

## Original article

# The Waste Management in Romania. A Case Study: WMS Implementation

OROIAN I.\*, Antonia ODAGIU, I. BRAȘOVEAN, P. BURDUHOS

*University of Agricultural Sciences and Veterinary Medicine Cluj – Napoca, Faculty of Agriculture, Mănăștur St. no. 3 – 5  
400372 Cluj – Napoca, Romania*

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## Abstract

The present study aims to discuss issues related to the degree of implementation of national waste management strategy by emphasizing progress in waste management at national level in three years after its development. In 2004, Romania has developed national policy documents as Waste Management Strategy and National Waste Management Plan (WMS, WMSP) based on the "waste hierarchy". In the four years after the initiation of this process results demonstrate the advantages of using this system in ensuring a sustainable solution to eliminate pollution from waste. Also, the amount of waste recovered at the start of the period - 2004, occupies a proportion of 5.08% of total while in the end of 2007, the degree of recovery reached 7%. Concerning waste disposal, this was achieved by storage. The reason is the lack of incinerators for thermal treatment of waste. Traditional collection of household and similar waste in the mixture, is the most common, accounting for a share of about 97%.

**Keywords:** strategies, plans, waste hierarchy, sustainable management

## 1. Introduction

In Romania, as elsewhere in the world, waste, the result of human activity, is a problem of particular timeliness due both pursue diversification and increase the quantities generated. However, the degradation infests environment and creates a danger to the health of nature and people. A proper waste management system implemented in addition to the contribution which it makes to maintain a clean environment, has the advantage of the possibility of recovery and introduction into the economic circuit of significant quantities of recyclable materials and energy [8, 9].

The measure of the interaction between human activities and the environment is reflected in the level of the waste. It usually plays consumption and production trends. Waste generation (quantity/capita) increases with rising living standards. Increased economic production, but inefficient management of resources, leads to the generation of large quantities of waste. In this context, favored by the need for environmental *acquis communautaire*, the strategic planning and development of integrated, economically efficient system was needed in order to protect human health and environment.

## 2. The National Waste Management Strategy

The main components of strategic planning include:

- identify problems based on analysis of existing situation;
- generation objectives to solve problems;
- assessment and prioritization of objectives;

\* Corresponding author.  
Tel.: 0040 264 596384/371; Fax: 0040 264 593792  
e-mail: neluorioian@gmail.com; neluorioian@yahoo.fr

- generating activities supporting each objective;
- action assessment;
- preparing a detailed action plan including a financial plan;
- monitoring and evaluating progress in providing feedback for changes and improvements.

Subscribing his development strategy to the Community policy in this field, Romania has developed national policy documents for waste management (with the two main components, namely Strategy and National Waste Management

Plan) in 2004, based on the "waste hierarchy". Under this concept, waste management options are ranked from best to the least good for the environment [1, 2, 7].

They were in such a way designed to make waste prevention a priority, strategy followed in the order of provisions on minimization, recovery (reuse, recycling and energy recovery) and only as a last option appearing disposed of by incineration or storage (fig. 1).

