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Solutions for waste collection in rural areas

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Abstract: The authors propose that in this paper to present some aspects of waste collection in rural areas. If in the city the waste collection problem seems solved, rural areas present some particular aspects, such as the nature of waste, existing infrastructure, economic development of village and others. In the case study are compared, some practical solutions which can be for a small locality.

Keywords: waste, waste collection, rural area

1. HISTORY

Since his appearance on earth, man has left behind him plenty of wastes: household garbage or different materials of no further use. Since ancient times, mankind has been concerned with the problem of household wastes, paying a special attention to waste disposal, as it was found that this was closely connected to the spread of diseases and epidemics.

Archaeological researches made in the Indus valley have revealed that, the concerns for waste disposal have existed for 4000 years. Moreover, in 1556, there was an organization in Amsterdam that dealt with collecting the solid and liquid wastes. In 1699, in Caen special wicker waste baskets for garbage collection were introduced.

In our country, the concerns for maintaining the cities clean appeared only in the XVIth century.

Today, it is unconceivable, anywhere in the World that the problem of waste management is left happy-go-lucky.

2. TERMINOLOGY

Wastes are different residues (organic, inorganic, solid, liquid and gas substances etc.), resulting from the day-to-day human activity.

Conformant waste landfills are definitive disposal spaces, set up in areas that are not usable for economic-social purposes, outside localities, built so that they would not allow the pollution of the environment factors in any way.

The term of household wastes refers only to the wastes coming from the domestic activities or the similar activities.

The term of urban wastes refers to both household wastes and to the wastes specific for the public institutions and spaces (wastes from parks,

markets, street wastes, wastes resulting from local economic activities, schools, sanitary institutions and others):

- household wastes;
- commercial wastes similar to household wastes;
- green wastes from parks, gardens and markets;
- sludge from city treatment plants;
- voluminous wastes;
- dangerous wastes.

The term of biodegradable wastes refers to the wastes that disintegrate in time, under the action of aerobic and anaerobic microorganisms.

Wastes accumulated as a result of human activities have a big impact on the environment and on human health because pollutant substances are discharged from their components.

3. THE CURRENT SITUATION IN OUR COUNTRY

Presently, there is a concern for developing civic responsibility by implementing some operational strategies for selecting and collecting household wastes. For instance, recyclable packaging wastes are: paper, cardboard, plastic materials and glass. Biodegradable household wastes are vegetal and organic wastes. Approximately 45% of the wastes are packages and recyclable materials. Not all wastes must be thrown away in the garbage; through a simple gesture of separation, they can be used, valued, recycled, thus saving raw materials and reducing the surface occupied by garbage landfill.

Replete landfills are sources of infection and are constantly maintained in the localities that produce bigger and bigger wastes quantities. Today, in our country there are 265 urban waste landfills, but only 14 of them correspond to the European legislation. In the rural area there are 3,453 waste landfills, occupying almost 2,400 de hectares, (figure 1).

In Romania, 9.578 million tons of municipal wastes are produced each year. Out of these, 8.81 million tons come from the population, economic agents, parks, gardens, markets and streets, 622,000 tons come from constructions and the rest come from the sludge resulting from the urban wastewater treatment plants. In 2003, the global quantity of packaging wastes amounted to 771,000 tons. In a

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study made by the specialists from the Ministry of Environment and Water Management it was found that in 2003 approximately 14.6% of a quantity of over 800,000 tons of packaging introduced on the market was recycled. Adding the metals, cardboard and paper collected mainly by REMAT centers, in 2004 the recycling rate reached 21%. One worrying aspect that the statistics show is that Romanians have abandoned for good the idea of recycling. In fact, the main waste disposal option is storing them in the existing landfills.

Today in Romania efforts are made to implement an efficient system of waste management.

Due to the lack of facilities and poor operations, waste landfills are among the recognized objects with a high risk for the environment and public health. The main forms of impact and risks arising from the urban waste landfills, in the order in which they are perceived by the population, are:

- landscape changes and visual discomfort;
- air pollution;
- pollution of surface water and groundwater;
- changes of soil fertility and biocenoses compositions on the surrounding lands.

