STUDY ON HOUSEHOLD WASTE COLLECTION IN URBAN COMUNITY ARIEŞ, CLUJ COUNTY

Lucia-Monica SCORŢAR[1]

ABSTRACT

In this article a waste collection scheme will be presented, in accordance with EU requirements, scheme proposed for urban comunity Arieş, Cluj County. Currently, in this area an adequate system of waste collection is not implemented and the uncontrolled waste accumulation has a negative impact on the environment and public health. The collection will be different for rural and urban areas. The waste collection scheme will be sized for an area that includes 117,780 inhabitants and 2,975 businesses, which are dispersed in two cities and nine villages. Any improvement to this component can reduce the cost of waste management in the investigated area.

KEYWORDS: *waste, collection, environmental education*

JEL CLASSIFICATION: *Q53*

1. INTRODUCTION

In Romania, the selective collection of the household waste is practiced only locally, in the pilot projects initiated by the sanitation companies and municipalities in order to capitalize the packaging waste (paper, cardboard, glass, metals, plastics). These projects run in collaboration with citizens associations, schools, and businesses.

The household waste collection is an essential component in the waste management, although it is often undervalued. It represents between 40% - 60% of the total cost of waste management. Any improvement to this component can reduce greatly this cost. (McDougall, 2001)

The selective collection involves the waste disposal in some special places. The public institutions, the associations, foundations, individuals are required to collect selectively the packaging waste in different containers. These are properly marked and installed in a special place, accessible to citizens (Rusu, 2006). According to the European Union, the selective collection in Romania is expected to take place in three stages:

- In the phase between 2004-2007, awareness actions and public information were conducted;
- The 2007-2017 phase is the period when the selective collection should be nationally extended;
- In the phase between 2017-2022 the implementation of selective collection in difficult areas such as dispersed and mountain rural areas will be achieved.

2. GOAL, LOCATION

The selective collection of the waste involves the disposal of the waste in special places for recycling. According to the GD 621/2006 (supplemented and amended by 1872/2006) the public institutions, the associations, the foundations and the individuals are required to collect selectively the packaging waste in different containers, that are labeled appropriately and placed in special places that are accessible to citizens.

---

[1] Babeş-Bolyai University, Romania, lucia.scortar@econ.ubbcluj.ro

The waste collection scheme will be sized for an area that includes 117,780 inhabitants and 2,975 businesses, which are dispersed in two cities and nine villages.

Table 1 : **The component of Comunitatea Urbană Arieş**

COMUNITATEA URBANĂ ARIEŞ	
URBAN AREAS	TURDA
	CÂMPIA TURZII
RURAL AREAS	MIHAI VITEAZU
	CĂLĂRAŞI
	FRATA
	AITON
	LUNA
	PETREŞTII DE JOS
	SĂNDULEŞTI
	TRITENII DE JOS
	VIIŞOARA

To create the collection scheme, the parameters of the current collection system (routes, locations of collection) and the national experience on projects related to the collection, transport and disposal of the waste will be taken into account. The functional scheme for waste collection is the following (Scorţar, 2010):

A.The non-selective waste collection
The project proposals provide the following things:
- In the urban area:
There will be pre-collection containers in each household and the collection points will be grouped as follows: in blocks of flats areas, the collection points will be set for about 200 apartments; in the houses areas, the sanitation machines will pass through that area (from door to door).
- In the rural areas:
The sanitation cars will collect the unselected waste. In the social and administrative areas (administrative and commercial areas, schools and kindergartens) containers with a capacity of 1.1m ^{3} will be provided for purchase.

A.The selective collection of recoverable waste
The project proposals provide the following things:
- In the urban area: the development of the collection points, where there will be located four collection containers for recoverable waste. Recoverable waste collection is collected into four fractions:
  - Glass, in two-compartment container;
  - Metal;
  - Paper and cardboard;
  - Plastics.
  In the houses areas, each collection point will be set up for every 100 households, and for the blocks of flats areas, there will be arranged similar points every 200 apartments.
- In the rural areas: The collection points will be organized in each village. The collection points will serve 150 rural households due to the smaller quantity of waste that is generated compared to urban areas. The structure of the collection points is identical to those in the urban areas (three containers/collection point and two-compartment container).

The waste collection scheme will be sized for an area that includes inhabitants and businesses, which are dispersed in two cities and nine villages.

3. INTERPRETATION AND ANALYSIS DATA TURDA:

This city has a population of 55,887 inhabitants, out of which:
- 18,185 people live in HOUSES
- 3,035 households have their own containers (meaning 3035 containers)
- Number of houses: 6582
- The living density in the houses areas is equal to 2.76 persons / household.

The number of inhabitants that have their own containers and live in houses is calculated as follows:

3.035 x 2.76 = 8,377 inhabitants (have their own containers)

18,185-8,377 = 9,808 people (this value represents the number of inhabitants who will receive waste containers), meaning: 9,808: 2.76 = 3,554 households= 3,554 containers of 240L

Next, we will determine the number of collection points needed for the population living in houses. For that we consider 100 houses that are grouped together / collection point.

