Waste Management and Associated Risks

IOAN HURJUI*, MARCELA CRISTINA HURJUI
Stefan cel Mare University, Doctoral Scool of Economy, 13 Universitãii Str., 720229, Suceava, Romania

Romania, with its membership of the European Union, has requested a transitional period of three years, time required for the construction of incineration instalations and for applying the directive on emissions of pollutants to air, water and soil of incineration and co-incineration existing instalations. There are also presented case studies on the implementation of the neutralization of medical waste through thermal sterilization, treatment and final disposal of waste.

Keywords: environmental protection, EU environmental policies, waste policy, waste prevention policy

The national policy on waste management in Romania must underwrite to the European policy objectives in terms of waste prevention and aim to reduce the consumption of resources, with the practical application of the waste hierarchy.

The National Strategy for Waste Management arose from the need to identify objectives and policies action that Romania must follow in waste management in order to achieve the recycling society status.

Experimental part

Materials and methods

The provisions of the National Strategy for Waste Management, as a principled way approach, namely straightening Romania to a *recycling society*, the implementation of the waste management hierarchy, the supporting measures aimed to an efficient use of resources, applies to all types of waste, namely:

-urban wastes and assimilables in commerce, industry, institutions, including separately collected fractions;

-specific waste flows: biowaste, packaging waste, construction and demolition waste, waste resulting from medical activities, forensic medicine and related activities.

The public authority responsible for ensuring the health of the population had the obligation of the development of the Strategy and the National Plan, based on the management plans of waste resulted from medical activities drawn up at the national level. In this regard, there have been exempted from these plans the health units carrying out medical activities that generate less than 300 kg of hazardous waste per year, for which shall be set obligation to comply with technical standards and to report quantities of waste products and how to manage them in accordance with the approved methodology.

The public authorities with their own health network send their management plan of medical waste resulted from medical activities to the public Authority responsible for ensuring the health, the institution designated by law for drafting the strategy and the Plan of waste management resulting from medical activities at national level.

Results and discussions

The public authority responsible for ensuring quality health, as a credit release authority, is responsible for providing the necessary funds for the functioning of the medical waste management system, from collection phase until the final disposal of medical waste.

In the period 2012-2014, from the data transmitted by entities subordinated to the public Authority responsible for ensuring public health revealed that the financing of the medical waste management was carried out as follows:

-from own revenues resulted of medical services provided and contracted with health insurance house for hospitals and institutes, respectively;

-from own revenues and state budget, if the county public health departments and ambulance services that county.

From studies in the entities subordinated to the public Authority responsible for ensuring public health for the period 2012-2014, there were found the following:

-some entities subordinated to the public Authority responsible for ensuring public health were not properly substantiated the necessary financial resources for the management of medical waste activity;

- the lack of an uniform record of financial resources needed for the management of medical waste activity.

It follows that establishing the necessary financial resources for the management of waste resulted from medical activities at the sanitary units of public Authority was not performed according to the real needs imposed by the steps that pass through the medical waste until to final disposal nor of the personnel involved in this activity.

Regarding the implementation of the acquis communautaire concerning the medical waste, it was established the closing of all small crematoriums from medical units and the replacement with alternative instalations for management of hazardous medical waste

In Romania in 2002 there were a total of 346 thermal waste treatment facilities (incinerators) placed within the medical units.

The old crematoria were not authorized anymore to destroy the medical waste, their activity being taken over by modern authorized incinerators. Therefore the activity of the 346 crematoria dismantled is complemented by authorized economic agents for disposal by incineration.

The health system remains uncovered in this area since the Government decided to close the incinerators, but did not allocated funds for building new ones.

In Romanian hospitals are used as methods of neutralizing the hazardous medical waste the thermal decontamination followed by crushing and deformation - the autoclaving for infectious waste, stabbing/cutting waste, chemical and pharmaceutical waste. For the

* email: hurjui_ioan@yahoo.com

pathological and anatomical waste and the anatomical parts, which necessarily must be incinerated, the health units have signed contracts with collection companies.

For example, we present two medical waste neutralization systems that have equipped the medical units duet o the crematoria closure within them:

A - In order to implement the thermal sterilization system through fixed and mobile units, the public Authority responsible for health insurance purchased in 2005 a total of 67 medical waste disinfection systems MEDISTER 160 type.

The MEDISTER 160 system is used for the disinfection of infectious waste and those containing liquid infectious waste, microbiological laboratory waste, dialysis systems, waste from wards, etc.

The devices are operated via an integrated touch panel. Each disinfection cycle operates fully automatically. Moreover, the data cycle are stored electronically and can be easily read using a USB or an Ethernet connection.

From studies conducted in health units subordinated to the public Authority responsible for insuring health, beneficiaries of MEDISTER 160 facility type, were found the following:

-at some hospitals the equipment never worked;

-some facility hospitals have used the instalation fewer years compared to the normal life cycle, according to the catalog regarding the classification and duration it was between 8-12 years.

