

WASTE MANAGEMENT STRATEGY IN CONSTRUCTION AND DEMOLITION INDUSTRIES: CONSTANTA DISTRICT

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Abstract

This article tries to evaluate the waste management strategy results in construction and demolition industry in Constanta district. Its purpose is to establish a framework for creating a waste management system to ensure the objectives and targets of the district, in accordance with national and European legislation in this area. All types of waste results from this industry, quantities collected in Constanta district, legislation in this area and how to manage their were presented in the article summary. The article can be used as the basis for policy in this area, to establish the necessary investments and for development projects in order to obtain the necessary financing.

Keywords: waste, construction and demolition industry, recycling.

1. DEMOGRAPHIC DATA OF CONSTANTA DISTRICT

After the last census data, the population of Constanta district is about 715.151 inhabitants (Table1), the district is in fourth place in Romania from this point of view. The district population counts 507.031 urban inhabitants and 208.117 inhabitants in rural areas according to statistics provided by the district at 01.07.2005.

The population density is about 101 people / km² – more than national average. As the ethnic structure, the majority is represented by the romanians, about 91,70%. Beside they are coexist and national minorities (3,20% turkish, 3,20% tatar, 0,80% russian-lipovan, 0,60% gipsy, 0,20% hungarian and 0,30% other nationalities).

The specific of the Constanta district is the Black Sea coastline, that lies over a length of 87 km, with a stable population of over 450.000 inhabitants and includes the following cities and resorts: Constanta,

Navodari, Mamaia, Techirghiol, Eforie Nord, Eforie Sud, Costinesti, Neptun, Cap Aurora, Olimp, Venus, Saturn, Jupiter, Mangalia, localities 2 Mai and Vama Veche.

TABLE 1 – THE POPULATION EVOLUTION IN 2000-2005

	2000	2001	2002	2003	2004	2005
Total	746.041	746.908	713.783	713.563	713.825	715.148
Urban	541.698	541.842	506.077	504.681	507.731	507.031
Rural	204.343	205.066	207.706	208.882	206.094	208.117
% Urban	72.61%	72.54%	70.90%	70.73%	71.13%	70.90%
% Rural	27.39%	27.46%	29.10%	29.27%	28.87%	29.10%
Total variation		0.12%	-4.43%	-0.03%	0.04%	0.19%
Urban variation		0.03%	-6.60%	-0.28%	0.60%	-0.14%
Rural variation		0.35%	1.29%	0.57%	-1.33%	0.98%

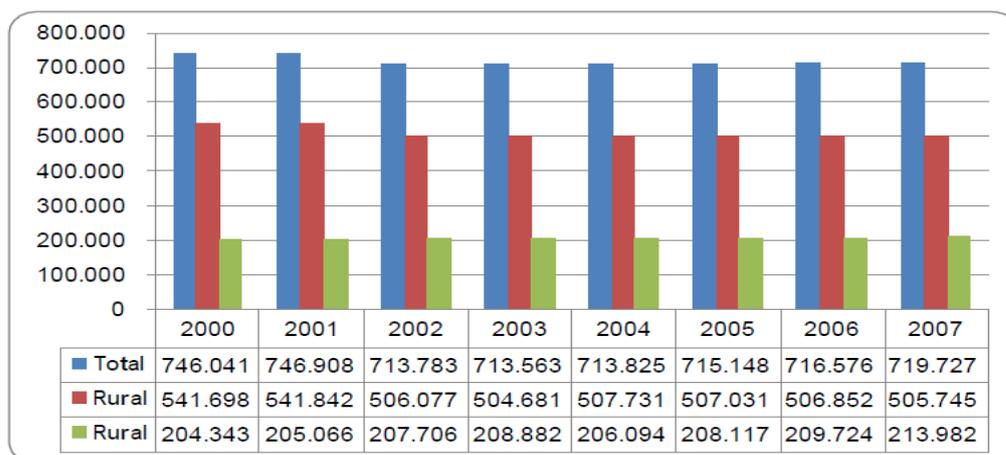


FIGURE 1 – THE EVOLUTION OF THE AVERAGE VALUE OF POPULATION IN 2001-2007

The administrative organization of the Constanta district (Figure 2), is the following: Municipalities – 3, Towns – 9, Communes – 58, Villages – 188;

