

WASTE MANAGEMENT PRACTICAL APPROACH

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The paper present the optimal set of criterion in order to decide on the most effective solution for the waste management design based on the stratification approach. The stratification is one of the initial stages for an integrated waste management system design, which can generate a correct and clear picture of the large scale situation. Based on the information, the specific decisions for the system design and equipments procurement are decided. It is to mention the practical importance of the correct approach of the stratification, taking into consideration the important investments in equipments and different other facilities necessary for the waste administration. At the national level, the National Action Plan and the National Strategy are based on a scientific stratification approach, but at local level the solutions are decided by political decision makers some time taking into account their own practical experience or local interests, more then relevant economical, environmental or technical criteria.

Keywords: stratification criterion, municipal waste design.

1. Introduction

In order to design waste-processing facilities and their various components, accurate data on quantity and composition as well as the chemical and physical properties of waste materials are required. The disposal and the recycling solutions make this knowledge essential, as it requires local counties and national authorities to develop individual waste management plans.

Oftentimes, the municipalities solicit design bids for waste-processing facilities based on yearly community- or county-wade averages. As result of these methodologies, considerable deviations frequently occur between the design and the actual processing capacity of a facility. Therefore, data on waste volume and composition can only be used during the first step of planning a waste-processing facility. On the other hand, there are other important data that are more constant and offer valuable information.

The solution for all these problems and tasks include a common effort of many actors, some of them being not involved in this topic until now. They are: owners of the wastes (producers), local sanitary companies, local and central

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authorities, local communities, companies for transportation on railway or auto ways, investments companies, sanitary authorities, NGOs, etc. All these parties have different backgrounds, different private interests, and different approaches of the waste solutions [1].

The waste stratification offers a holistic picture of the waste composition and volume, local and regional relevant characteristics based on common criteria. These criteria give the opportunity to tackle the waste problem and to solve it in the best interest of all the parties and in a sustainable manner in the same time. Following the stratification criteria, the parties have a common language and can adopt the best available solutions for all the waste management components, fitted to the local and general interest.

2. Identification of the stratification criterion

The stratification criteria describe general characteristics of the counties areas, relevant for the waste management purpose. It is important to select a complete and minimal group of criteria, in order to draw a realistic picture of the local situation and to design an effective and appropriate plan for the waste management [2]. This group has the generic name of the lead criteria group for the stratification. A minimum of criteria recommended is:

- A. **Structure of dwelling.** There are two main characteristics to take into consideration: the population (number and density) and the aspect of the buildings. They are in a direct connection, but can refine the district situation, in order to adopt the main appropriate solutions. The population gives an idea about the volume of waste per unit of area. The buildings stand representatively for a multitude of spatial significant attributes like typical building types linked with typical building sizes, also characteristic for an equipment of infrastructure leading to different accessibility and typical configurations of open spaces [3]. There are strong interrelations with other aspects, such as socio-economic ones. The combination of them largely determines the amount and composition of the generated waste and the organization of their collection.

- B. **Structure of heating.** The manner of heating is crucial as far as it concerns the possibility of the households to get rid of their waste and moreover has a significant influence on the physical properties of the waste forwarded to disposal and the options that arise thereof for its collection and treatment (e.g. plastic bins are generally unsuitable for collecting waste which occasionally contains hot ashes from the combustion of solid fuels).

- C. **Commercial structure.** Largely influencing the amount and types of the waste generated and in combination with the dwelling aspects provide quite a reliable indicator for the socio-economic status/conditions of an area (e.g. employment, income situation, development potentials etc.).
- D. **Industrial structure.** Determines the possibilities for waste treatment and recycling and the transportation needs. Also, the small and medium sized services and production companies can influence the types of waste generated in a specific area and the common or individual solutions to be adopted.
- E. **Transport network.** Determines the possibilities and intensity by which an area can be served with waste collection services and the means to get the waste shipped away for treatment and/or recycling. There are to be considered all the transportation solutions (auto ways, railways and navigation), each of them offering specific advantages.
- F. **Regional particularities.** Basically there are rural areas, with very specific features, offer a specific approach. The main regional particularities considered are:

Protected zones (nature conservation areas, national park, reservations, military protection area, etc). They are important for possible limitations as far as the options for managing the waste and development potentials of the area are concerned.

Special zones (specially promoted development zones, border influenced zones etc.) They are important to be mentioned for the development potentials of the area and phenomena like transboundary export/import of waste and trade of waste materials.

Topographic particularities (extremely mountainous, wetland area etc.). They are important for the possible limitations as far as the options for waste collection and development potentials of the area are concerned.

Disposal structure opportunities. These areas can be located mainly in rural and suburban areas. It is important to determine the areas with opportunities for waste disposal, according to the needs for waste treatment and transportation, requirements for safeguarding. This has a great relevance as regards the costs for the waste management.

