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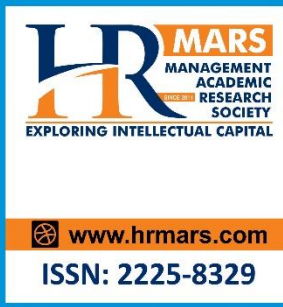
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## The "Zero Waste" Concept in Serbia

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### Abstract

The characteristics of the living environment in Serbia are, according to the level of degradation, similar in many aspects to those in high-industrialized countries, although there are many differences regarding to the industrial and urban development. Practically, Serbia has faced the critical ecological phenomena largely than it would be appropriate to the degree of its economic development. The problem of the environmental protection in Serbia has been for long out of the social policy focus. These problems have not been often realized because they have been left to individual and local initiatives and solved mostly by some regulations, but their application is not guaranteed by appropriate material conditions. The possibilities of applying the 'zero waste concept' in Serbia are conditioned by the strict hierarchical track of waste reduction according to the European waste directives and laws, i.e. the implementation of these provisions in our legal norms and, more important, carrying out these norms into effect.

**Keywords:** Waste, Living Environment, Recycling, Zero Waste

### The State of "Zero Waste" in Serbia

The problems of the living environment today are increasingly getting the institutional character of public properties of national and global character. The most complex ecological and economic problems appear in non-developed countries and East European countries and, besides the lack of financial resources and other factors important for the process of development, it represents the burden and problem for the global ecological system, especially because such the level of development points to the intensive natural resource exploitation.

The industrial development in Serbia, as well as in the former Yugoslavia, has not evaded temptations of serious violations and degradation of the living environment in the last 60 years. It appears in the form of biosphere pollution by hazardous waste, in the irrational exploitation of unrestorable natural resources and energy, and the danger of their too early exhaustion. The causes of the living environmental degradation in Serbia are the accelerated economic growth and urbanization, the same reasons causing the ecological crisis at the global level.

The characteristics of our living environment are similar in high-industrialized countries in many ways according to the level of degradation, although there are considerable differences regarding to

industrial and urban development. Practically, our country has faced the critical ecological phenomena largely than it would be appropriate to the degree of its economic development.

The conflict between social and individual rationality is expressed fully in our country. From the standpoint of the society, more economic consumption is certainly based on the technique, which minimizes hazardous ecological consequences. However, the enterprise in the commodity production gravitates to the maximization of direct economic effect and uses the technique, which enables the fastest attaining results disregarding to the damages done in the environment.

The problems of the environmental protection in Serbia have been for long out of the social policy focus. These problems have not been often realized because they have been left to individual and local initiatives and solved mostly by some regulations, but their application is not guaranteed by appropriate material conditions.

One of the prerequisites for a successful cooperation of Serbia with the EU in the field of environmental protection is to harmonize the policy and legal norms to this organization and its members, i. e. legislature harmonization. For Serbia, this is not important only because of environmental protection in the narrow sense, but because of many other fields associated narrowly with these problems requiring the regional cooperation.

For the waste in Serbia, the Law on Waste Management and the Law on Packaging Material and Packaging Waste, passed in 2009, are very important. It is very essential that the progress in institutional strengthening and developing is made by associating communities into regions for waste management and inter communal agreements. Sanitary garbage dumps in 46 cities and communities were eliminated in 2009 in Serbia. Besides, local self-management communities are authorized to give permissions to secondary raw materials companies. The cited, with other measures, contribute to establishing the sustainable system to provide the reduction of living environment pollution, financial profit for the local community, recycling industry development and employment. The national strategy of waste management, as the basic document passed in 2003, was innovated by new laws; therefore, local communities had to pass plans of waste management until May 2010. During 2010, irregular and unlicensed waste depositories were listed, and the projects of rehabilitations and waste recultivation of disorganized waste depositories.