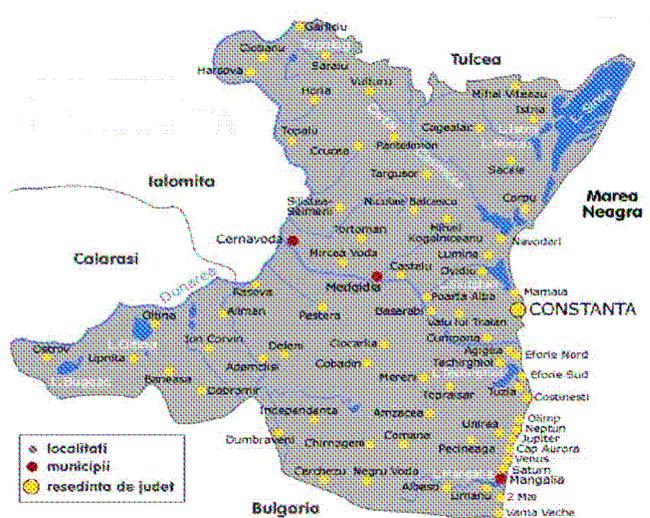


FIGURE 2 – THE MAIN LOCALITIES OF CONSTANTA DISTRICT

2. SOURCES AND SPECIFIC WASTE TYPES OF CONSTRUCTION AND DEMOLITION INDUSTRY

At national level, in the first semester of 2009, compared with the corresponding period of last year, the value of construction works increased with 33,2% in real terms, highlighted growth in all types of construction: non-residential buildings (+35,7%), residential buildings (+34,7%) and engineering constructions (+31,7%). Also, the structure elements have been recorded increases in new building works (+33,9%), maintenance and current repair works (+33,2%) and overhaul works (+30,2%) (National Institute of Statistic). In June 2009, the construction works have increased in real terms compared to May 2008 with 19,0%. Compared with the corresponding month of the previous year, the value of construction works grew with 33,9%. The indices of construction works have increased at residential buildings (+36,7%), non-residential buildings (+36,2%) and engineering constructions (+32,3%). By structure elements, the indices of construction works have increased thus: new construction works (+36,6%), maintenance and current repair works (+30,6%) and overhaul works (+30%).

TABLE 2 – TYPES OF ANALYZED WASTE FROM CONSTRUCTION AND DEMOLITION WORKS

Waste code according HG nr. 856/2002	Waste type
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and si ceramics
17 01 07	Mixtures of concrete, tiles, bricks and ceramics, other than those specified at 17 01 06
17 02 01	Wood
17 02 02	Steel
17 02 03	Plastics
17 03 02	Asphalt, other than those specified at 17 03 01
17 04 01	Copper, bronze, brass
17 04 02	Aluminum
17 04 03	Lead
17 04 04	Zinc
17 04 05	Iron and steel
17 04 06	Colours
17 04 07	Mettal fittings
17 04 11	Cables, other than those specified at 17 04 10
17 05 04	Soil and stones, other than those specified at 17 05 03
17 05 06	Waste from dredging, other than those specified at 17 05 05
17 05 08	Rubbish of gravel, other than those specified at 17 05 07
17 06 04	Nonconductive materials, other than those specified at 17 06 01 at 17 06 03
17 08 02	Construction materials gypsum based, other than those specified at 17 08 01
17 09 04	Mixed waste from construction and demolition works, other than those specified at 17 09 01

Compared with may 2009 the construction works in June 2009 increased with 19% for total. The construction works executed at residential buildings decreased with 3,3%. The construction works executed at engineering constructions and residential buildings recorded an increase from the previous month by 23,6% and 22,8%. By structure elements, the indices of construction works have increased thus: overhaul works (+26%), maintenance and current repair works (+24%) and new construction works (+14,8%) (Source: <http://www.cjc.ro>). The waste types from constructions and demolitions, subject of our study, are presented in Table 2.

3. THE QUANTITIES COLLECTED IN CONSTANTA AND THEIR MANAGEMENT

The quantities of waste from construction and demolition works collected in 2007-2009 are shown in Table 3.

