

## ENVIRONMENTAL MANAGEMENT AND REVERSE LOGISTICS

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**Abstract:** Nowadays, when modern societies more clearly perceive the impact of pollution on the natural environment, the industry must also adapt to more restrictive laws which regulate level of emissions to the environment and exploitation of natural resources. It seems to be extremely important to manufacturers who, taking care of environmental protection, improve their competitive position i.e. customers are more attracted to products which are environmentally friendly. Moreover, lack of adaptation to environmental protection law regulations puts entrepreneurs at risk of huge financial loss in the form of penalty fees. In consequence, manufacturers, especially these from industry sectors, seek for more and more modern solutions which would help them adapt to current law. One of the most beneficial opportunities include reverse logistics processes with properly adapted environmental management. This study has been prepared in order to approach both of these issues and to present benefits to companies resulting from implementation of these solutions.

**Keywords:** reverse logistics, environmental management.

Operation of companies, usually based on theories and practice of management, proves that an organization is a complex unit with multilateral interrelations with natural environment. This complexity of companies means not only opportunities to build profit-oriented strategies but it also causes that organizations must take responsibility for the natural environment, which is a substantial element of their external surroundings. Nowadays, the companies aim not only to manufacture goods and services and to ensure and maintain workplaces, which is connected with social responsibility, but also to keep certain ethical norms in business, determining their own duties in terms of ecological aspects.

Natural environment is being degraded year by year and the reason for such a state can be found in industry development and operation a variety of businesses. It is the first time that human race has seen a global crisis, encompassing both developing and developed countries, caused by human attitude towards the environment. The symptoms which heralded this crisis has been long obvious – demographic explosion, insufficient integration of extremely developed technologies with environmental demands, land overuse, unplanned development of urban areas, decrease in free areas and increased risk of extinction of various animal and vegetation life forms. Undoubtedly, if this process is continued, future life on Earth might be endangered. Thus, it is extremely essential to consider the problems of threats to the environment and to take necessary measures in order to prevent them [7]. Due to this fact, it is more and more popular to combine management science with environmental protection with the practice of business operation in order to use and protect it more reasonably.

For this very reason, in the seventies of past century, a socially-economic concept was conceived, according to which the aim of environmental protection is to satisfy material and esthetical needs, health and life protection and protection of interests of future generations.

Apart from this concept, another ecodevelopment concept also appeared, i.e. integration of the environment with social and economic development.

Fundamental goal of ecodevelopment is to ensure such a scale of intervention in the natural environment that its condition is not deteriorated and nature-relating basis of functioning of social and economic systems as well as satisfying of human physical and psychological needs are guaranteed through proper adjustment of human relation to the natural environment. Ecodevelopment is a method of business operation through use of environmental potential and society organization, which ensures dynamic development of production processes, continuity in use of natural resources as well as improvement and maintenance of high quality of life [6]. Main principle of ecodevelopment is unambiguous determination that an obligation of environmental protection can not be treated as being in conflict with economy's interests but it becomes an element of proper management and all activities which infringe this obligation are illegal.

It has been known for many years that biggest damage to the environment is brought by the industry and that is why the measures have been taken to influence the companies through legal system with environmental protection economic instruments. The economic instruments include the measures to affect finance in companies and other economic entities, which make environmental protection profitable. They might be a means of economic pressure to some companies, while to others they might be a form to reward preventive measures that are taken. In each case they have essential importance to financial result in a company, forming cost-benefit relationships in production efficiency account or through reduction in profits as a result of penalty fees.

From this point of view of environmental issues, ecological policies of organizations are derived. Environmental protection have long been treated as one of the elements in economic policies. Initially, it was termed 'economic policy for environmental protection. After some time, however, it was observed that ecologic policy also shows strong relationships with social policies and the domain of management.

Yet, it is important to the process of ecodevelopment to consider a principle of prevention against pollution and other emissions to the environment during any activity and at any stage of manufacturing processes. A variety of preventive measures can be applied here, including: avoiding pollution during technological processes, application of recirculation or installing protection equipment which prevents pollution.