Air pollution by odors and wind-blown suspension is particularly evident in the current household wastes areas, the so-called "garbage" (Figure 1). Flows from the deposit hillsides near the surface waters in the area contribute to their pollution with organic substances and fine particles. Waterproof waste landfills are often the source of groundwater pollution with nitrates and nitrites. The soil is also affected.

In terms of biodiversity, a landfill means removing from the surface designed for this use a number of 30-300 species per hectare, without taking into account the microbiological population of the soil. In addition, biocenoses on the surrounding lands change:

- species specific to the polluted areas become dominant in the vegetal associations;

- some mammals, birds and insects leave the area for the benefit of those which eat garbage, (rats, mice, crows).

Although the effects on flora and fauna are theoretically limited in time, seeing the duration of the waste landfill exploitation, the ecological rehabilitation made after recultivation could not restore the initial biological balance, as the evolution of that biosystem has been irreversibly modified.

The current practices of urban waste collection, transport and storing facilitate both the multiplication and the dissemination of pathogens and their vectors: insects, rats, mice, crows, stray dogs. There should be a better use of waste compounds after the orderly and regular collection, given the economic and environmental benefits.

Finally, the remaining waste must to be removed ecologically. In the final waste storage condition, the waste must have an inert structure (neutral towards the environment), meaning to be physically, chemically and biologically stable. Waste treatment and waste landfill isolation are needed in order to meet these requirements.

An ecological waste removal can be achieved only by respecting all the stages as follows:

- waste collection;
- extraction and utilization of the recovered materials;
- processing the remaining parts;
- controlled disposal of the remaining parts;
- maintenance and permanent control of the landfill.

The local authorities play an important role in the waste management (city halls and local councils) that must organize the selective collection and timely transportation of the whole waste quantity generated. The county councils will need to coordinate and support the work of local councils.

Last, but not least, recycling ensures the possibility to create SMEs and to increase employment.



Fig. 1 "Waste landfill" at the periphery of a village. The waste variety can be noticed

4. WASTE COLLECTION IN RURAL AREAS

The main factors on which both the quality and the quantity of waste depend and that make the difference between the city and the countryside are:

a) The standard of living, consumer purchasing power.

Obviously, the higher the standard of living, the higher the consumption and thus the amount of generated waste is higher. Besides the higher purchasing power compared to the countryside, the public activity is more intense in the city.

b) The percent of green spaces.

In the city, the green spaces are systematically maintained by specialized services. In the countryside its inhabitants are in charge with the green spaces maintenance, they have to take care of the public domain allocated to their own household.

c) The level of education.

Consumer awareness about waste issues represents the base for their selective collection. The separate waste collection decreases very much the processing costs, providing recyclable raw materials. Compared to the countryside, the town has a more developed infrastructure needed for the selective collection and recycling (access roads for waste trucks, waste-collecting and selection stations, etc.). Whether from the rural or the urban environment, young people are the most receptive to environmental issues. The efforts currently made by various information campaigns, are primarily addressed to them (kindergartens, schools, universities).

d) The economy of the locality.

The quantity, but especially the waste quality is influenced by the predominant economic activity in a place. In the city, the industry provides more jobs, and labour is drawn from the neighbouring settlements. The waste from the industrial and public domain has a huge weight. In the countryside, most waste is issued from the domestic, agricultural and zootechnical field.

e) The local Infrastructure.

A developed infrastructure offers the possibility to implement a waste management strategy, directly influencing the way in which it is collected. In rural

areas this infrastructure is poorer and the waste management options are more limited.

f) The possibility to reuse the generated waste.

In the city this possibility is almost zero, perhaps except for some packages which are reused. In the countryside, given the nature of the waste, much of it can be reused as fuel or as agricultural fertilizer.