As for packaging material and packaging material waste, the most important thing is to accept the division of responsibilities of all the companies, according to "the polluter pays" system, preventing, i. e. the reduction of packaging material and damage for the living environment, as well as recycling. Serbia will have to recycle 60% of packaging material of glass, paper and cardboards, 50% of metals, 22% of plastic material and 15% of wood( according to the new EU Directive 2004/12/EZ, the set goals for recycling, cited in percentage, Serbia should realize until the end of 2014.).

In the redesigned strategy of waste management, among other things, the rules will be issued that the number of inhabitants included in the system of waste collecting should be increased to 75% until 2014. It is necessary to develop the system of primary waste selection in local communities, establish the system of dangerous waste management (building the central dangerous waste depositories and building the plants for physical-chemical treatment of dangerous waste). It is also necessary to develop management systems for special waste (tires, worn-out batteries and accumulators, waste engine oil, worn-out engines, electric and electronic waste), as well as the system for medical and pharmaceutical management and animal waste management. Establishing the waste management system requires the existence of some infrastructure, beginning from

collecting, classifying, transport, treatment until the final disposal. Regional centers for waste management should include the territories of 200.000 inhabitants at least. The intention is to treat or dispose waste as near as possible to the place of its origin, that is, in the region where it is produced in order to evade unwanted consequences for the living environment during transport.

All the cited points to the fact that good legal norms on waste management have been issued in Serbia, as well as packaging and packaging waste, but the realization of these activities is quite in the beginning and the application will be a difficult process. If we take into consideration the “state of neglect” regarding to waste disposal, it is logical that changes cannot happen “over the night”. Awareness development is necessary with every individual and the need to collect waste, select, recycle and compost it, and so on, with a view of realizing the positive economic and ecological effects.

### **Possibilities of Applying the “Zero Waste” Concept in Serbia**

The interaction of economy with nature has come into the phase requiring the permanent follow and active measures in order to provide the undisturbed functions of economic processes. It is necessary not only because of limited natural resources but, before all, because of waste emissions which exceed the absorption capacities of the natural environment. In relation to the level of economic activities, the natural environment is becoming limited, therefore economic relevant. These problems are of the global, regional and local importance.

The fact that economy and ecology deal with studying the relationships between the man (society) and the natural environment, the character of man-nature relationships, which they study, is different. The key question for economy is the adaptability of nature to human material needs, while for ecology it is the opposite case. The basic question is the adaptability of society development to the processes reigning in the nature.

Environment pollution by waste in the whole world, therefore in Serbia, is more and more intensive so it is necessary to take measures to preserve the quality of life and provide conditions for biological survival. Production development and consumption of raw material, products and energy reach such proportions that they exert influence on balance disturbance between the amount of separated hazardous matters and the capability of nature to absorb them. Together with the globalization of ecological problems, knowledge about their global character has increased. Most countries are oriented to issue adequate regulations on environment management and the creation of favorable social conditions in order to provide stimulating conditions for environmental protection. In addition, an increasing part of national income is planned to solve the problem of living environment protection.

Waste management in the ecological way is found on the hierarchy of measures attempting to reduce maximally the amount of real waste and its uncertainty. Then, we try to use maximally and recycle the waste, which still appears, and at the end, the waste, which cannot be prevented or used, is disposed in the least hazardous way relating to the living environment.

Considered organizationally and technologically, to dispose and burn waste is simpler than to establish the culture and system of acceptable production and products, as well as selective waste collection. An ecological correct approach includes waste producers to participate in its elimination; i.e. it includes the problem creator in problem solution.

In finding solution to the problem, we should have in mind that the aim is not to process and dispose waste but to avoid its negative influence on the living environment. The best way to do that is to prevent waste producing.

Consumer society development in the Central and East Europe caused the crisis regarding to waste eliminating and for that most authorities in were unprepared, therefore, legal and illegal waste depositories were the most spread way to eliminate waste.

EU donation approaching funds were the stimuli for the governments to take resolute steps regarding to waste elimination. The EU Directive on waste depositories (*Directive 1999/13/EC*) is one of the most important legislative documents in the field.