-the equipment has never been used or has been used fewer years compared to the normal life cycle, set by legal provisions.

For carrying out an analysis on efficiency of the treatment system type MEDISTER 160, the only entity that has used the treatment facility type MEDISTER 160 provided, has sent the statements on the quantities of medical waste treated with their own instalation and the costs arising from the use and maintenance of the facility in the period 2012-2014.

Table 1

THE SITUATION OF THE AMOUNTS OF WASTE TREATED WITH THEIR OWN INSTALLATION AND THE ANNUAL COSTS ARISING FROM THE USE AND MAINTENANCE OF THE INSTALATION, HEALTH UNIT X, IN THE PERIOD 2012 – 2014

Year	The amount of waste (kg) treated with the instalation MEDISTER 160	The annual costs arising from the use and maintenance of plant (lei)	Waste cost treated with their own instalation (Euro/kg)
0	1	2	3 = 2/1
2012	8.460	30.880	3.65
2013	8.880	30.950	3.48
2014	8.700	30.975	3.56

Table 2

THE SITUATION ON THE QUANTITIES OF WASTE GENERATED AND TREATED BY ECONOMIC OPERATORS IN 2012

Health unit	Data on waste production (Kg / year) / Waste Code		The total amount of waste (kg)	Unit price economic operators (Euro / kg)	Value of economic operators service (lei)	Cost / kg when using instalation MEDISTER (Euro / kg)	Total costs for the use of MEDISTER (lei)	Savings (lei)
	Sharpen-cutting waste code	Infectious waste						
0	1	2	3 = 1+2	4	5 = 4*3	6	7 = 3*6	8 =5-7
Health unit A	6.410	30.360	36.770	4.4	161.788	3.65	134.211	27.577
Health unit B	1.100	10.288	11.388	7.69	87.574	3.65	41.566	46.008
Health unit C	0	35.414	35.414	4.1	145.197	3.65	129.261	15.936
Health unit D	1.183	59.164	60.347	5.45	328.891	3.65	220.267	108.624
TOTAL	**8.693**	**135.226**	**143.919**	**X**	**723.450**	**X**	**525.305**	**198.145**

Table 3

SITUATION ON THE QUANTITIES OF WASTE GENERATED AND TREATED BY ECONOMIC OPERATORS IN 2013

Health unit	Data on waste production (Kg / year) / Waste Code		The total amount of waste (kg)	Unit price economic operators (Euro / kg)	Value of economic operators service (lei)	Cost / kg when using instalation MEDISTER (Euro / kg)	Total costs for the use of MEDISTER (lei)	Savings (lei)
	Sharpen-cutting waste code	Infectious waste						
0	1	2	3 = 1+2	4	5 = 4*3	6	7 = 3*6	8 =5-7
Health unit A	6.266	42.657	48.923	4,4	215.261	3,48	170.252	45.009
Health unit B	1.035	10.662	11.697	7,69	89.950	3,48	40.706	49.244
Health unit C	1.479	28.069	29.548	4,10	121.147	3,48	102.827	18.320
Health unit D	3.555	56.297	59.852	5,10	305.245	3,48	208.285	96.960
TOTAL	**12.335**	**137.685**	**150.020**	**X**	**731.603**	**X**	**522.070**	**209.533**

Table 4

SITUATION ON THE QUANTITIES OF WASTE GENERATED AND TREATED BY ECONOMIC OPERATORS IN 2014

Health unit	Data on waste production (Kg / year) / Waste Code		The total amount of waste (kg)	Unit price economic operators (Euro / kg)	Value of economic operators service (lei)	Cost / kg when using instalation MEDISTER (Euro / kg)	Total costs for the use of MEDISTER (lei)	Savings (lei)
	Sharpen-cutting waste code	Infectious waste						
0	1	2	3 = 1+2	4	5 = 4*3	6	7 = 3*6	8 =5-7
Health unit A	2.707	49.218	51.925	4,40	228.470	3,56	184.853	43.617
Health unit B	474	9.647	10.121	7,69	77.830	3,56	36.031	41.799
Health unit C	1.179	26.771	27.950	4,10	114.595	3,56	99.502	15.093
Health unit D	1.646	49.859	51.505	5,10	262.676	3,56	183.358	79.318
TOTAL	**6.006**	**135.495**	**141.501**	**X**	**683.571**	**X**	**503.744**	**179.827**

Table 5

THE SITUATION REGARDING THE AMOUNTS OF WASTE WITH THEIR OWN INSTALATIONS AND THOSE WITH THIRD PARTIES AND ALSO THE RELATED COSTS IN 2012