3. Practical application of stratification criterion for cities

3.1. Criterion identification

The available data sources, the stratification criteria and the main areas features assessed represent the bases for the characterization for the Romanian local situation. It is important to remark that, Romania, like the big majority of the European counties have both rural and urban areas, low and high density areas, good transportation networks, industrial and commercial activities, and some of them have specific regional particularities. The main known utilities are general solutions for the local authorities, after identifying the opportunities of self planning and of cooperation in developing common plans for waste management. Specific criteria are identified for different types of location, presented in table no.1, as follow: a) urban areas, b) suburban areas.

Table 1.a.

Criteria	Characteristics
Structure of drawing	connected with the structure of population; large and concentrated volume of wastes; available places for storage the waste large density of population, then a large amount of waste; there are developing areas with indefinite heating structure; multistoried constructions.
Structure of heating	each city has significant residential sectors with long distance centralized heating systems, designed and built before 1990; some of the population redesign the system and choose small apartment heating systems; the brownstones districts have the same heating system as well; the old, traditional cities (such as: Bucharest, Cluj-Napoca, Timisoara, Constanta, Iasi, etc.) have old residential sectors or slam sectors of houses with stove heating or with solid fuel firing, mainly old single houses.
Commercial structure	Different commercial wastes (in the urban areas there are specific structures, generating special kinds of wastes (organic wastes in fresh market places, paper, in offices areas, packages in commercial storage areas); The amount of different kind of wastes is specific to different suburban area, and different from the urban area;
Industrial structure	Characterized by large spectrum of industrial processing, large diversity of specific wastes; in each judet (county) there are more or less developed all types of commercial activities;
Transport network	Urban areas are well connected to the railways network
Regional particularities	Topographic particularities Tourist areas (Black Sea, mountain resorts) Border influenced areas

Table 1.b.

Criteria	Characteristics
Structure of drawing	connected with the structure of population; large and concentrated volume of wastes; good accessibility for heavy equipments; limited space available for storage the waste large density of population;, then a large amount of waste.
Structure of heating	each city has significant residential sectors with long distance centralized heating systems, designed and built before 1990; some of the population redesign the system and choose small apartment heating systems; the brownstones districts have the same heating system as well; old, traditional cities (such as: Bucharest, Cluj-Napoca, Timisoara, Constanta, Iasi, etc.) have old residential sectors or slam sectors of houses with stove heating or with solid fuel firing, mainly old single houses.
Commercial structure	different commercial wastes (in the urban areas there are specific structures, generating special kinds of wastes (organic wastes in fresh market places, paper, in offices areas, packages in commercial storage areas); the majority of the engross commercial activities are concentrated in suburban areas.
Industrial structure	Characterized by large spectrum of industrial processing, large diversity of specific wastes; in each judet (county) there are more or less developed all types of commercial activities.
Transport network	suburban areas are well connected to the railways network; useful for heavy or paper wastes resulting from industrial activities and that must be transported to users from other localities.
Regional particularities	topographic particularities; tourist areas (Black Sea, mountain resorts); border influenced areas

3.1. Comments on the regional particularities

Extremely mountainous zone:

Cost of the waste collection and transport is high and it is necessary to adopt incentives for attracting investors in these zones;

Recovery, through recycling has to be encouraged through educational programs (including in schools);

Programs for encouraging local initiatives are necessary to be supported.

Wetland area

Cost of the waste collection and transport is high and it is necessary to adopt incentives for attracting investors in these zones;

Necessary to have water ways transport solutions for the waste collection;

Re-use of some of the organic wastes;

Develop educational programs, including with the neighbour counties when necessary.

National parks

Waste management is done by the park administration, according with the specificity of each national park (e.g.: high mountains);

Tourist activities have to respect the rules imposed by the status of the national park;

Educational and information programs for rising the awareness in preserving the character and particularities of these zones.

Tourist areas (Black Sea, mountain resorts)

Waste management has to be integrated with the general management of zones, taking into account the waste impact on the business activities (attract tourist means clean spaces too);

Encouraging the collection of the waste on side (beaches) or around the hotels by hand;

Design a flexible system for collecting and disposal the waste during the year, taking into consideration the variation of the waste volume;

Collection programs and the equipment have to be appropriate with the tourist activities (disturbing not too much the population).

Border influenced areas

Waste management has to be integrated with the general management of the zones, taking into account the waste impact on the zonal activities (tourist transit);

Design an appropriate system of collection and disposal of the waste during the year, taking into consideration the level of the generated waste;

Collection programs and the equipment have to be appropriate with the transit activities.

6. Conclusions

The identified criterions are the bases of the stratification design method for waste management design in rural areas. Part or they are already applied in practice for developing regional characterisation of Romanian [4].

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