TABLE 3 – THE QUANTITIES OF WASTE FROM CONSTRUCTION WORKS COLLECTED (TONES)

SANITATION OPERATOR	YEAR		
	2007	2008	2009
EDILMED	11.586	4344.75	0
URANUS	2.640	2520	1.447,4
BASARABI	0	6750	0
CERNAVODA	240	370	300
UTIL SERV	1978	480	4860,7
HARSOVA	0	550	0
NAVODARI	0	0	0
NEGRU VODA	35	5	7
TECHIRGHIOI	400	200	0
BANEASA	0	0	200
TOTAL	16.879	15.219,75	6.815,1

Source: <http://www.mediu-constantia.ro>.

From 2008, in Ovidiu locality was authorized the operation of an inert landfill where are removed the construction and demolition waste generated in the district.

TABLE 4 – THE QUANTITIES OF WASTE FROM CONSTRUCTION WORKS STORAGE (TONES)

Storage	Place	YEAR	
		Operator	2009
Inert waste storage	Ovidiu, Zona UTR 5	SC OVI-PRESTCON SRL Ovidiu, str. Portului nr.25; Tel./fax:0241/255343; oviprestconsrl@yahoo.com	2.600,6

The existing information on national and regional level on the construction and demolition waste are incomplete and inconsistent.

Thus:

- at national level have been collected 466.983 tones of waste from construction and demolition works for year 2008.
- in PRGD (source: <http://www.cjc.ro>) is estimated a generated quantity of 449.000 t in the south east region, for year 2008 (about 112.250 t/year for Constanta which is collected: 13,56%, about 15.220t)
- PRGD estimated indices are under UE similar indices (157 kg/inhabitant/year average urban+rural – compared with 180-200 kg/inhabitant/year – UE average);
- the responsibility for handling, including transport of construction and demolition waste, belongs of their generators/owners, the municipalities are required to indicate the places for disposal, disposal method and transport route.
- starting from year 2007, European Union stoped financing the projects initiated by local governments to treat waste from construction and demolition works;
- considering the fact that these facilities are performed by private operators (sanitation, deposits etc.) or by the sanitation services subordinated to the local governments, and waste generators are economic agents, below investment costs are for information, will not be included in the costs of alternatives and can not be suported by the population (not influence the supportability analysis);

Considering the above issues, we consider very difficult sizing indisputable specific treatment facilities. But to analyze this issue, we still choose to accept a European average index of this waste generation, of 190 kg/inhabitant/year. Starting from the current premises in the construction sector will remain linear indicating that during the entire forecast. In the sizing calculations was taken into account only population statistics without considering the influence of the number of tourists annually. Construction and demolition waste can be recycled easily, some operators reporting a recovery in operations represented over 90%. This process can be achieved by two methods: preliminary sorting at generation places in containers or pots; the use of crushing and screening equipment for the recycling of concrete and bricks.

Nationally, there are several operators who operate crushers, concrete and bricks making in materials that may have future use. It should be noted that material resulting from crushing must rise in terms of cost and quality of the ballast used normally. Currently in Romania there are no rules on the quality of the material resulting from construction and demolition waste treatment, preventing its use in various applications (ex. filling material for the construction of transport routes). Another aspect to be taken into account in the analysis of this waste stream, is the proper separation of the two categories of dangerous waste and non-dangerous because in practice it is very difficult for non-dagerous waste to be collected separately from denagerous waste, especially in case of uncontrolled demolitions. Therefore, a separation must be performed prior on a special platform on the location site where the works are completed (Bold, 2003).

In Table 5 are presented the types of dangerous waste from construction and demolition works, and categories of permitted and denied waste from temporary storage in specially built platforms on construction sites or waste treatment from construction and demolition works (Table 6).

TABLE 5 – THE CATEGORIES OF DANGEROUS WASTE FROM CONSTRUCTION WORKS

Waste code according HG nr. 856/2002	Name of waste category
17 01 06	concrete mixtures, bricks, tiles or ceramics which containing dangerous additives
17 02 04	glass, plastic and wood containing or contaminated with dangerous additives
17 03 01	bituminuos mixtures containing coal tar
17 03 03	coal tar and tarred products
17 04 09	metal waste contaminated with dangerous additives
17 04 10	cables containing oil, tar or other dangerous additives
17 05 03	soil and stones containing dangerous additives
17 05 05	dredging wastes containing dangerous additives
17 05 07	track ballast containing dangerous additives
17 06 01	insulation materials containing asbestos
17 06 03	other insulation materials consisting of or containing dangerous additives
17 06 05	building materials containing asbestos
17 08 01	construction materials contaminated with dangerous substances gypsum
17 09 01	construction and demolition wastes containing mercury
17 09 03	other construction and demolition wastes (including mixed wastes) containing dangerous substances