## ''Waste hierarchy''

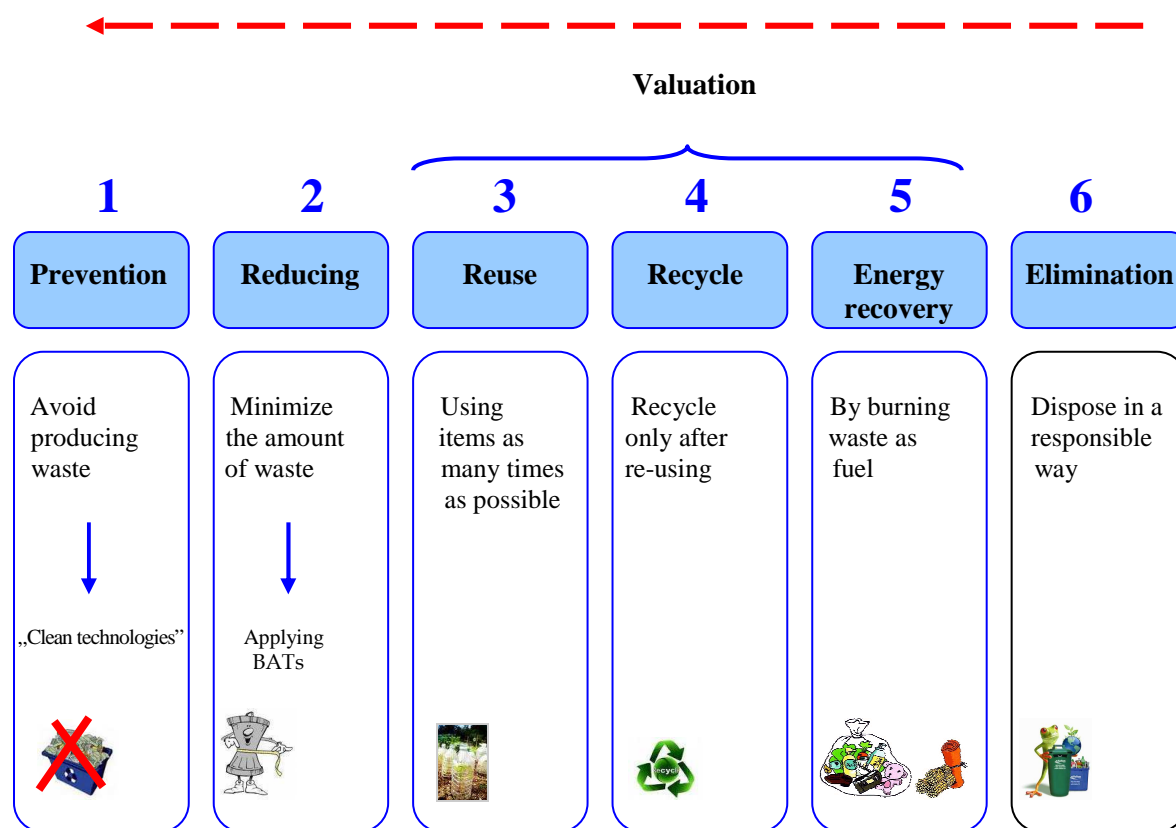


Figure 1. Waste management options

Reduction in waste storage and protection of natural resources require implementation of separate collection system of waste recovery and recycling of reusable waste.

Needed public awareness programs are needed in order to signal that, if not act on selective collection of waste is generated daily (paper and cardboard packaging, plastic containers, glass or metal, electrical and electronic waste and batteries) and throws them mixed in trash bins or containers, this will reflect very soon, not only the high degree of pollution affecting human health and

the environment, but also on the price that has to pay for new products from the same material for sanitation services, etc. [1, 2, 8].

After the development of national strategy, followed the development of regional strategies, local and county, finally. Instruments and national policy priorities are reflected in regional and county WMS. Regional Waste Management Plans (WMSP) were developed in late 2006, the Regional Agencies for Protection Environment, in cooperation with local representatives of environmental authorities and public administration. Details, at the county

level, measures and actions in WMSP is done by county waste management plans, which have been

prepared by county councils [3], together with all stakeholders in each county in 2008 (fig.2 ).