In Turda, the total number of houses is 6,582 meaning that there will result a number of 66 collection points. These will have:
- ∗ 198 containers of 0.6 m^3 (meaning 3 containers of 0.6 m^3/collection point)
- ∗ 66 two-compartment containers (meaning 1 two-compartment container/ collection point)

The number of people living in flats is calculated as follows:

55,887 - 18,185 =37,702 persons

Number of apartments is equal to: 13,275

The living density in flats is 2.84 persons / flat.

37,702: 2.84 = 13,275 apartments ≈ 32 apartments/block ≈ 415 blocks (with 4 levels)

We'll consider a number of 100 apartments grouped together/collection point

13,275: 100 = 132 points collection

Because the access to some collection points is more difficult, we considered a total of 136 collection points that are divided as follows:
- 68 non-selective collection points, that are equipped with 5 waste bins/collection point;
- 68 collection points that have:
  - ∗ 3 containers of 0.6 m^3 / collection point
  - ∗ 1 two-compartment container / collection point

Finally, the total containers to be purchased in Turda are:
- 3,554 bins at houses (240 L)
- 204 + 198 containers of 0.6 m^3 (68 + 66 selective collection points x 3 containers / point)
- 68 + 66 two-compartment containers (68 + 66 selective collection points x 1 container /point)
- 340 waste bins for the non-selective collection (ie, 68 points x 5 waste bins = 340 waste bins)
- 93 containers of 1.1 m^3 for the commercial waste.

4.523 containers

CAMPIA TURZII

The same algorithm is applied for Campia Turzii, which has a population of 26,823 inhabitants. As in Turda, we will determine the number of collection points for the people living at houses and blocks.

The total of containers that must purchase in Campia Turzii is:
- 2,912 waste bins at houses
- 69 + 186 containers of 0.6 m^3 (23 + 62 selective collection points x 3containers / point)
- 23 + 62 two-compartment containers (23+62 selective collection points x 1 cont./point)
- 115 waste bins for non-selective collection (23 points x 5 waste bins)
- 46 containers of 1.1 m^3 for the commercial waste

3,413 containers

MIHAI VITEAZU village has a population of 5749 people living in HOUSES
- Number of houses: 1,942 households
- The living density at the house is 2.96 people / household
- 1,185 households have their own bin, meaning 1185 bins of 240 L (non-selective collection).
- The bins must be purchased for 757 households (1942-1185)

In rural areas, we considered 150 houses grouped/selective collection point, because of the smaller waste quantities generated by the population. This requires 13 collection points. These will be equipped as in urban areas, as follows:
- ∗ 3 containers of 0.6 m^3/collection point
- ∗ 1 container two-compartment/collection point

The total purchased recipients in MIHAI VITEAZU are:
- 757 bins of 240L (non-selective collection)
- 39 containers of 0.6 m^3 (13 points x 3 containers / collection point)
- 13 two-compartment containers (13 collection points x 1 cont. / point)

   809 containers

The same algorithm is applied for other villages that are part of urban comunity Aries.
The following table summarizes the data obtained by calculations. This table shows the number of collection containers and collection points necessary for each city and village.

Tabel 2: **The needed number of containers and colection points**

City and Village	Popula-tion	Total containers	That:			Number of colection point
			Bins 240 l	Containers 1,1m^3	Containers 0,6 m^3 /two-compart	
Turda	55,887	4,523	3,894	93	536	134+68
Câmpia Turzii	26,823	3,413	3,027	46	340	85+23
Mihai Viteazu	5,749	809	757	0	52	13
Călăraşi	4,450	830	790	0	40	10
Frata	4,382	655	615	0	40	10
Aiton	1,338	345	333	0	12	3
Luna	4,450	473	433	0	40	10
Petreştii de Jos	1,891	429	413	0	16	4
Sănduleşti	1,892	497	481	0	16	4
Tritenii de Jos	5,066	731	687	0	44	11
Viişoara	5,852	964	912	0	52	13
Total	**117,780**	**13,669**	**12,342**	**139**	**1,188**	**388**

Source: Calculations obtained by own processing

4. RESEARCH RESULTS

The value of the estimated cost for the waste collection is obtained by summing the values of the works categories that compose the collection component. The estimated cost for the works categories is established based on the estimated quantities of the works and their prices.

In order to set up a collection point, the concrete platform will have an area of 32 m². The platform construction price is 140 euro/m².

$$140 \times 32 \text{ m}^2 = 4,480 \text{ euro/collection point}$$
$$4,480 \text{ euro / point} \times 388 \text{ points} = 1,738,240 \text{ euro}$$

The channel for the pluvial waters is a ditch bordering the concreted platform. The channel construction involves 8m + 4m + 4m = 16m (the channel length) and 30 cm (the channel wide. The value of this building is 255 euro/collection point (15.9 euro/m) and for 388 collection points, the value of this work is equal to 255 euro/collection point x 388 collection points = 98,940 euro

Regarding the facilities for the achievement of 388 collection points are considered the following investments:

I. For selective collection points
- 4 containers are required for each collection point, being a total of 297 selective collection points.
- 136 euro/container x 4 = 544 euro (this value is needed to equip a selective collection point)
- 544 euro x 297 collection points = 161,568 euro

II. For non-selective collection points
- 240L bins are required for each point being 91 non-selective collection points.
- 35 euro / bin x 5 = 175 euro (this value is needed to equip a non-selective collection point)
- 175 euro x 91 points = 15,925 euro

In both cities, 91 non-selective collection points will be set up in the blocks, distributed as follows: 68 collection points in Turda and 23 collection points in Campia Turzii.