Another important element connected with protection of natural environment against negative impact of industrial activity is ecological management. It is impossible to manage companies without considering a very important, from the social standpoint, aspect such as pollution and degradation of natural environment. More intensive environmental pollution negatively impacts human health and ability to work, shortens average life expectancy, morbidity and death rate as a result of ecologic stress connected with exposure to the devastated environment; there are also changes in interpersonal relations, social cost of development are rising while competitiveness on foreign markets is on the decrease [8]. Responsibility for such a condition of the environment is obviously taken by companies, which are its main users. Thus, taking care of its quality must become one of the most important issues of managing them and planning their development. It must appear in all areas of operation: research and development, production and marketing – thus both during the process of goal setting and their realization.

Modern management is based on systematic approach, whose starting point is an assumption that a company and nature make up a closed system. In relation to the company, this means output in the form of ecological product, experience of the staff and financial means. In each production cycle there is, however, some waste, which in the analysed system is brought back to the production cycle and processed into other products, feedstock for another cycle or it is subject to utilization or neutralization.

The above approach is a base for more and more popular, in operation of organizations, concept of natural environment management. It is important to emphasise, considering this issue, the European Union ordinance [2] issued in 1993, concerning environmental management. While legally regulating the system of environment management which guarantees realization of goals and tasks of organization concerning environmental protection, a series of ISO 14000 standards were prepared.

General goal for preparation of ISO 14000 standards is to improve results of environmental operation in companies, production of goods at minimal use of natural resources, energy and water and simultaneous keeping the quality at the same level. According to this series, the environmental management system is an integral part of the company management system [10].

According to the recommendation of this group of standards, elements of management systems such as: structure, procedures or ecological policy must cooperate with other function in an organization and be conducive to further development while integrating with its strategy. Accepting of ISO 14000 standards is currently voluntary, however, in the future, they might become a compulsory requirement to fulfil in order to ensure operation of organizations. Benefits from adaptation to the requirements of these standards are varied, often in the form of improvement of an organization's image and its competitive position in the markets, both domestic and foreign ones, lack of obligations concerning pollution to the environment, energy consumption and material saving, more detailed cost control, easier cooperation with external environment in an organization etc.

The system of environmental management defined within the Act related to a part of a more general management system, which encompasses organizational structure, planning, duties, rules for actions, procedures, processes and means necessary to prepare, implement, realize, supervise and maintain environmental policies. Environmental management system includes elements such as: environmental aspects, goals and tasks, environmental programmes, individual lists of legal acts, readiness to response in case of failures, operational control, waste management, protection of atmospheric air, water and sewage management, noise prevention [10].

The aim of environmental management, on the other hand, is a continuous reduction in negative impact on the environment through ensuring accordance of a company's activities with the accepted environmental policies [4]. The goal of this system is to ensure, methods, means, procedures and tools necessary to reduce failure rate and elimination of potential threats to the environment in emergency cases.

A fundamental principle of environmental management is continuous improvement, systematic minimization, within the possible means, of a negative impact of companies' activities on the environment. Environmental management system encompass prevention in terms of potential ecological threats in a company, developing of ecological awareness in the whole organization and forwarding of information about impact on the environment.

Operation without damage to the environment requires systematic approach and continuous improvement in environmental management system. The system is necessary to each company in order to determine the goals for environmental protection and then to achieve these goals as well as to operate according to the regulations of environmental protection.

In order for the natural environment problems to be solved, early identification analysis and assessment is necessary. All the environmental aspects connected with the operation i.e. emission of gases to the atmosphere, water and sewage management, waste management, land contamination or raw material and natural resources use should be diagnosed.