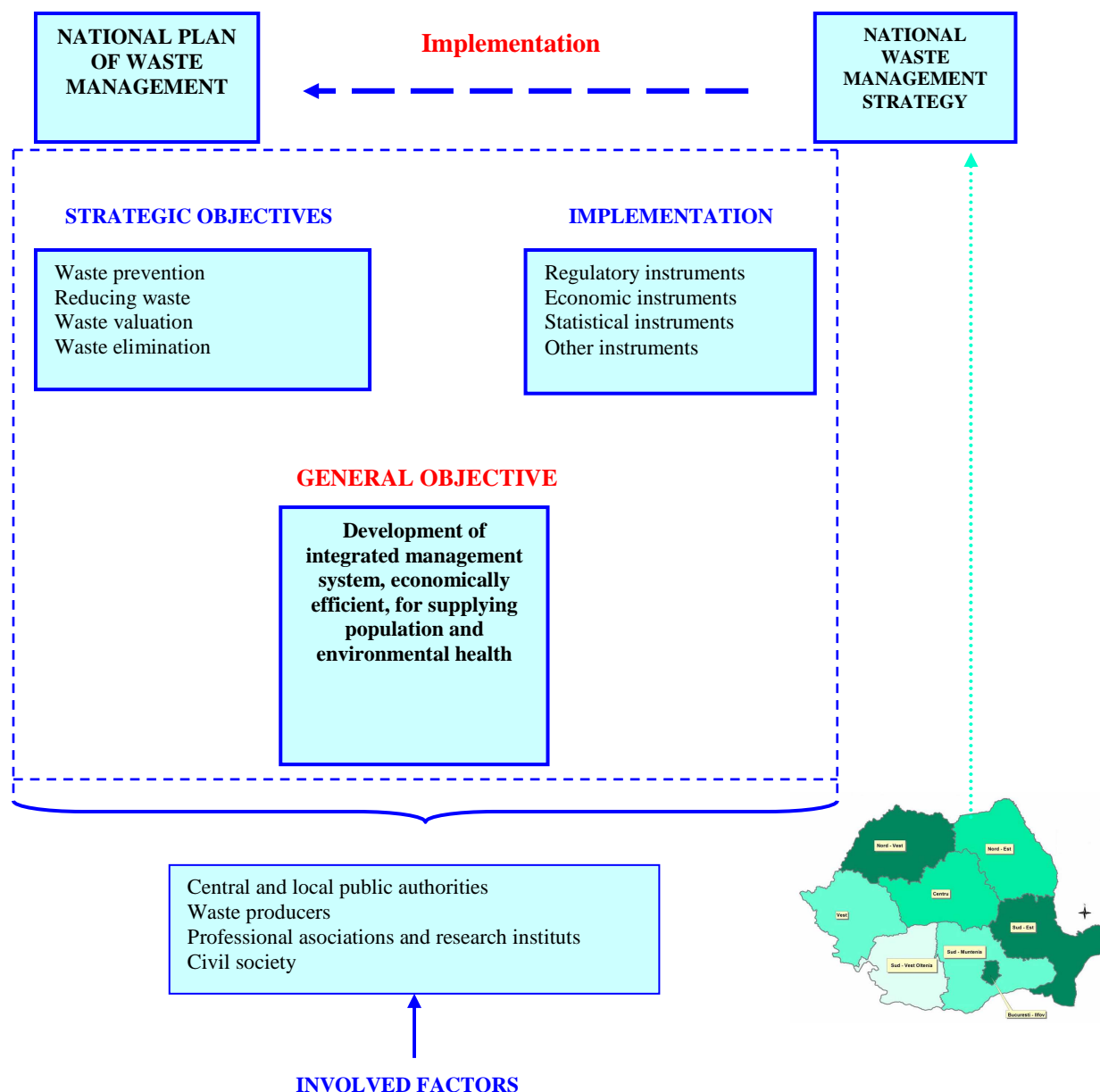


Figure 2. The implementation of the new national approach of waste management

In the strategy developed at the national level (WMS) waste management planning is based on a system of principles [1]:

**1. Protection of primary resources principle** - is made in the context of the broader concept of "sustainable development" and sets out the need to minimize and streamline the use of primary resources, especially renewable ones, focusing on the use of secondary raw materials.

**2. Preliminary measures principle**, linked to the BATNEEC principle ("The best available techniques not entailing excessive cost") - establishes that for any activity (including waste management), they must take into account the following main issues: the state current technology development, environmental requirements, selection and application of those measures economically feasible.

**3. The prevention principle** - establishes the hierarchy of waste management activities, in descending order of importance to be attached: issue avoid, minimize quantities, treatment for recovery, treatment and disposal in a safe environment.

**4. The "polluter pays" principle** related to producer responsibility and the responsibility of the user - set need to create an appropriate economic framework and so that waste management costs are borne by their generator.

**5. The substitution principle** - sets out the need to replace hazardous materials with hazardous materials, thus avoiding the occurrence of hazardous waste.

**6. The proximity principle**, correlate with the **principle of autonomy** - that waste should be treated and disposed of as close to the source of generation, in addition, the export of hazardous waste is possible only to those countries that have appropriate technologies for disposal and only provided that the requirements for international trade in waste

**7. The subsidiarity principle** (and correlated with the proximity principle and the principle of autonomy) - provide skills grant so that waste management decisions taken at the lowest administrative level to the power generation, but on the basis of uniform regional and nationally.

**8. The integration principle** - states that waste management activities are integral to social and economic activities it generates.

To achieve the strategic objectives set out the regulatory instruments and economic, statistical and additional [1, 2, 9].

**Regulatory instruments** - will be completed and improved legislative framework for waste management activities by:

- documents regulating environmental impact;
- documents regulating the activities of material recovery and energy;
- regulatory documents aimed at the responsibilities of waste generators/producers of goods that become waste;
- regulatory documents aimed at public authorities and responsibilities to be defined relations between them and other stakeholders.