For temporary storage of waste for treatment, is required to arranging special locations. These locations will be placed in the line or inert waste deposits or in collection centers. Locations of waste treatment must be arranged in such a way that before processing of waste to be adequate for temporary storage and handling during processing. To treat waste must be arranged an concrete area for placement of a technological line.(Wehry, 2002).

TABLE 6 – ACCEPTED AND DENIED WASTE AT TEMPORARY STORAGE

Non-dangerous waste accepted for storage	Dangerous waste accepted for storage
<ul style="list-style-type: none"> - inert materials (concrete, bricks, tiles, ceramics, glass); - gravel, oil, mud; - wood which has not been chemically treated; - metals and metal mixtures; - tar-free asphalt content; - other materials which does'nt contain dangerous chemicals. 	<ul style="list-style-type: none"> - inert materials (concrete, bricks, tiles, ceramics, glass) contaminated - gravel, oil, mud containing dangerous additives; - asphalt containing tar ; - materials containing asbestos; - materials containing PCB ; - materials containing mercury; - other dangerous materials
Non-dangerous waste denied for storage	Dangerous waste denied for storage
<ul style="list-style-type: none"> - equivalent waste garbage,resulting from activities carried on storage places, those can be stored on emplacement in special places arranged; - liquid waste; - non-dangerous industrial waste from disabled instalations. 	<ul style="list-style-type: none"> - equivalent waste garbage,resulting from activities carried on instalations/storage places; - denagerous industrial waste from disabled instalations.

The period of temporary storage of dangerous waste from construction and demolition can vary depending on the size of the storage facility and distance from treatment facilities, recovery and disposal. For example, in case of placements which on realized construction and demolition activities located in large urban areas might be required to collect and transport the waste generated daily. While for larger placement isolated, waste could be stored for longer periods. The lifetime of temporary storage facility of construction and demolition waste, is strictly related to the period for carrying out demolition and construction activities, clearly established period in the the demolition / construction permit (Căpățână, 2003). Construction and demolition waste generation is a process limited in time. Amount generated depends strictly on the size of the building demolished, and for building sites depend on technological discipline (construction to generate small amounts of waste). Their generation is a sporadic process. Construction and demolition waste are stored at the place of generation then are transported to landfills, or to tratment stations or treatment of waste at generation place (on the placement which construction or demolition is done), especially for larger places (Căpățână, 2003).

Regarding the selection of the area where the waste will be temporarily stored results, the possibilities are these: (Căpățână, 2003);

- in case of controlled demolition:
 - storage of debris is done at the demolition place (transfer them in a special area designated for storage is not feasible because of large quantities generated);
 - storage materials that can be reused / recycled is done in a specially designated area in metal containers;
- in case of classic demolition without treatment at generation place;
 - Storage of mixed waste is done where demolition operations take place;
- in case of classic demolition with treatment at generation place:
 - Storage of mixed waste is done where demolition operations and crushing debris take place;
- in case of construction activities:
 - Organization plan must be provided for waste storage areas, for construction; storage can be done in piles or metal containers(according to the amounts generated).

Starting from the quantities of waste collection areas, shown in Table 7, for their treatment is proposed purchase of two production lines:

- fixed installation with a capacity of 80-100 kt/year, in the Ovidiu collection region, which can serve regions Ovidiu and Medgidia;
- mobile or semi-mobile installation with a capacity of 40-50 kt/year to serve other regions of collection.

TABLE 7 –WASTE QUANTITIES FROM CONSTRUCTION AND DEMOLITION WORKS

Region/year	2006	2007	2008	2009	2010
HARSOVA	5.596	5.665	5.648	5.632	5.616
COGEALAC	4.563	4.655	4.642	4.629	4.615
CERNAVODA	5.434	5.464	5.449	5.433	5.417
BANEASA	5.721	5.813	5.797	5.780	5.763
MEDGIDIA	15.129	15.246	15.202	15.158	15.115
OVIDIU	75.522	75.496	75.279	75.061	74.844
COSTINESTI	11.790	11.959	11.925	11.890	11.856
ALBESTI	12.395	12.449	12.413	12.377	12.342

Table 8 and Table 9 present the investment costs for the two proposed technological lines.