In the system of environmental management, a very important question is a lifecycle of a product. Through proper planning and designing the products it becomes possible to efficiently reduce negative impact on the environment. This is the right time for initial determination of environmental properties of the product and duration of a cycle, including

all its stages, from material supply to recapturing of the values from the used products and recycling (Fig. 1). Such an organization of the product life cycle enables companies to produce goods which do not deteriorate natural environment properties.

The concept of environmental management derives from the system of quality management. It consists, however, not only in determination of the quality of the produced goods, but also determines the properties of the management system, which enable a controlled processes and activities essential from the management goals standpoint. In environmental management system, all the processes and factors necessary for ecological goods manufacturing are involved, such as planning, raw materials, materials and parts supply, production, distribution, use, recovery and recycling.

Since in environmental product life cycle management (Fig. 1) it is essential to include ecological awareness of product quality, it is necessary to make sure if it has actually been properly implemented. In order to achieve this, an assessment of environmental properties of each product is made as early as at the stage of planning and more and more ambitious goals and further development of each product are determined. Product preparation and planning phase is very important to further product life cycle and must be performed very carefully. It determines further course of the cycle, its duration and quality of the product, both from the standpoint of product utility and its ecological properties [5].

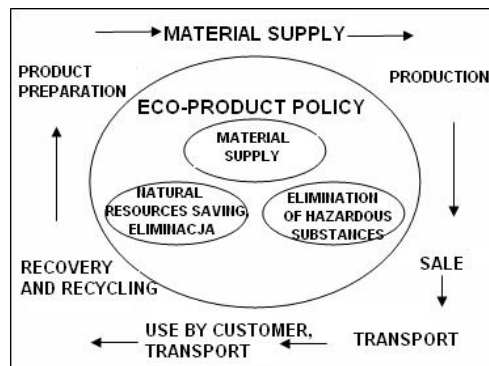


Figure 1 Product life cycle and the concept of environmental management.

Source: own study on the basis of: *The Annual Report of Epson's Activity. 2003.*

During the phase of raw materials, materials and parts supply, each of the components is carefully selected and analysed from the quality and ecological perspective. Improper components are rejected and the product is manufactured only from these which fulfil very restrictive norms and standards. Phases of production, sale and transport are also carefully examined and the attempts are made to reduce material, energy and hazardous substances consumption. Following new rules leads to achievement of better conditions of environmental protection in the future [9].

In concept of environmental management, both phase of product use by customer and the phase of used product recovery and recycling are extremely crucial. This process is more and more common phenomenon in companies that operate on a large scale. Pursuing the global tendencies, more and more companies develop systems whose aim is to recover used products or parts, which facilitate their reuse and systems for recycling of the products which have already been manufactured and sold. These systems must often fulfil very restrictive legal regulations, depending on the country and region of the world, and quality requirements so that they meet the needs of various customers. The products generate and represent a certain value only if they are accepted by the customers. For this reason the companies

exchange environmental information and encourage their customers to purchase these products which reduce a negative impact on the environment. This is done in order to ensure taking responsibility for ecology by a manufacturer [9].

This is the point where an essential role of reverse logistics in ecological operation of companies begins. Current, traditional logistics is a domain which is well known in theory and practice, however, the concept of reverse logistics has appeared relatively recently and has not been prepared in detailed yet. The most popular definition of reverse logistics was popularized by the Council of Logistics Management, which determines it as 'a process of planning, implementation and control over efficiency, cost efficiency of flow of raw materials, inventory, finished goods and the related information, from the point of consumption to the starting point in order to recover the value or proper management.

In other words, reverse logistics is a process of moving goods from their typical place of final designation in order to recover their value or proper management.

The difference between the traditional and reverse logistics is that reverse logistics leads all its processes in a reverse way. Reverse logistics, being a subsystem of a traditional logistics, is characterized by many features which make it different from such system. They are presented in the Table 1, presented below.

Table 1 Characteristics of traditional and reverse logistics

Source: Grabara J.: *Wykorzystanie Handlu Elektronicznego do Realizacji Zadań Logistyki Odwrotnej (Use of E-Commerce for Realization of Reverse Logistics Tasks)*, [in] *Komputerowo Zintegrowane Zarządzanie*; 2004.

