



## Ecological waste management and economic concept of sustainable

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### Abstract

Waste is one of the key problems of modern civilization and the consequences of man's way of life. The modernization of society, expanding and increasing the purchasing power of the population creates an increasing amount of waste which man distorts the natural balance. Resolving the problem of waste is recognized as one of the highest priorities to reduce environmental pollution, and therefore to protect human health, animal and plant life. The fact is that the developed countries have recognized this problem, and it is supported by their legislation and strategic documents in which they provide clear guidance on effective waste management. Basic settings in general are almost everywhere identical: to produce as little waste as possible, reuse or recycle as much as possible, develop and apply new technologies, materials or energy, and finally the rest disposed of in an environmentally acceptable way. In order to protect the ecosphere and all components of the environment (water, soil, air, flora and fauna, landscapes, built environment), environmental policy in the Republic of Srpska (BiH) must be based on international conventions. Achieving the goals of environmental protection from the damaging effects of waste must be done to prevent pollution and reduce the effects on human health and the environment.

### Key words

Environment, Sustainable Management, Waste

### 1. INTRODUCTION

Resolving the problem of waste is recognized as one of the highest priorities to reduce environmental pollution, and therefore to protect of human health, animal and plant life. The fact is that the developed countries have recognized this problem, and it is supported by their legislation and strategic documents in which they provide clear guidance on effective waste management[1].

Basic settings in general are almost everywhere identical: to produce as little waste as possible, reuse or recycle as much as possible, develop and apply new technologies, materials or energy, and finally disposing the residue in an environmentally acceptable way.

The amount of waste is growing while the infrastructure which should deal with waste is not sufficient. The waste management system doesn't function completely, and the regulations establishing the waste management have not been implemented completely. System which is disturbed in that manner has negative effects on the parts of ecosystem such as water, air, soil, climate, human health and other living world. The underground waters have been endangered as they are the main source of drinking water storage supply and the basic national resources. By continuing with this undesirable practice we will face with a huge risk for greater and more serious consequences for

health. Increasing pollution and losing surface waters will demand the expensive procedures of purification and remediation of the waters and soil.

The problem of waste cannot be successfully overridden with only one technology but with the mixture of greater number of available technologies. This approach, coloured with the sustainable development philosophy, is contained in the whole or integral management of the waste, based on the concept[2]:

**A**–Avoid (reduction) of the waste

**E**- Evaluation (using) of the unavoidable waste

**R**- Removing (processing and disposing) of the remaining waste.

By this ecological-economic concept the priority is given to the prevention in the waste production, separate collection, material and energy recycling of the unavoidable waste (advanced technologies).

## 2. MATERIALS AND METHODS

### 2.1. The waste management

The waste management is a complex activity covering all economic branches, production and consumption, and contains the series of procedures and technologies using most of them indifferent forms.

The Six Action Programme for the Environment Protection – “Six environment action programme 2010: our future, our choice”, adopted in 2001 represents the stand point of the European Commission for Environment Protection, and within its new initiative on waste for the first decade of the 21st century[3]. Increased consumption and the change in the life style will additionally burden already overburdened waste management systems and communal infrastructure. That is why, altogether with the improving of the existing waste management systems, the priority will be given to the investment into the initiative to avoid the production of waste, recycling and the infrastructure development.

Based on the continuing of the present approach, the Programme gives special attention to the need for the significant improvement of the implementation of the existing measures in the member-states. As the local governments are often those carrying the burden of the implementation of the demands of EU legislature on waste, the Commission is intending to improve their inclusion in the preparation of the legislature and supporting the mutual exchange of experience and the best practices.

The aims of the EU waste management policy contained in the Programme state that the main aims are to achieve the condition in which waste is non-hazardous or represents very low risk for the environment and health; and is reintroduced in the economic cycle by recycling or is returned to the environment in a useful way such as compost[3]. The Six Action Programme has planned to adopt seven new strategies for the priority areas of the environment protection in which the most important strategy is prevention of waste and use of waste[3].

The management of the waste is a complex system with a large number of activities, which are in most cases, interdependent. The time when the waste management system was composed of two main parts: the collection and disposal are gone by. The waste, by definition, represents non useful and undesirable product, and is made as a result of the human activity, and the whole waste management system is composed of series of the following elements:

- waste production, evaluation the amount of waste and the possibility of the reduction in waste production,
- waste handling and separation include all waste activities until disposed into the garbage bin or waste collection container,
- waste collection includes all activities from collection and transport of waste to unloading vehicles for further waste processing as the secondary raw-material, readjusting for the use as energy source and disposing,
- waste separation and processing include processing of collected materials; conducted mostly in remote sites far from the location where it was generated,
- waste transport includes transport and reloading collection vessels and containers where waste is temporary stored in bigger transport equipment, and also transport to the distant locations for processing or disposal sites.

