



European Experience in Waste Management [†]

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Abstract: The development of the waste management system in the European Union is studied. The waste management practices in a range of the EU countries are analyzed. The main principles of solving the problem of managing waste in the EU are revealed. A comparison of indicators for waste management in the EU and Ukraine is provided. The dominant European trends among other areas of waste—"zero waste" and "circular economy"—are identified. The regulatory framework for waste management developed in Ukraine as a step towards international environmental safety standards is discussed.

Keywords: sustainable development; waste management; circular economy



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1. Introduction

Improving living the conditions (public health) and productivity of natural resources depend on the quality of waste utilization, so the issues of reducing environmental hazards caused by waste accumulation are actively discussed in the scientific community. In Ukraine, general issues of waste management, environmentally friendly waste management in particular, are less developed. In order to ensure the effectiveness of waste management, it is necessary to study the experiences of other countries, especially the those in the European Union (hereinafter—EU), for which, regardless of the level of country's economic development, a common policy in the field of waste management has been developed.

The aim of the current study is to analyze the development of the waste management systems that have been developed in the EU and to illustrate the practices of the systems of the countries that are the most developed in this regard (within the execution of the Jean Monnet Module "An interdisciplinary approach to waste management study: implementing the EU practices" (621029-EPP-1-2020-1-UA-EPPJMO-MODULE).

2. Legislative Aspects of Waste Management in the EU

In the EU, the principles of sustainable development determine the main direction of waste management and form the basis of the hierarchy of waste management methods. General waste management issues in the EU are covered in the Waste Framework Directives (2006, 2010) [1,2]. These documents provide a list of substances that can be classified as waste, and individuals or organizations are required to bear the costs of their disposal (the polluter pays). This establishes a hierarchy of the desired waste management methods: "Prevention of generation or minimization of sources → reuse → processing into raw materials and products → composting → incineration or burial with energy recovery → burial without energy recovery → incineration without energy recovery".

National legislation in the EU is in line with European environmental law and the recommendations of the Basel Convention [3]. In countries such as Germany, Sweden,

Austria, Denmark, Belgium, the Netherlands, and others, there are three main principles for solving problems related to waste: the reuse and recycling of valuable waste components as a secondary raw material; if recycling is impossible or inefficient, the waste must be used as secondary energy resources; when the above mentioned methods are unacceptable, the waste can be identified as being appropriate for a landfill.

3. Waste Management Practice in the Selected EU Countries

In Europe, 24% and 18% of waste was recycled for use secondary raw materials and for use a compost, respectively [4]. In Ukraine, the waste disposal threshold exceeds 90%. It should be noted that Ukraine lags far behind other EU countries in the field of waste management (Table 1).

Table 1. Indicators for waste management.

Indicators	Municipal Recyclable Waste, Including Composting	Municipal Waste Buried in Landfills	Separate Waste Collection	Penalty for Separate Waste Collection
EU countries	48%	23%	89%	EUR 5000
Ukraine	3%	94%	5%	EUR 45

Important differences in solid waste recycling can also be observed between the EU member states: Bulgaria and Romania, for example, bury 79–85% of their waste. The country that leads in terms of the recycling of household waste (88%) is Germany; 56% of waste is incinerated in this country. The countries that lead in terms of waste incineration (69%) are Sweden and Switzerland.

Nowadays, sustainable development is shaped by the principle of using fewer resources per unit of output, and the concept of circular economy is being developed as a fundamental component of the “green economy” [5,6]. According to the estimations of the Ellen MacArthur Foundation [7], companies in the EU that produce durable goods will be able to save up to USD 630 billion annually in 2025 due to the emphasis placed on circular economy. At the household level, transport, housing, and food industry costs may decrease by 25% in 2030.

The most actively implemented environmental policies are in Sweden, Germany, Denmark, and the Netherlands. Sweden [8] has a system for sharing the responsibility of waste collection and treatment. Households (municipalities) are responsible for the separate collection and disposal of waste in appropriate containers; collection points are usually within 300 m of any household. Today, the landfill levels in Sweden have decreased to less than 1%.