Either it is in the urban or the rural area, the waste management is an organized process, at the county level, the operators being specialized firms. But the local authorities are in charge with the implementation of the strategies. Usually the countryside is "neglected" because the transport distances are big, the population density is low, the amounts of collected waste are small and the collection is not selective. The poor infrastructure also hampers its collection and transport.

5. CASE STUDY

We have analyzed a settlement in Timis County, with a population of 1500 inhabitants. The village is located on a highway, but the access is also possible by railway. The population is employed in the city or it works in agriculture. There is no local industry, the only public institutions being the school, church and medical station. The waste removal service is provided by an external operator, the collection system is the one with a single dustbin, the "wet dustbin", all wastes, regardless their nature are collected in one place (Figure 2 and 3). Their removal is done weekly. However, the landfill of the village is still active (Figure 1). The auto access is possible on almost every street.

The current solution has the advantage that it is cheap, efficient and convenient for the beneficiary. Collection is done on a set schedule, the fullness of the dustbins is almost 100%. The main disadvantage of this solution is that all the wastes are collected together. In order to exploit the recyclable waste, a prior sorting is needed. This sorting involves additional costs, and it is profitable only for large quantities. Because the wet waste such as plant debris is collected in the dustbin (Figure 3), its mechanical sorting is difficult.

Next, the authors propose five other solutions whose efficiency and possibility of implementation depend on the current situation on the ground.

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Fig. 2 Waste collections in a single “wet” dustbin of 110 liters



Fig. 3 Waste removals, the vegetable mass can be noticed in the dustbin



Fig. 4 Container in the schoolyard for the collection of both plastic packs and cans

1) The selective pre-collection at the beneficiary's (the beneficiary has several dustbins or dustbins and bags)

Advantages:

- wastes are collected selectively, by category, which facilitates the direct transport to the recycling or transshipment station, waste is of good quality.

Disadvantages:

- charging the beneficiary with too many containers which are not all filled at the same time, which can lead to the inefficiency of the collection transport;

- use of multiple waste trucks, (for each waste or waste group separately), or timing of different intervals for the removal of the various types.

2) The selective collection "wet dustbin/ dry dustbin", the dry dustbin is for all recyclable materials (system adopted in Timisoara City)

Advantages:

- only two dustbins are used, (dustbin and bag), a "bearable" aspect for the beneficiary;

- an increased efficiency of the collection transport (two waste trucks coming at the same time, or a waste truck coming at different times for each type of waste).

Disadvantages:

- recyclable waste collected "mixed" must be sorted in a sorting line.

3) The wet dustbin selective collection at the beneficiary's and central collection points for the recyclable materials. This involves placing some container platforms in the locality. Each recyclable waste or each waste group is allocated a container (engraved or of a certain colour). Platforms will be easily accessible (both for beneficiaries and for waste trucks) hygienic and fenced (Figure 5).

Advantages:

- a single dustbin, which is at the beneficiary's, is used;

- the good quality of the selected waste;
- increased efficiency of transport, recycling waste collection being made in a container, their removal occurs only after they are completely filled, (except for paper and cardboard that are moisture-sensitive).

Disadvantages:

- the beneficiary must go to the place of the recyclable waste selective collection, which for convenience will lead to their disposal in the common dustbin;

- damage of some public facilities for platforms

4) The selective collection with a wet container and a group of containers for recyclable waste. All containers are located in central collection points (Figure 5).

Advantages:

- minimum number of containers and high efficiency in transport;

- easy maintenance, operation and supervision.

Disadvantages:

- the beneficiary must go to the collection points, regardless the type of waste;

- storage of biodegradable waste in the public space (odour and other emissions).

5) The removal of the recycled waste through actions and campaigns such as "Marea Debarasare" ("The Big Get Rid of Waste"),

Advantages:

- simplicity for the beneficiary, as all he/she has is the wet dustbin.

Disadvantages:

- storage of large amounts of waste between two collections.