The whole waste management system includes all these intertwined elements; also evaluation of their functionality, economic advantages and their inter-relation in order to achieve the goal for establishing the efficient system. The system is defined as a choice and the use of existing techniques, management, programmes, and requires careful planning of the material flow from natural resources, production and consumption to the impact on the environment, whether positive or negative.

(Figure 1)[4]

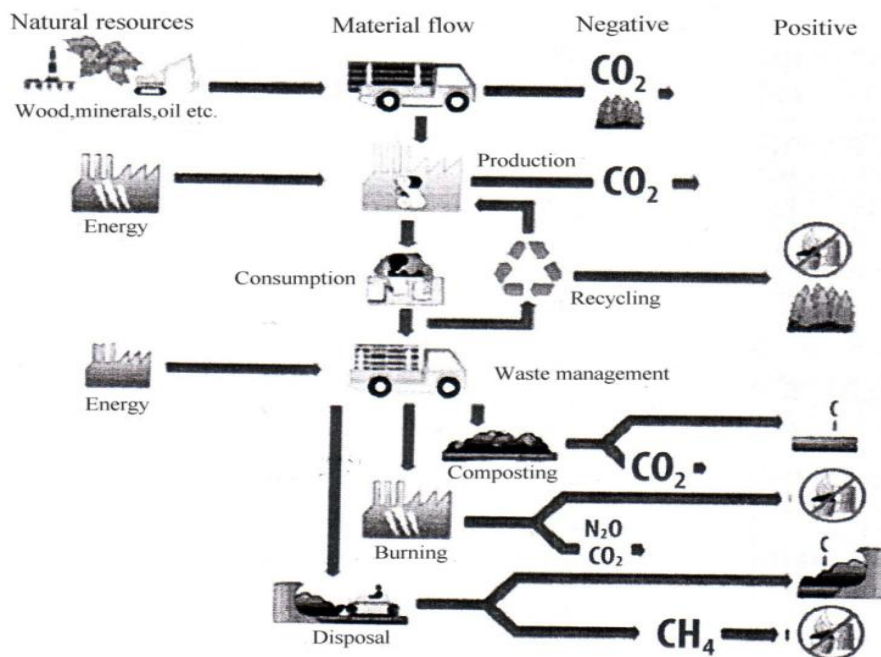


Figure 1. Portrayal of the life cycle of the material (Source: EPA, 2005)

## 2.2. The waste economy as the precondition of the environment protection

The waste economy represents the sum of all political, scientific, technical and other measures achieving the reduction of the waste, the use of the waste and the safe disposal, by keeping the existing production and consumption [5]. Those goals can be reached only in the market oriented economy and with flexible solutions, taking into consideration:

- Ecological benefits,
- Technical feasibility using the best available techniques,
- Economic feasibility.

Regional and sociological differences in a certain town i.e. region affect the amount of the generated waste and its make up where the setting of waste economy is being carried out such as village regions, town regions, agricultural and industrial zones of the area. These reasons, for the setting of the integral waste management system-waste economy, require detailed work on the following data:

- *Population*: number and structure of the population, the surface of the region, the density of population,
- *Settlement*: towns, villages, number of flats, number of the individual houses (with the number of the household members),
- *Industry*: number of the companies, number of the employed, number of the hostels,
- *Surrounding*: geological conditions, hydro-geological conditions, topography of the terrain and so on.

### Cooperation with the public

The goal of cooperation with the public is informing the citizens on systems and installations for collection, processing, use and disposal of waste in towns and regions. Cooperation with public stimulates citizens, producers and vendors on reduction of waste and avoidance of waste production.

### Avoiding waste

One of the principal goals of the integral waste production system- the waste economy is to avoid waste generating. Direct influence on avoiding waste and production of certain products in trade and industry is limited. That is why avoiding must be done indirectly by stimulating the citizens, producers and vendors with following measures:

- *Cooperation with the public*: the goal is stimulation of citizens and industrial-trade organizations to avoid waste, for example, they shouldn't use products with little packaging but they should use multiuse products, etc.
- *Legal regulations*: the legal acts on connecting municipal waste companies in regional level, introduction of the cycle for useful waste components, etc.

