

## CONCEPT OF WASTE AND ITS IMPACT ON HUMAN HEALTH

### PROBLEM ODPADÓW I ICH WPŁYWU NA ZDROWIE CZŁOWIEKA

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#### ABSTRACT

**Introduction:** Impact of the environment on human health is increasingly being paid attention both at the international level and at the level of individual countries. Among the factors that anyhow can affect it negatively, various objects are distinguished and waste is not of the last consequence. It has different nature of origin, ways of further utilization and a degree of impact on human health and the environment. Its generation, utilization and neutralization are determined by the relevant processes; their research allows continuous improvement and reduction of their negative impact on human health and the environment.

**The aim:** To analyze provisions of the international legislation concerning the concept of waste and its classification, as well as its potential impacts on human health and the environment.

**Materials and Methods:** The study analyzes and uses international legal documents, data of international organizations and scientists' deductions. Furthermore, the study integrates information from scientific journals with scientific methods from the medical and legal point of view. Within the framework of the system approach, as well as analysis and synthesis, the concept of waste, its classification and impact on human health and the environment have been researched.

**Results:** In consequence of the conducted study, it has been found that at the European level, considerable attention is paid to waste in the context of its possible negative impact on human health and the environment. Solution of this problem is carried out with the integrated approach, which is expressed both in enacting statutory acts and amending existing ones, as well as elucidating various aspects at the scientific, methodological, statistical and other levels.

**Conclusions:** Waste in itself has different nature of origin, negative impact, ways of its further utilization. Some kinds of it can be used further in order to achieve other goals and needs that are not related to their generation, others can no longer be used for human benefits taking into account existing achievements.

**KEY WORDS:** waste, waste classification, hazardous waste, human health, environment.

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#### INTRODUCTION

In 1989, the first Ministerial European Conference on Environment and Health adopted The European Charter on Environment and Health, stating that: «Good health and well-being require a clean and harmonious environment in which physical, physiological, social and aesthetic factors are all given their due importance. The environment should be regarded as a resource for improving living conditions and increasing well-being» (WHO, 1990).

This basic statement results from a self-evident but often neglected fact that human health depends on the availability and quality of food, water, air and shelter. It is a basic requirement of health that the global cycles and systems on which all life depends are sustained. The potential of the environment to have adverse effects on health has been realized for centuries. However, in recent years, public awareness of environmental health hazards has increased. This has been due, in part, to the rapid development of industry and new, potentially hazardous, technologies. The progress of scientific research revealing the existence of previously undetected hazards, which may have been present for some time, has also increased public concern. [1].

Since everything surrounding humans is anyhow reflected on them, the state of human health is an important

indicator of various spheres of their life activities. Factors influencing health can be different, both direct and indirect, as well as more and less safe. Deterioration of the environment negatively affects human health. In particular, as it is stated at the general theoretical level, ensuring the proper quality of drinking water, food, air, ecology, etc. [2, p. 11] is important and affects human health.

Various scientists have studied issues of influence of different factors on the state of public health [3, 4, 5, 6, 7, 8, 9, 10, 11], but the problem of impact of the relevant environmental components contaminated by waste on human health has remained out of the scientists' attention.

The environment plays a crucial role in people's physical, mental and social well-being. Despite significant improvements, major differences in environmental quality and human health remain between and within European countries. The complex relationships between environmental factors and human health, taking into account multiple pathways and interactions, should be seen in a broader spatial, socio-economic and cultural context [12].

Among the components that affect creating the environment which is favourable for human health, different ones are defined, for example: 1) upholding the right to health in national law. All States should strengthen legal

recognition of human rights to health and through health, including sexual and reproductive health and rights, in their national constitution and other legal instruments; 2) establishing a rights-based approach to health financing and universal health coverage; 3) addressing human rights as determinants of health etc. [13].

Sources of negative influence on human health, either through the environment or directly, may be different in origin, negative influences, methods of utilization, etc., for example, use of certain substances in the relevant areas of public life, namely, application of pesticides [14] and agrochemicals in agriculture, construction, metallurgy, chemical sphere, etc. But all these areas are related to waste generated in the course of the relevant activity.