Health unit	The amount of medical waste generated (kg / year)	The amount of medical waste neutralized (kg / year) own instalation	The amount of medical waste (kg / year) treated by third parties	Total cost of ownership and maintenance of the facility (lei)	Costs / kg waste treated with own instalation(Euro / kg)	Service treatment value made by third parties (lei)	Unit Price / kg waste treated with third parties (Euro / kg)	Additional costs if would not be used the own instalation (lei)	Savings (lei)
0	1	2	3	4	5=4/2	6	7=6/3	8=2*7	9=8-4
Health unit X	265.316	135.960	129.356	172.868	1,27	386.566	2,99	406.520	233.652
Health unit C	85.645	50.231	35.414	112.634	2,24	129.153	3,65	183.343	70.709
Health unit E	115.595	109.122	6.473	189.061	1,73	33.712	5,21	568.526	379.465
TOTAL	**466.556**	**295.313**	**171.243**	**474.563**	**X**	**549.431**	**X**	**1.158.389**	**683.826**

Analyzing the statements submitted by the health unit X, resulted that in the period 2012 - 2014, the quantities of medical waste treated by their own instalation were 8.460 kilograms in 2012, 8.880 kg in 2013 and 8.700 kg in 2014.

In this sense, we present the savings that would be achieved in the period 2012 - 2014 by some hospitals that have not used the MEDISTER 160 instalations provided, taking into account the cost/kg waste produced by the health unit X in the same period.

By applying cost 3.65 lei/kg on treated waste produced by the health unit X in 2012 following to the use of its own system on the amount of waste generated in the same year and undergone to this process by the medical units mentioned, who did not use the facilities MEDISTER 160. It results that in 2012, the 4 hospitals could have achieved total savings in the amount estimated of 198 thousands lei, while this service would have been provided with the equipment MEDISTER160, in the endowment of these entities.

By applying the cost of 3.48 lei / kg of treated waste produced by the health unit X by using its own instalation in 2013 on the amount of waste generated in the same year and undergone to this procedure by health units listed in the table that have not used MEDISTER 160 provided. It follows that the savings that could be obtained from the 4 health units were estimated in the amount of 209 thousands lei, while the service would have been provided with MEDISTER 160 equipments in the endowment of these entities.

By applying the cost of 3.56 lei / kg of treated waste produced by the health unit X in 2014 following of the use of its own system on the amount of waste generated in the same year and undergone to this procedure by health units listed in the table that have not used MEDISTER 160 provided. It follows that the total savings that would be achieved by the 4 health units were in the estimated amount of 180 thousands lei, while the service would have been provided with equipment MEDISTER 160 in the endowment of these entities.

So if the 4 health units in the sample would have treated the quantities of waste according to the law could be subject to this procedure with MEDISTER 160 installations, would have achieved savings in an amount estimated of 587 thousands lei.

B. By PHARE 2006 / 018-147.03.03 / 4.9 Project was made the *Procurement of equipment for the treatment and final disposal of hazardous medical waste in accordance with national legislation and European standards*. The responsible public Authority for ensuring health as beneficiary acquired 28 neutralization equipment by thermal steam pressure sterilization of hazardous waste from medical activities.

The neutralising by thermal steam pressure sterilization equipment of hazardous waste from medical activities, with processing capacity of 180-200 kg of hazardous medical waste / cycle amounting 184,542.13 euros without VAT, was delivered to health unit X.

Table 6

SITUATION ON THE AMOUNTS OF WASTE TREATED WITH OWN FACILITIES AND THOSE WITH THIRD PARTIES AND THE RELATED COSTS IN 2013

Health unit	The amount of medical waste generated (kg / year)	The amount of medical waste neutralized (kg / year) own instalation	The amount of medical waste (kg / year) treated by third parties	Total cost of ownership and maintenance of the facility (lei)	Costs / kg waste treated with own instalation (Euro / kg)	Service treatment value made by third parties (lei)	Unit Price / kg waste treated with third parties (Euro / kg)	Additional costs if would not be used the own instalation (lei)	Savings (lei)
0	**1**	**2**	**3**	**4**	**5=4/2**	**6**	**7=6/3**	**8=2*7**	**9=8-4**
Health unit X	202.605	92.129	110.376	151.335	1,64	329.846	2,99	275.466	124.131
Health unit C	61.416	33.347	28.069	107.979	3,24	136.723	4,87	162.400	54.421
Health unit E	108.598	105.515	3.083	181.855	1,72	16.057	5,21	549.733	367.878
TOTAL	**372.619**	**230.991**	**141.528**	**441.169**	**X**	**482.626**	**X**	**987.599**	**546.430**