**Economic instruments** to encourage the reflection of the costs of waste management activities both in product prices and the market status of the manufacturer. The correct application of financial incentives on the one hand and penalties on the other hand, will encourage management activities through prevention, mitigation and recovery, leading simultaneously to eliminate management practices impact on the environment or which run counter to the principle "polluter pays".

**Statistical instruments** by which to obtain accurate data on waste generation and management and to assess the current situation and establishing goals to be achieved. It is necessary to improve and adapt the current system of collecting, validating and reporting data at county **and national levels**.

**Other instruments:**

- application and enforcement of existing legislation; develop waste management plans;
- creation of committees comprising representatives of all the factors involved in the management of certain types of waste;
- life cycle analysis of products and achieve "ecological balance", to implement best practice waste management.

For achieving national and EU waste management is necessary to involve practically the whole of society, represented by:

- central and local public authorities (environmental, administrative, health, industry, finance);
- waste generators (natural and legal)
- associations and institutes of research and development;
- civil society (consumer goods, NGOs, etc.).

### 3. Results obtained following the implementation

Highlighting the progress made nationally in three years after establishing WMS and WMP is possible because since 2005, the National Agency for Environmental Protection, in collaboration with the National Institute of Statistics and county agencies for Environmental Protection, made annually collect data on waste generation and management in the previous year [5, 6]. In 2004, the total quantities of waste generated in Romania were about 363,315 thousand tonnes, which represents 99.4% and 0.6% hazardous waste hazardous waste. In 2007, the total quantity of waste generated in Romania was 281,200 thousand tons, of which 99.85% are non-hazardous waste (fig. 3). Hazardous waste generated as waste categories listed in the European Waste List, represents approximately 0.15% of total waste. In the mining industry generates the largest amount of hazardous industrial waste, over 76% of the total amount of waste generated from the activity of mining and coal preparation is more than 96% [4, 5, 6]. The amount of waste recovered in 2004 is approximately 18,067 thousands tons, the highest rates of recovery/recycling being obtained from waste recovery activities and scrap recycling (39%), metallurgy (18%) and manufacture of chemicals and chemicals (17%).