## THE AIM

To analyze provisions of the international legislation concerning the concept of waste and its classification, as well as its potential impacts on human health and the environment

## MATERIALS AND METHODS

According to Art. 2 of Council Directive 96/61/EC concerning integrated pollution prevention and control [15]: 'pollution' shall mean the direct or indirect introduction as a result of human activity, of substances, vibrations, heat or noise into the air, water or land which may be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment.

Analyzing such a definition of pollution, it can be noted that waste is one of the factors that can affect natural resources, be harmful to human health or the state of the environment. One of the components of the concept of «efficient use of natural resources» is reduction of the corresponding negative environmental impacts, namely, harmful emissions and an amount of generated waste [16, p. 21].

The degradation of the environment, through air pollution, noise, chemicals, poor quality water and loss of natural areas, combined with lifestyle changes, may be contributing to substantial increases in rates of obesity, diabetes, diseases of the cardiovascular and nervous systems and cancer – all of which are major public health problems for Europe's population [17]. Reproductive and mental health problems are also on the rise. Asthma, allergies, and some types of cancer related to environmental pressures are of particular concern for children [12].

According to Art. 3 of Directive 2008/98/EC on waste and repealing certain Directives (hereinafter referred to as Directive 2008/98/EC) [18], 'waste' means any substance or object which the holder discards or intends or is required to discard.

In other words, waste refers to the relevant objects which cannot be possessed by their owners any more due to their own desire or circumstances that do not depend on them. Additionally, wastes are also all the items which people are required to discard, for example because of their hazardous properties [19, p. 97]. Waste includes many different types

of items and substances. Each kind of waste stream has its own characteristics which have different pressures on the environment and on human health [19, p. 100].

The basis of waste-related activities should be, firstly, the need to introduce such production which would ultimately reduce the amount of wastes and, consequently, their harmful effects, and, secondly, use of those wastes that were formed as secondary raw material, with the maximum benefit from them or as a source of energy. Council Resolution of 24 February 1997 on a Community strategy for waste management [20] insists on the need for promoting waste recovery with a view to reducing the quantity of waste for disposal and saving natural resources, especially by reuse, recycling, composting and recovering energy from waste.

In particular, significant overall reduction in the volumes of generated waste will be achieved through improved waste-prevention initiatives, better resource efficiency and a shift to more sustainable consumption patterns [21]. Degree of waste impacts depend upon the amount and composition of waste streams as well as on the method adopted for treating them. Improper management of waste has caused numerous cases of contamination of soil and groundwater, threatening the natural functioning of ecosystems and the health of the exposed population [19, p. 131].

According to the British magazine "The Economist", at the edge of XX and XXI centuries waste has caused an ecological problem of anthropogenic pollution of the environment; its solution most worries people in developed countries as the delay in solving this problem inevitably leads to the crisis of waste, or crisis of landfills [22, pp. 19-20]. Significant concerns over the environmental impact of waste have emerged in recent decades. Managing waste has a wide range of potential environmental impacts, since natural processes act to disperse pollutants and toxic substances throughout all environmental media. The nature and dimension of these impacts depend upon the amount and composition of waste streams; improper management of waste has caused numerous cases of contamination of soil and groundwater, threatening the natural functioning of ecosystems and the health of the exposed population [19, p. 97].

The World Health Organization (WHO) estimates the environmental burden of disease in the pan-European region at between 15 and 20% of total deaths, and 18 to 20% of disability-adjusted life years (DALYs), with a relatively higher burden in the eastern part of the region [23].

According to clause 6 of the Preamble of Directive 2008/98/EC, the first objective of any waste policy should be to minimise the negative effects of the generation and management of waste on human health and the environment. Waste policy should also aim at reducing the use of resources, and favour the practical application of the waste hierarchy.

Directive 2008/98/EC establishes its major principles as: - integration of the objectives of environmental protection and human health with measures to maximize the use of waste resource potential; - application of the following waste hierarchy as a priority order in waste prevention and management: (a) prevention; (b) preparing for re-

use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal; - establishing a regulatory procedure of determination of the waste which is to be considered as hazardous waste (introducing properties of waste which render it hazardous); - introduction of the principle of extended producer responsibility; - requirements to waste management plans; - keeping records [24, p. 5].