The use of waste

a) *Material use of the useful waste components*– the goal is to use components from waste as useful material. In order to use useful components as material from waste, the market of waste must be established for glass, paper, cardboards, construction waste, plastic mass, woods and organic waste. Material use of the useful waste components is possible to achieve by the building installations for separation, installation for composting, installations for the recycling of the construction material and waste from the street reconstruction, installation for sludge reconstruction.

b) *Thermal exploitation*– primary reason for thermal waste processing is separation of harmful substances and reduction of the waste amount for disposal as well as the use of waste with high thermal power. Achieving these goals can be reached only by building installations for waste combustion, pyrolysis, combustion of waste, and so on.

**3. RESULTS AND DISCUSSION****3.1. The aims and directions for the environment protection**

In order to protect the ecosphere, i.e. all environmental components (water, soil, air, flora and fauna, landscapes and constructed surrounding), the environment protection policy in the Republic of Srpska (BiH) is based on the international conventions from that area:

- Reduction in use, prevention of burdening and polluting environment, prevention of damaging, as well as improving and the remediation of the damaged environment,
- Human health protection and improving conditions for the life quality,
- Safe keeping and protection of natural resources, rational use of resources and the economy manner to ensure the renewal of resources,
- Coordination of other interests and entities with the demands for the environment protection,
- International cooperation in the environment protection,
- Initiatives by the public and participation of the public in the activities aiming for the environment protection,
- Coordination of economy and integrating of the social and economic development according to the requests for the environment protection,
- Setting of and development of the institutions for development and saving the environment.

*Achieving the goals to protect the environment from the hazardous waste* should be done to prevent the pollution and reduce consequences for the human health and the environment. The following measures can reach those goals [6]:

- Reduction in generating of waste to minimum, by reducing to minimum hazardous characteristics in particular,
- Reducing the amount of the waste taking into consideration special and hazardous waste,
- By processing waste and recovering useful materials from it,
- Combustion and disposal of waste which cannot be recovered, reused or used for the production of the energy in the manner acceptable for the environment.

The processing and disposing of waste should be carried out in the manner that is not endangering human health and without producing the harmful consequences or significant risk for the main components of the environment (Figure 2), in particular [7]:

- Without risk for the water, air, soil, flora and fauna,
- Without making hindrances via noises or unpleasant smells,
- Without harmful influences/ affects on nature or on the location of the special interest.

Carrying out these goals for protection and following all stated demands, is a very complex project. This project needs to be resolved by parallel researches and development of the waste economy (is yet to be formed in the Republic of Srpska (BiH)).

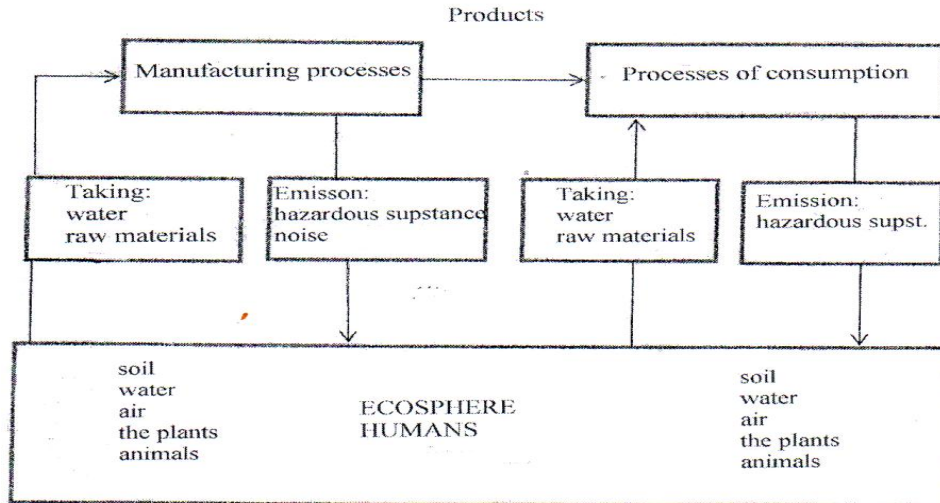


Figure 2. Man's influence on the environment (Source:BMU,2005)

With the idea on forming of a new product all relevant factors that could affect its final form should be taken into consideration (Table 1)[9]. Also, input- output analysis is often used when we choose the optimal choice (Figure 3)[1]which is a detailed image of material and energy flows. The basic for this analysis is the principle by which the materials and energy that enter the process of "transformation" are not lost but only their forms are changed.