The primary aim of the Directive is to stop waste disposal of unprocessed waste in the communal depositories, especially biologically degradable which is the big cause and subject of decay under the influence of oxygen lack inside the deposited waste. The Directive causes the double reaction. On the positive side, it leads to more efficient stimulating measures for recycling and composting, but on the negative side, this message is partially said (not well-defined) and unclear regarding to the problem of waste prevention and it leads to the simpler solution to eliminate waste, i. e. to think about waste burning power plants.

Waste depositories must be the last act in the process of waste management. To the opinion of many experts for environmental protection, waste burning should not be characterized as waste management. The biggest effect of environmental protection can be attained by the application of appropriate procedures with the used and thrown out packaging material. Packaging materials are valuable secondary raw materials and the phase of packaging materials includes all the procedures of processing thrown out packaging materials in order to produce new products. Used packaging materials processing reduces the volume of waste more than ten times. At the same time, it provides raw materials or products having some economic, as well as ecological value. Therefore, paper, cardboard and wood packaging materials are increasingly used in the production of paper, cardboard and other products.

Recycling, as profitable business, by which the living environment is protected, is the subject about which it is more and more spoken. Unfortunately, statistics points to the huge material and ecological damage, appearing every year in Serbia because of bad waste management. Estimations are that it amounts to €300 million or 1.1% of GNP of Serbia. Data on the volume of collected and processed waste, as well as export and import data of waste in 2008 are illustrated in Table 1.

Table 1. List of Waste

| Waste nomenclature                             | Use value | Total waste collected in Serbia in 2008 | Waste processing in Serbia           | Import realized | Export realized | Financial standing in Dec. 12, 2008 |
|--|-----------|---|--------------------------------------|-----------------|-----------------|-------------------------------------|
| Waste of metal and metal alloy in non-dispers. | Yes       | 3.296,03 tons                           |                                      |                 | 219,50 tons     | 3.076,53 tons                       |
| Waste and copper residuals                     | Yes       | 33.137,68 tons                          | 4.462,04 tons                        | 251,49 tons     | 7.661,19 tons   | 21.265,94 tons                      |
| Waste and aluminum residuals                   | Yes       | 77.480,04 tons                          | 35.897,44 tons                       | 5.324,80 tons   | 9.507,79 tons   | 37.399,61 tons                      |
| Waste and zinc residuals                       | Yes       | 123,70 tons                             |                                      |                 | 45,10 tons      | 78,6 tons                           |
| Waste and tin residuals                        | Yes       | 1,96 tons                               |                                      |                 |                 | 1,96 tons                           |
| Waste and tin residuals                        | Yes       |   |                                      | 1.323,09 tons   |                 | 1.623,09 tons                       |
| Waste of iron and steel                        | Yes       | 1.235.558,21 tons<br>448 pieces         | 203.467,35 tons                      | 47.082,58 tons  | 240.320,5 tons  | 838.852,99 tons<br>448 kom          |
| Other waste containing metals                  | Yes       | 1.748.349,83 tons                       | 590.620,58 tons                      |                 |                 | 1.157.729,3 tons                    |
|  | No        | 1.354,86 tons                           | disposed in depositories<br>1.314,86 |                 |                 | 40,00 tons                          |
| Glass waste in non-dispers.                    | Yes       | 14.782,22 tons                          |                                      |                 | 11.719,19 tons  | 3.063,03 tons                       |
| Ceramic waste in non-dispers.                  | Yes       | 8.21 tons                               |                                      |                 | 4,69 tons       | 3,52 tons                           |

Source: Agency for Environmental Protection. Report on the State of The living Environment in the Republic of Serbia in 2008, According to the data of the Republic Bureau of Statistics.

In the context of the theme, it is interesting to note the Study on Biomass (In accordance with the EU Directive, biomass refers to the biologically biodegradable wastes, originated in agriculture, cattle breeding and related industry, as well as biodegradable part of industrial and urban waste), made by the Ministry of Science and the Living Environment. Within the framework of energy efficiency in 2005, agricultural producers in Serbia burn every year even 10 million tons of different plant wastes, where two third of it is available for use in agriculture, and “only” one third of it could have energy use. Three million tons of biomass, per energetic potential, is equal to 11 billion kilowatts of electric energy (Šecerov, 2007).