Table 7

THE SITUATION OF THE AMOUNTS OF WASTE TREATED WITH OWN FACILITIES AND THOSE WITH THIRD PARTIES AND RELATED COSTS IN 2014

Health unit	The amount of medical waste generated (kg / year)	The amount of medical waste neutralized (kg / year) own instalation	The amount of medical waste (kg / year) treated by third parties	Total cost of ownership and maintenanc e of the facility (lei)	Costs / kg waste treated with own instalation (Euro / kg)	Service treatment value made by third parties (lei)	Unit Price / kg waste treated with third parties (Euro / kg)	Additional costs if would not be used the own instalation (lei)	Savings (lei)
0	**1**	**2**	**3**	**4**	**5=4/2**	**6**	**7=6/3**	**8=2*7**	**9=8-4**
Health unit X	147.993	84.500	62.493	84.466	1,00	186.754	2,99	252.655	168.189
Health unit C	57.750	30.979	26.771	90.307	2,92	131.706	4,92	152.417	62.110
Health unit E	117.648	109.297	8.350	167.830	1,54	43.488	5,21	569.437	401.607
TOTAL	**323.391**	**224.776**	**97.614**	**342.603**	**X**	**361.948**	**X**	**974.509**	**631.906**

From studies in health units and from an analysis on the effectiveness of waste tratment generated by their own instalations compared with the cost of this type of economic operators services, it was requested the submission of the amounts of waste treated with their own instalations and those with third parties, and also the costs related to the period 2012-2014.

In 2012, the costs of waste treatment supplied with their own instalations were lower than the costs of treatment by third parties with 1.72 lei / kg for health unit X. If health units would not have benefited from waste treatment instalations, the additional costs related to treatment by economic operators of 295,313 kg would be in total 1,158 thousands lei.

In 2013 the costs of waste treatment with own installations compared with the costs of treating them by economic operators were lower by 1.35 lei / kg for health unit X. The additional costs of treatment by economic operators of the amount of 230,991 kg waste in lack of the own instalations were totaling 988 thousands lei, it follows that the 3 health units have achieved savings in the amount estimated 546 thousands lei, due to the treatment of 230,991 kg waste generated by their own instalations.

In 2014 the costs of waste treatment with own installations compared with the costs of treating them by economic operators were lower by 1.99 lei / kg for health unit X. The additional costs of treating 224,776 kg of waste by economic operators in terms of non existing treatment instalations were totaling 974 thousands lei. It follows that the savings obtained in 2014 by the three health units that carried aut the treatment of the 224,776 kilograms of waste generated by own instalations were 632 thousands lei.

Conclusions

In conclusion, the savings made during 2012 - 2014 only by 3 health units holding an own waste treatment instalation ISDM type compared with the costs that would be incurred if waste treatment were done by economic operators were estimated amount of 1.862 thousands lei.

It follows that, by not buying their own waste treatment instalations ISDM type by health units, the costs have increased very much. Moreover, there is a high risk due to the improper management of hazardous medical waste, the thermal decontamination followed by grinding and deformation, as well as waste incineration of anatomo-pathological and pathological waste of forensic pathology, which causes an increased risk of infections on the population.

References

1. *** Sinteza Raportului de Audit al Performanței privind modul de gestionare a deseurilor rezultate din activitatea medicală la Ministerul Sanatatii cat si la unitățile din subordine,coordonare si sub autoritate în perioada 2012 – 2014.

2. *** Tratatul de la Amsterdam NAT/538"Al saptelea Program de acțiune pentru mediu (PAM) si monitorizarea celui de-al saselea PAM

https://webapi.eesc.europa.eu/documentsanonymous/ces1052-2012_ac_ro.doc
3. *** Mediu 2010 – Viitorul nostru, Optiunea noastra, adoptat prin Decizia nr. 1600/2002/CE
www.varoshaza.ro/site/uploads/editor/2013/hotarari/hcl34-2013
3. *** Al saptelea PAM pentru perioada pânã în 2020, cu titlul O vita buna, în limitele planetei noastre
ec.europa.eu/environment/pubs/pdf/factsheets/7eap/ro
4. *** Strategia Nationala de Gestionare a Deseurilor pentru perioada 2003 – 2013
www.juridice.ro/wp-content/uploads/2013/03/2013-01-18-DGDSP-SNGD_v2.doc
5. *** Strategia Nationala de Gestionare a Deseurilor pentru perioada 2014 – 2020
www.juridice.ro/wp-content/uploads/2013/03/2013-01-18-DGDSP-SNGD_v2
6. *** OMS nr. 1226/2012 si HG nr. 856/2002 privind evidenta gestiunii deseurilor ºi pentru aprobarea Listei cuprinzand deseurile, inclusiv deseurile periculoase
7. *** Legea nr. 111/1996 privind desfasurarea în siguranta, reglementarea, autorizarea si controlul activitatilor nucleare
8. Raportul studiului privind managementul si tratarea deseurilor medicale_MEDWASTE (Versiunea RO)

Manuscript received: 5.10.2016