Table 1. Factors affecting the choice of a new product (Source:Abfallwirtschat-journal,1995)

Number	Description
1.	Choosing the basic materials with low amount of the harmful components
2.	Minimizing the use of materials
3.	Extending the life time of the product
4.	Possibility of dissembling
5.	Unification of the integral parts
6.	The possibility to re-use the integral parts
7.	Reduction of the integral parts
8.	Unification of the basic parts
9.	The possibility of the material re-cycling
10.	Minimizing of the material
11.	Using the material for packaging which can be recycled or biologically decomposed

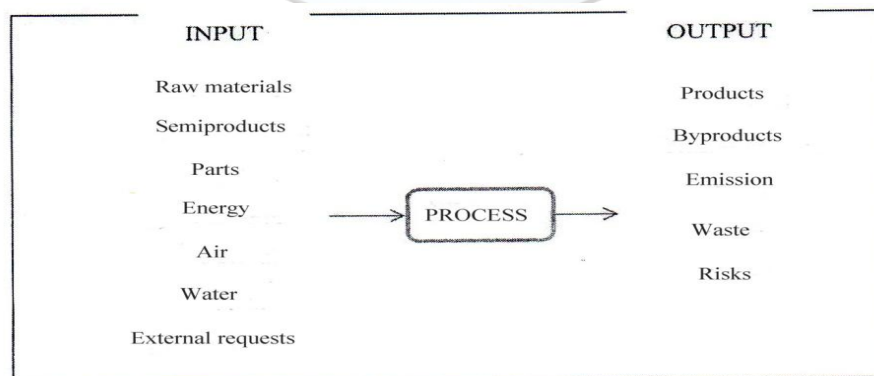


Figure 3. Input-Output Analysis (Source:Đukić,2008)

#### 4. CONCLUSION

Waste production in real life is inevitable. Man produces and creates a lot, entailing some undesirable phenomena such as the production of waste. Waste cannot be completely removed but it can be reduced to an acceptable measure, which can be achieved only if we all become a part of its reduction. We achieve that primarily by education and raising public awareness in whole society.

The general ecological advantages by setting the whole waste management system are: reduction in the amount of waste being disposed at dumps, conditioning the reduction in the dump gas production, dump filtrate and many other harmful substances which are negatively affecting the basic elements of the environment i.e. directly or indirectly on human health, reduction in the total amount of waste would provide conditions for better use of existing waste dumps and a series of all other advantages.

The general economic advantages are: separation of all useful components from the waste (paper, glass, plastic, wood and other) and their use in the technological production processes of the same or the similar products or producing of the energy, saving non renewable raw-materials for the future generations, saving in the use of energy and other components during the production of certain products by using the secondary materials, creating new jobs. Reaching the goals for protecting the environment from hazardous waste needs to be conducted to prevent pollution and reduce the consequences on the human health and the environment.

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#### REFERENCES

- [1] V. Đukić, *Basic Principles for the Environment Protection*. Paneuropean University "Apeiron", Banjaluka, Bosnia and Herzegovina p.120-125, 2009.
- [2] Council Directive 2008/98/EC, Establishing the system for the harmonized waste management in EU, 2008.
- [3] Sixth Environmental Action Programme of the European Community (Environmental 2010; Our Future, Our Choice COM2001; 31),
- [4] The Environmental Protection Agency, Office of Solid (5306 P), Washington, 2005.
- [5] J. Sredojević, M. Krajišnik, Waste Management system Setting up the Integral "ICASUS conference proceedings, Banjaluka, 2011, p.111-119.
- [6] Law on the Waste Management of the RS (Official Gazzette of the Republic of Srpska, No.111/13),
- [7] K. Gellenbesk, Optimierung der sammel-und transportlogistik für Abfälle aus haushaltungen, in: korrespondenz Abwasser, pp. 279-283, 1998.
- [8] V. Đukić, New systems for collection and transport of the communal waste in order to reduce expenses, Regional Conference on the transport of the hazardous materials, Tara 2013, p.250.
- [9] H. Rogall, Strategien zur entsorgungsgerichten Gestaltung von Produkten, in: Abfallwirtschaft-journal, pp.704-706, und 727-729, 1995.