Possibilities of applying the “Zero Waste” concept in Serbia are conditioned by the strict hierarchical follow-up of waste elimination, as defined by the European directives and European laws on waste, i. e. the implementation of this waste and its toxicity in our legal norms and, more important, their implementation in practice. First of all, it is thought on the following:

1) Prevent waste producing where it is necessary to reduce the amount of waste and its toxicity. The pay for waste transport from households and enterprises should be done per the amount of waste, not per square meter of housing or office space. As part of waste prevention, the authorities must take the following steps;

- inform the population about the danger of some materials, as well as possibilities to purchase alternatives for these materials;
- exert pressure and insist, at the national level, to increase taxes and duties for using non-recycled materials, recommending the “responsibility of producers”;
- use products from recycled, i. e. recycling (biodegradable) materials in business as much as possible;
- exert influence on companies in order to apply measures for waste prevention;
- avoid buying products double packed. At the national level, we should recognize producers responsible for products having no future in the recycling circle. Local authorities can forbid the use of some kinds of products, which cannot be regularly renovated, repaired, recycled or composted.

2) Repeated use used to be customary, especially for drink packaging. One glass bottle can be filled more than thirty times, replacing in this way the same number of unacceptable plastic packaging for the living environment. Citizens, producers and traders must become aware of consequences of their consuming habits for the future generations and their problems with the amount of new waste. Educative campaigns on the usefulness of replacing packages can stimulate the interests of citizens about waste problems.

3) Recycling and composting.

4) Waste disposal must be the last step in the hierarchy of waste management. Unusable waste can be disposed in depositories, which will be necessary for the near predictable future, but they can be significantly improved not endangering underground water and soil, as well as not producing methane and unpleasant odor.

To some opinions, there would be an adding degree in the hierarchy of waste management - energy recovery, except waste recycling and waste disposal. It usually means to get energy by means of burning waste. Energy recovery has some shortages, the same as the thermic waste processing. These are emissions of heavy metals, dioxin and furan, as well as the appearance of big amounts of poisonous ash and filters (which also should be disposed). The term of uses in energy purposes can relate to anaerobic digestion because the process of composting, without the presence of oxygen, produces methane, which produces energy by burning. The process is ecologically acceptable. For the time being, results attained by anaerobic mud digestion drawn from wastewaters are better a bit than the anaerobic digestion of organic part of the communal waste.

Relating to the cited, large local communities have a big role to take the following steps:

- a) examine the amount of waste which is collected according to all categories;
- b) examine possibilities for recycling and composting, and estimate necessary costs;
- c) make plan for reducing dangerous waste;

d) separate waste in the place of appearing, both kitchen, garden or biologically biodegradable ones, then inorganic recycling matters, as paper, fabric, glass and metal, and, at the last, other communal waste.

e) inform the public, pointing to the positive examples and provide assistance of city authorities and communal services to perform maximally their duties to reduce the amount of waste;

f) educate the people in order to point to the dimension of waste crisis, exert influence on the behavior of every individual, negative influence of waste on health and the living environment;

g) penalty for non-selecting waste.

Besides the cited measures, it is very important to point to the economic significance of recycling and composting, through different kinds of saving, as well as the possibilities of opening new jobs.

## Conclusions

Serbia will have to get rid of old waste depositories and advance technologies for waste processing before joining the European Union. Therefore, most enterprises will have to be engaged in recycling, i. e. collecting, classifying, preparing and processing of secondary raw materials, waste import and export. In our country, only 10% of waste is recycled. The most recycled waste of metal, paper, five packaging materials, textile, and electronic waste has been recently disposed. The control of carrying out the legal norms is one of the substantial tasks of authorized services, together with appropriate penal policy because it is unavoidable at this level of development of ecological awareness of our citizens.

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