and impacts are within set borders of the Environmental Management System, they should be absolutely identified regardless their sources. At the stage of identification of the environmental aspects, their qualitative assessment is prohibited. As a result of this analysis, the aspect may be recognised as not important and excluded from the register of environmental aspects. This situation would be a system error because the standard [1] unambiguously requires identifying all environmental aspects regardless the significance of their environmental impact.

### 3. Methods for assessment of the environmental aspects

An assessment of the environmental aspect is the most important step in preparation for implementation of the Environmental Management System accordant with the ISO 14001 standard. Its correctness has an impact on the final effects of the system functioning and, thus, a scale of benefits resulting from the system implementation. An erroneous assessment of the environmental aspects may prevent covering costs of the Environmental Management System maintenance by potential benefits from the resultant environmental effects (frequent case for too strict criteria of significance which make the aspect significant).

The standard [1] does not indicate any methods for assessment of identified environmental aspects. However, it requires preparation, implementation and maintenance of the procedure of identification and assessment of the environmental aspects, keeping documentation and permanent updating. Helpful information on methods for assessment of the environmental aspects can be found in the standard [10] which suggests assessing the environmental aspects from two points of view. First of all, paying attention to the environmental interactions, such as:

- environmental impact scale
- environmental impact severity
- environmental impact probability
- environmental impact duration.

Secondly, it indicates that determination of the interaction with organisational aspect of conducting business activity is important when assessing the environmental aspects and impacts, especially regarding:

- connections with legal and normative acts
- scale of difficulty of change in the identified impact
- costs of change in the identified impact
- impact of change on other activities and processes
- opinions and comments of interested parties
- impact of change on public acceptance and a company's image.

The common way for assessing the environmental aspects and impacts is to use elements of the risk analysis [2, 3] (Fig. 2). The established methodology assumes considering two parameters: probability of event occurrence (impact) on the environment as a result of previously identified aspect and severity (results) of occurrence of this event (impact). If the event occurrence is sure, its frequency is considered (also the continuity of occurrence).

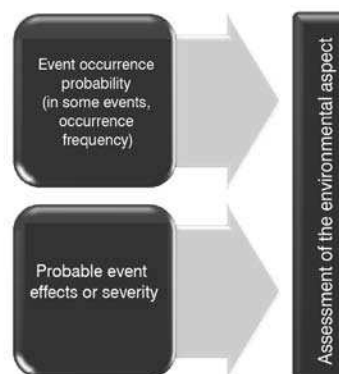


Fig. 2. Assessment of the environmental aspects with the use of risk estimate analysis

Two equivalent methods, descriptive and point-based, are most often used for an assessment of the environmental aspects. A descriptive method (Fig. 3) is based on the assignment of graduated descriptions to considered parameters of the event occurrence probability and its consequences. The final result of the significance analysis of the environmental aspect is a resultant of descriptions characterised in the procedure of identification and assessment of the environmental aspects. The aspect is determined as a significant one, if it reaches or exceeds the level of gradation set in the procedure. The level of gradation corresponding to the assignment of significance to the aspect should be common for all environmental aspects.

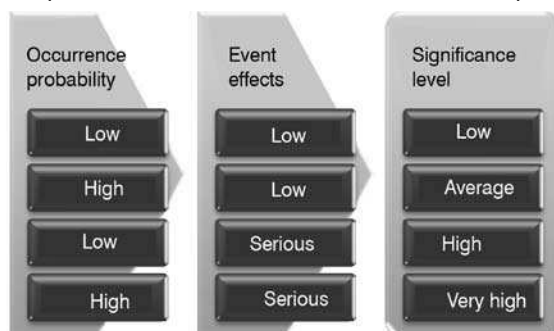


Fig. 3. Assessment of the environmental aspects with the use of descriptive methods

A point-based method for assessing the environmental aspects assumes replacing the graduated descriptions of the significance of the event occurrence probability and effects (environmental impact) with assigned numbers of the point key. The point key is completely random in the method of parameters gradation and should result from a detailed analysis of all identified environmental aspects. To underline the parameter significance, it is allowed to use a non-linear scale and expand the method by additional parameters assessed in the same mode (Fig. 4).

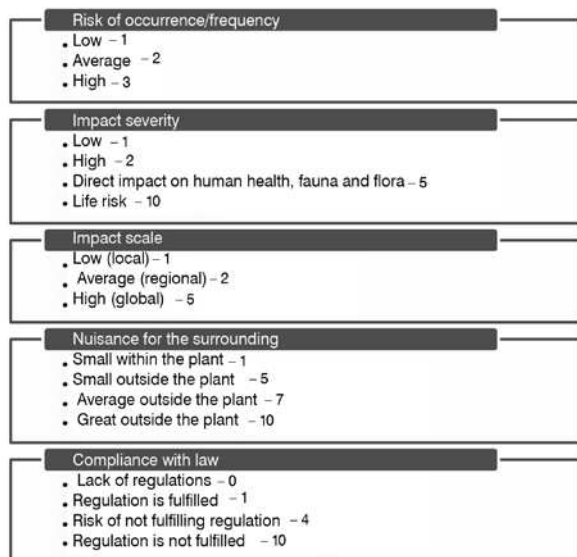


Fig. 4. Sample of the environmental aspects assessment with the use of the key point

In the point-based method, the number of points collected by the environmental aspect decides about assigning to it a significance attribute. The methodology of algebraic operations used for a final sum of points for the aspect should be described in the procedure of identification and assessment of the environmental aspects. In the most simple case, points for a particular category are summed up. Particularly complicated interactions between environmental impacts, used technology or preventive means may be described with the use of other known mathematical operations, creating even complicated equations.

As for identification of the environmental aspects and impacts, it is suggested to attach the results to the procedure of identification

and assessment of the environmental aspects. At the end of works, this kind of attachment will be a complex set of information on the environmental aspects and impacts and the assessment of their significance for the plant.

According to the general tendency for parameterisation of management systems [11, 12], nowadays the point-based method is recommended for assessment of the environmental aspects.

#### 4. Summary

The Environmental Management System accordant with the ISO 14001 is consistent in structure with many popular standards supporting the organisation management. More often, a decision about its implementation is a logical step of pro-environmental actions. One of the main cores of discussed Environmental Management System is the procedure of identification and assessment of the environmental aspects. When analysing the methodology of the procedure preparation, it can be seen that it is concentrated on 3 main areas:

- formal compliance with the standard [1]
- production technology in the plant
- impact of the plant on the environment (also on society).

In the industrial practice, works related to development and implementation of the discussed procedure should be conducted in work groups. In this way, an access to the systemic, technical and environmental knowledge of high quality is guaranteed and the risk of not identifying the environmental aspect is minimised. The procedure of identification and assessment of the environmental aspects has a universal character and can be used regardless the scale and type of an organisation under evaluation.

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