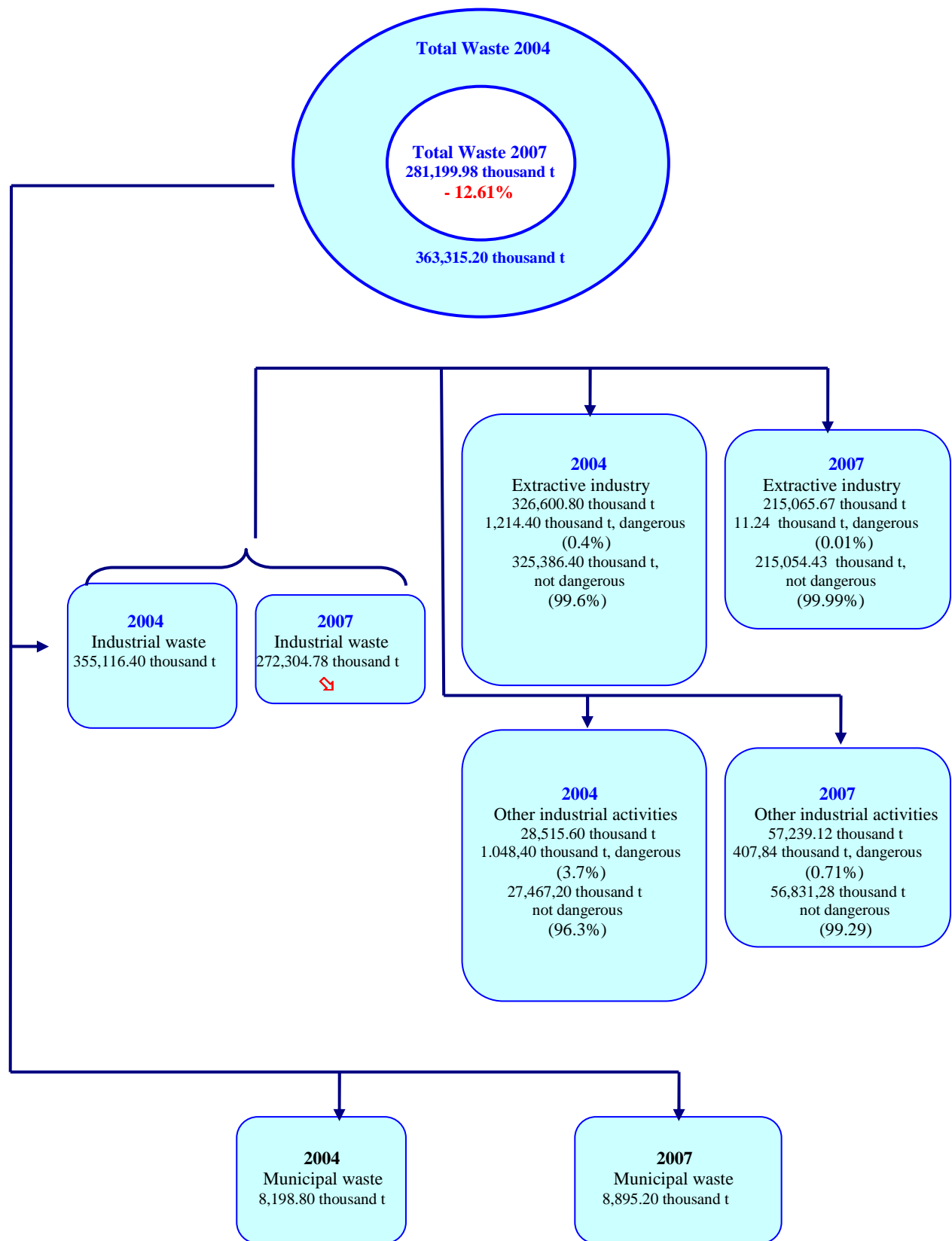


Figura 3. The evolution of waste producing during 2004 - 2007

The percentage of recovery of municipal waste collected was approximately 1.2%. In category of household and similar waste, almost 50% represent biodegradable waste.

Due to low recovery of waste, over 90% of the industrial type waste generated in Romania is eliminated by storage (fig. 4).