TABLE 8 – INVESTMENT COSTS FOR OF CONSTRUCTION AND DEMOLITION WASTE TREATMENT PLANTS

ELEMENTE DE INVESTITII	P.U	U.M.	50KT/AN		100KT/AN	
			CANT.	VAL.	CANT.	VAL.
CONTAINER TREATMENT	14.000	BUC	1	14.000	1	14.000
CONCRETE PLATFORM	60	MP	1.000	60.000	1.000	60.000
FENCE	10	M	300	3.000	300	3.000
GATE	5.000	BUC	1	5.000	1	5.000
MINCER	240.000	BUC	0,8	180.000	1	240.000
SORTING INSTALLATION	180.000	BUC	0,9	160.000	1	180.000
MAGNETIC SEPARATOR	60.000	BUC	1	60.000	1	60.000
AIR SEPARATOR	80.000	BUC	1	80.000	1	80.000
LOADER	140.000	BUC	1	140.000	1	140.000
ROTARY EXCAVATOR	140.000	BUC	1	140.000	1	140.000
UNRAVELING PRESS	20.000	BUC	2	40.000	3	60.000
TRUCKS	128.000	BUC	1	128.000	2	256.000
TRAILERS	28.000	BUC	1	28.000	2	56.000
CONTAINERS	3.400	BUC	5	17.000	10	34.000
TRAILERS	120.000	BUC	1	120.000	1	120.000
COSTS C+M				1.175.000		1.448.000
UTILITIES				29.375		72.400
DESIGN COSTS				45.569		52.720
TOTAL COSTS				1.249.944		1.573.120

TABLE 9- ORGANIZATION COSTS FOR CONSTRUCTION AND DEMOLITION WASTE TREATMENT PLANTS

COST ELEMENTS	50KT/YEAR	100KT/YEAR
PERSONNEL COSTS	50.100	50.100
FUEL	210.000	378.000
LUBRICANTS, OILS	30.000	54.000
EQUIPMENT TRANSPORT	36.000	48.000
SUPPLIES	22.000	39 600
MAINTENANCE COSTS	56.000	100 800
MATERIAL COSTS	70.000	126.000
WASTE STORAGE	55.000	99.000
MANAGEMENT COST	52 910	89 550
TOTAL	529.100	705.000
EURO COST / T	10,58	7,05

4. WASTE MANAGEMENT LEGISLATION IN THE FIELD OF CONSTRUCTION AND DEMOLITION WORKS

The law 27/2007 with the modification OUG 78/2000 on waste management provides:

- 1) the waste deposited in temporary storage or waste from demolition or rehabilitation of buildings are treated and transported by the waste holders, by those who execute the construction or demolition or another person under a contract.
- 2) the municipality indicate the waste disposal placement referred at paragraph (1), how to remove and transport route to it.
- 3) the waste producers and owners have the obligation to ensure the recovery or disposal of waste own means or by delivering their own waste to units authorized for their recovery or disposal; the delivery and receipt of waste production, waste, waste from construction and demolition and dangerous waste for disposal, must be performed only on a contract basis.

The law no. 101/2006 on organization of sanitation localities enter the activity in the settlements sanitation service of „ collection, transport and storage of waste resulting from construction and demolition activities” as a separate activity of „ pre-collection, collection and transportation of municipal waste, including toxic waste and household dangerous waste”. The waste from construction and demolition accounts approximately 25% of waste, it derived largely from demolition and renovation of old buildings. It are made from materials such as bricks, concrete, wood, glass, metals, plastics, solvents, asbestos, soil excavated, many of them can be recycled in one way or another.

5. CONCLUSIONS

This article has a key role in sustainable development area by establishing and implementing a performance management plan for waste from construction activity. The main purpose of this paper is to present the waste streams and identify the best solutions for managing them within the timeframe set.

Growing complexity of the specific issues and standards on waste management facilities lead to increased demands on recycling, treatment and disposal.

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