Traditional logistics	Reverse logistics
Comparably easy forecast	Difficult forecast
Distribution from one to many points	Distribution from many to one point
Uniform product quality	Varied product quality
Uniform packaging	Damaged packaging
Destination/ determined routes	Unclear destination and routes
Determined decision options	Unclear dispositions
Comparably uniform prices	Prices depend on many factors
Importance of process rate	Secondary importance of process rate
Readable distribution costs	Less visible costs
Continuity of inventory management	Lack of continuity in inventory management
Controlled product life cycle	Complex goals of product life cycle
Easiness of negotiation within the chain partners	Difficult negotiations due to additional agreements
Well-known marketing methods	Multi-factor complex marketing
High process transparency	Low process transparency

Characterizing of reverse logistics is quite a difficult task due to high differentiation of its processes in comparison to traditional logistics. Reverse logistics starts when the used products are returned to supply chain. Their processes are led on the basis of post-production waste and products returned commercially or after use. In order to ensure continuous influx of such goods, special systems for organization and management of reverse flow are created. Then, among returned products, a selection, i.e. inspection and testing of the level of their further usability is performed. These which lost too much of their primary value are managed in waste dumps. However, those which still present a value to the company, are subject to further processing and, depending on their value and properties, are used in processes which are aimed toward their further use, i.e. recovery, repairs, renovation, processing or recycling. After completion of the circulation in the processes of reverse logistics, the recovered products, parts or materials are included again into the traditional logistics.

In theory, organizing of all the processes of reverse logistics does not seem to be difficult. However, practice shows that a particular problem for the companies during operation of the reverse logistics system are problems with determination of the route which is covered by damaged or used goods from the customer to the producer, which should be as economic and efficient as possible. It is a particularly important issue in comparison to the costs which might reach relatively high level due to expensive processes of collecting and transport of waste.

Considering reverse logistics, one should mention four rules which are extremely important in order to succeed in this domain. These principles, arranged in order of importance, are [11]:

- application of recycled materials, rather than the new ones, for production;
- use of ecological materials;
- reuse of recycled materials (mainly packaging);
- recovery of materials and used products.

All the abovementioned actions are very expensive and require great involvement of the companies. In order to adapt operation to the requirements of reverse logistics processes as early as during product design, it is necessary to consider their further use. Implementation of reverse logistics brings particular effects. As a rule, they include beneficial changes in terms of product manufacturing. If, in addition, a company has implemented a system of environmental management and it is connected by close cooperation with reverse logistics processes, the impact of environmental factors on production process is considerably reduced and customer's interest in products is increased. Production of the products which, having been returned during reverse flows, are easy to disassemble and to recover their value, is automatically increased. The effects of such a cooperation also include a closer cooperation with suppliers and subcontractors in order to acquire materials and components which are able to be reused [3].

All the described benefits of both environmental management and reverse logistics, are extremely crucial for the companies, particularly those performing intensive industrial activity. However, due to low popularity of such solutions, there are still few companies which use a concept of reverse logistics and set the goals to protect natural environment. The main reason for such a state is high costs of implementation of environmental management and reverse logistics and their maintenance. Only biggest companies might invest in such processes. Other companies, who do care for natural environment, subcontract such processes to specialized organizations, which reduces the costs.

That is why, caring for reduction in the level of natural environment pollution and depletion of natural resources, it is necessary to promote implementation of environmental management into companies' operation. Such solutions are typically beneficial to both sides – the environment is cleaner while entrepreneurs reduce costs of materials and penalty fees for pollution. Additionally, the customers also reap benefits, since they get products of high quality but manufactured by means of ecological technologies. Comparing advantages and disadvantages, more and more companies in recent years have started such an ecological activities – not because they were legally forced but voluntary, seeing the results of impact of industry on the environment.

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