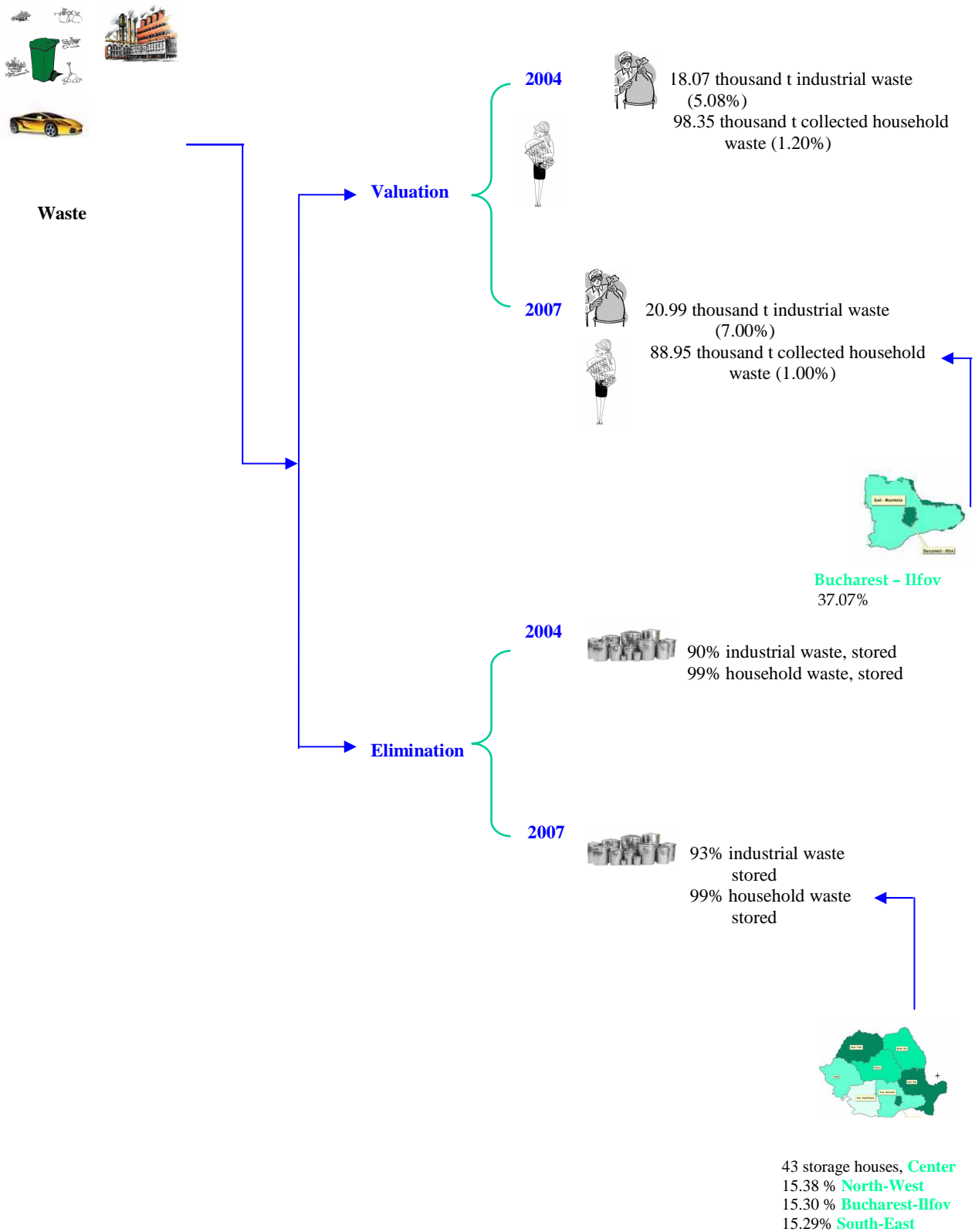


Figure 4. The waste valuation and elimination at national scale during 2004 – 2007

The amount of industrial waste (hazardous and non) recovered in 2007 was approximately 20,996 thousand tons (about 7% of total industrial waste generated), the largest contributions, the recovery of waste, taking it the following industries: metallurgy (6,774 thousands tons), manufacture of other non-metallic mineral products (3,882 thousands tons), manufacture of wood and wood products and cork, except furniture, manufacture of articles of straw and other materials (3,734 thousands tons). In 2007 about 1% of municipal waste collected has been recovered [4, 5, 6].

The large quantities of municipal waste is stored in developing regions: Bucharest-Ilfov, North - West and Center (fig. 4). Household waste collected separately and recovered almost 54% is waste paper and cardboard.

Household and similar waste represents nearly 76% of the amount of municipal waste collected, and approximately 45% of biodegradable waste they represent the largest amount of municipal waste recovered (37.07%), is found in the developing region Bucharest - Ilfov.

In 2007, the total amount of industrial waste generated, about 93% is removed by storage (landfills, waste dumps, ponds, etc.). Of total municipal waste collected, about 99% are eliminated by organized storage space, respectively landfills [4, 5, 6]. The waste elimination in the period under review (2004 - 2007) solution was only their disposal, because, in present, in Romania are not in operation thermal treatment facilities, waste incinerators, respectively. Composition and characteristics of household waste in Romania (about 50% moisture content and calorific value of less than 8,400 kJ/kg) and higher costs of this method of disposing of waste incineration that do not allow time. National Waste Management Plan provides that municipal waste incineration in Romania will become feasible in economically and socially, but after 2016, because of higher values for calorific value and reduce moisture levels and organic substances [4, 9].

#### 4. Conclusions

Between 2004 - 2007, total amount of waste generated in Romania has decreased from 63,315 thousand tons, to 281,200 thousand tons, respectively with 12.63%. of which 99.85% are non-hazardous waste. The amount of waste recovered at the start of the period, that in 2004, occupies a proportion of 5.08% of the total.

Progress has been made in this sector, highlighted the increasing recovery at the end of 2007 and 7%. Waste disposal has been achieved

entirely through storage, because in our country the thermal treatment with waste incinerators is not yet practiced. The waste collected was disposed by landfilling to 90% in 2004, and the proportion increased to 93% in 2007. The waste was removed from storage at constant rate, 99%, in the period considered. In terms of municipal waste collection system, traditional mixed collection is the most common, accounting for a share of about 97% of household and similar waste collected. Sbut it is in current expansion. Successful implementation of sustainable waste management system involves major changes to current practices.

Implementing these changes requires the participation of all segments of society: individuals as consumers, businesses, social and economic institutions and public authorities.

The results obtained from development and starting the implementation of the Strategy and National Waste Management Plan which are based on the "waste hierarchy" show the benefits of using this system in ensuring a sustainable solution to eliminate pollution from waste.

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