In Germany [9], the levels of various waste treatment streams had significantly exceeded the average European level. Thus, more than 90% of household waste is recycled, while for Europe as a whole, this figure (in average) accounts for 37%. The overall recycling rate of various materials in Germany exceeds 80%; more than 70% of paper, 94% of glass, and 45% of steel are made from “secondary” materials.

The Danish waste management model has a clear divide between the roles, responsibilities, and competencies of the members of the system—state, regional, and local authorities; waste generators; and waste management companies. This structure covers all waste management activities: the system covers all types of waste (domestic, industrial, and hazardous); the full responsibility lies with the local government, which determines the methods of waste collection and further treatment—rules that are strictly guided by waste generators; strict adherence to the “polluter pays” principle; and the whole process is based on the principle of separate collection. The national goal set out in the Energy Agreement is to ensure the full independence of Denmark from fossil fuels by 2050.

In the Netherlands, the task of making gradual progress towards a circular economy is approved at the state level and is the national priority. In 2014, a special program, RACE—“The Realization of Acceleration of a Circular Economy”, was developed. In 2016,

the so-called “government-wide” program “Circular Netherlands until 2050” was initiated and has been ongoing since then. The program provides two time periods, where for the first one until 2030, the goal is to make a 50% reduction in the use of “primary resources”—minerals, hydrocarbons, and metals. There are five priority sectors (programs) that need priority attention in terms of expanding the “circular” part of the economy: biomass and food, plastics, production, construction, and consumer goods.

Waste manage experience, which is acquired over a long period of time and by working with all types of raw materials, made it possible for France to possess important technical skills that can be applied to the processing of raw materials: highly skilled labor and high-tech experience. Waste reduction is one of the key reforms of the Grenelle Environment Roundtable, which has previously proposed legislation aimed at increasing recycling to 35% in 2012 and to 45% by 2015, which was successfully implemented.

It took the Czech Republic 20 years to reduce the share of disposed municipal waste from 93% to 49%. Financial support from businesses through the Extended Producer Responsibility Mechanism (EPR) has been one of the main drivers of such progress. In addition, in 4 years the Czech Republic will have a complete ban on the disposal of unsorted mixed municipal waste, which has been enforced in many EU countries since the early 2000s.

In the early 2000s, Poland was similar to Ukraine in terms of both the volume and morphology of solid waste and the state of waste management infrastructure. In 15 years, the country has managed to reduce waste disposal from 97% to 42% due to the development of the recycling industry and the construction of incinerators in the country. Since joining the EU, seven facilities have been opened, and the construction of two more plants has been approved (which are financially supported by the EU).

For several years, within the requirements of the Association Agreement between Ukraine and the EU, a regulatory framework for waste management in Ukraine has been developed. In particular, the National Waste Management Strategy until 2030, the National Waste Management Plan until 2030, the Ukrainian law entitled “On Housing and Communal Services”, and the draft the Ukrainian law entitled “On Waste Management” 2207-1d, which passed its first reading in the Verkhovna Rada, are aimed at accelerating the country’s movement towards international environmental safety standards.

4. Conclusions

Thus, the concept of a circular economy has been implemented in a wide range of industries and focuses on both consumer behavior and the way businesses do business through the revision of legislation, the implementation of various initiatives, and tools. Economic entities comply with environmental requirements for the methods for the development, labeling, and disposal of products for “green” public procurement, and for other circular economy mechanisms, significant budget funds are directed for these purposes. In the short and medium terms, the EU will become a leader in implementing the concept of a circular economy in practice through reuse and recycling, which will both save on electricity bills and imports of raw materials and will increase the environmental culture of the population.

Author Contributions: T.V. analyzed the indicators for waste management in the EU and Ukraine and the waste management practices in the Netherlands and France; I.K. studied the legislative aspects of waste management in the EU and Ukraine as well as the waste management activities in the Czech Republic; N.M. researched the peculiarities of waste management in Sweden, Germany, Denmark, and Poland; T.V. and N.M. wrote the paper. All authors have read and agreed to the published version of the manuscript.

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