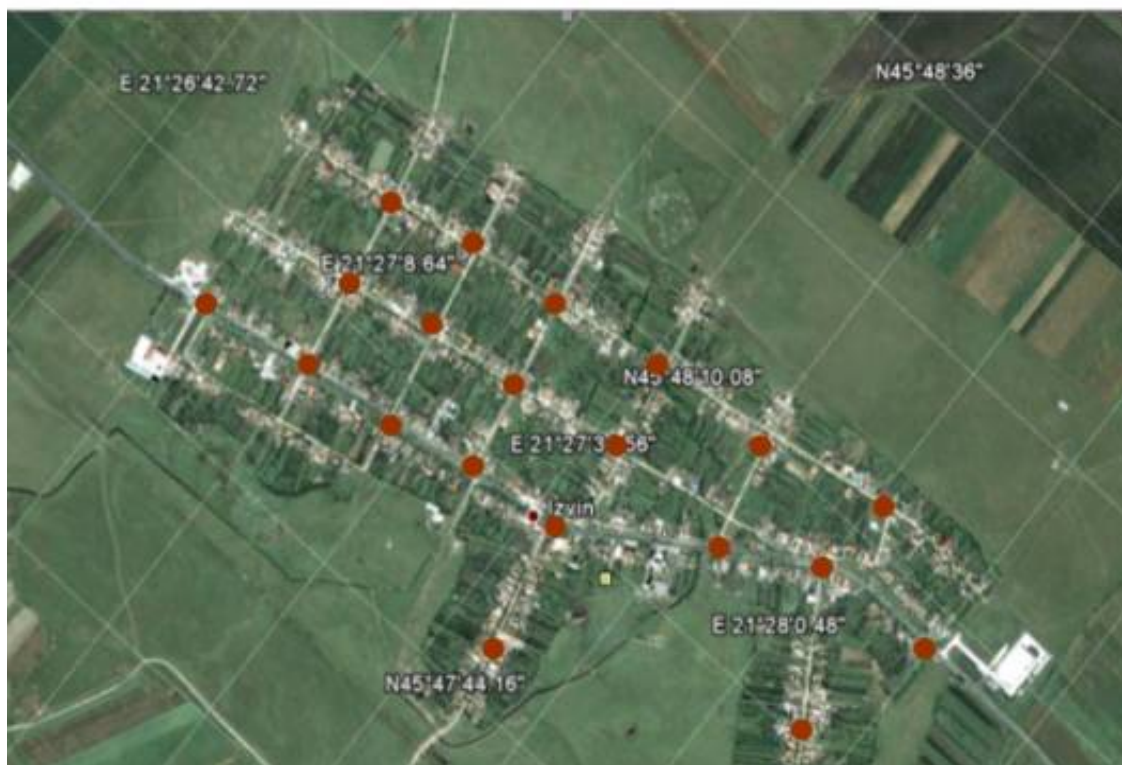


Fig. 5 Map of the locality, positioning the central collection points

6. CONCLUSIONS

All the five solutions above have in common reducing the amount of waste at the wet dustbin and promoting the selective collection in order to recover the recyclable waste. It is necessary to inform the citizens about the waste categories and about the importance of its selective collection. At the rural level, the municipalities and the school are in charge with informing people, and they will monitor, along with the collection service, the selection and efficient collection of waste. The collection of certain types of waste such as paper, cardboard, PET, (Figure 4) can be done by the school, by informing and encouraging pupils. The hazards that may occur will be taken into account. Children are forbidden to collect glass or metal.

We recommend composting the biodegradable waste in the household to reduce the waste volume in the dustbin. This may also involve a reduction in tariffs.

Attracting the processors who are interested in recycling certain wastes (plastic packaging, glass, paper and paperboard or others). They may or may not work with the already employed operator. The activity of these processors will be made public, and the inhabitants will be informed about the benefits brought to the locality.

The implementation of the most effective strategy and acquiring experience from other villages.

Not using the landfill from the edge of the village anymore (even for inert materials storage) and taking the necessary steps to close it.

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