Because each non-selective collection point will be equipped with 5 bins of 240 l, this means that a number of 455 bins are required to set up non-selective collection points at blocks (in both cities). The needed number of bins from houses, in the investigated area, will be 11,887 bins (12342-455).

After calculations, the total cost for the collection component has been estimated to be 2,886,884 euro (including VAT). The total investment cost includes the costs of constructions and installations (earthworks, perimeter protection), assembling costs and costs for equipment (containers, bins).

In the proposed waste collection scheme there were taken into account the already existing facilities of the local sanitation systems and therefore, for the two cities, it was also considered the fact that some of the people that live in individual houses and some of businesses already have appropriate waste collection containers. In this regard, investment costs were included only for the difference of required recipients, costs to be recovered directly from the direct beneficiaries on a sanitation service fee basis. Thus, it is considered that local authorities will distribute these containers in a proper manner, on a fee basis, to those who want to benefit from such services, and as such, recovering their value.

These containers cannot be distributed free of charge because of the following reasons:

- The acquisition costs of these containers is very high (12.342 containers x 35 EUR/container = 431.970 EUR, VAT not included)

- if the distribution of these pre-collection containers would be done for free, those who have previously purchased them will be placed in an obvious disadvantage and inequity position as opposed to those who would receive them for free, and, thus, the fundamental principle of equal opportunities would be violated. The support of these funds for implementation of the project would go specifically to those people who have not done a minimum effort and expressed a lack of interest in waste management issues, contrary to the "polluter pays" principle. (GPA BUSINESS CONSULTING);

- supporting the costs of this action equally, by the entire population, would increase service fees above an acceptable level, which would affect those who previously purchased these containers and expressed a minimal interest in collecting this waste; this, as well, would be unfair. It was considered more appropriate that the purchase price be borne - possibly granting installment payment facilities by local authorities - only by those to which these containers are directly addressed and service fees will not be loaded by the depreciation costs of these containers.

5. CONCLUSIONS

Large household waste quantities are the result of increased production of goods, increased production and use of packaging and an over-usage behavior characteristic of developed countries. The waste collection scheme proposed and analyzed for urban comunity Arieş, Cluj County is based on the principle of public access to sanitation services, according to which public authorities are responsible for organizing public services to the community so that all community members have equal access to these services.

The quantity of recoverable materials through collection depends on the local consumption habits, the strength of the campaign for recovery, the organization of selective collection (collectors should move to every consumer, to every public collection point, to collection centers).

The collection of recoverable fractions through these storage containers requires a significant effort of the citizens, by transporting old materials to these collection points.

Therefore, in order to have the best possible participations by citizens, therefore a high collection rate, several principles must be observed when choosing the location of these sites and organizing the transportation:

* Containers must be arranged so that citizens see them and recognize them (for example, near markets and streets) and not mess around traffic;
* Sites must be located conveniently (e.g. near shopping centers, large markets, squares and public spaces);
* The optimum distance to location is not more than 300 m (in the cities);
* Sites must have a solid ground so that loading and delivery vehicles can easily reach them;
* Frequency of emptying the containers must be such as to avoid overfilling;
* Regular cleaning of the site and, if possible, daily monitoring of containers must be provided;
* When installing in residential areas, noise pollution should be considered (especially in throwing old bottles off). By prohibiting the use of containers during the evening and night, as well as on holidays, one can combat this effect;
* Sites must have a pleasing appearance, in order to successfully integrate the landscape and nearby buildings.

The advantages of this system are the low level of impurities in the collected materials as well as the low collection costs.

In conclusion, the efficiency of this waste collection scheme requires, besides organizational and investment measures, a comprehensive program designed to educate the target population, raise their awareness and mobilize voluntary participation in waste collection activities.

REFERENCES

McDougall, F, White, P., Franke, M., Hindle, P. (2001), *Integrated Solid Waste Management: a Life Cycle Inventory,* Blackwell Publishing;

Rusu, T. & Bejan, M. (2006), *Deşeul – sursă de venit*, Cluj-Napoca: Editura Mediamira;

Scorţar, L. (2010), *Managementul deşeurilor menajere*, Cluj-Napoca: Editura Alma Mater;
  „*Colectarea selectivă"* Retrieved September 6, 2012, from http://www.ecoromambalaje.ro/colectarea_selectiva.php *Studiu de Oportunitate privind delegarea gestiunii serviciului de salubritate în municipiul Turda*, GPA Business Consulting.