## RESULTS AND DISCUSSION

Waste in itself has different nature of origin, negative impact, ways of its further utilization, etc. Nevertheless, it can be classified into the category that can be further used to achieve other purposes and needs not related to its primary origin and the category that can no longer be used for human benefits taking into account the achievements and technologies existing and being applied nowadays.

Determining the classification of waste, we turn to the following provisions, namely, in accordance with paragraph 1 of the Annex to Commission Decision 2000/532/EC replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste [25] (hereinafter referred to as Decision 2000/532/EC) a list of waste is harmonized. Wastes classified as hazardous are considered to display one or more of the listed properties.

The aforementioned document establishes an appropriate list of objects that can anyhow have an impact, including negative ones, on human health and the environment. If we proceed from different criteria of waste, namely, sources of its generation, characteristics that can be hazardous, ways of its utilization, etc., we can speak of different degrees of impact on humans and the environment. All daily activities (e.g. production, distribution, final consumption of goods and services, as well as their collecting and processing) can give rise to a large variety of different waste flows from various sources. These sources include, for instance, waste coming from households (e.g. plastic packaging waste), commercial activities (e.g. cardboard packaging waste from shops, food waste from restaurants and medical waste from hospitals), industry (e.g. textile waste), agriculture, construction, etc. A small part of the waste which is generated is hazardous; that is, it poses substantial or potential threats to human health or to the environment [19, p. 97].

Understanding the notion of waste, a two-way relationship can be formed on its part, as certain objects are waste for some subjects whereas it can be raw material used in production for others. Some waste is identified as hazardous which, first of all, has a negative impact on human health and the environment.

According to clause 14 of the Preamble of Directive 2008/98/EC, the classification of waste as hazardous waste should be based, *inter alia*, on the Community legislation on chemicals, in particular concerning the classification of preparations as hazardous, including concentration limit values used for that purpose. Hazardous waste should be regulated under strict

specifications in order to prevent or limit, as far as possible, the potential negative effects on the environment and on human health due to inappropriate management. Furthermore, it is necessary to maintain the system by which waste and hazardous waste have been classified in accordance with the list of the types of waste as last established by Commission Decision 2000/532/EC, in order to encourage a harmonised classification of waste and ensure the harmonised determination of hazardous waste within the Community.

Due to the fact that it can represent a potential danger both to human health and to the environment, hazardous waste is subject to stricter legislations and controls. Wastes are classified as being hazardous if they exhibit particular characteristics [19, p. 101].

According to Art. 2 of Decision 2000/532/EC, wastes classified as hazardous are considered to display one or more of the properties, e.g. - flash point  $\leq 55$  °C, - one or more substances classified as very toxic at a total concentration  $\geq 0,1$  %, - one or more substances classified as toxic at a total concentration  $\geq 3$  %, - one or more substances classified as harmful at a total concentration  $\geq 25$  %, etc. Furthermore, in Annex III to Directive 2008/98/EC, properties of waste which render it hazardous are listed. Taking into account such properties, waste is determined to be considered as hazardous if waste is explosive, oxidizing, highly flammable, flammable, irritant, harmful, toxic, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic, releases toxic or very toxic gases in contact with water, air or an acid, sensitizing, ecotoxic.

Hazardous waste can arise from all human activities. Waste generation and treatment create different pressures on the environment. This is mainly due to the quantity of waste generated, the types of waste generated, and the proportion of the waste which is hazardous [19, p. 106]. For example, waste containing heavy metals, acids, asbestos, cyanides or phenols and others is regarded as hazardous waste. Hospital wastes contain contaminated materials and are generally required to be segregated from other waste. Household wastes commonly include hazardous items, such as batteries, fluorescent lamp tubes, used oils, some types of paints and resins, and out-of-date medicines [19, pp. 101-102]. Three per cent of the total waste generated in the EU-27 in 2006, or 88 million tonnes, was hazardous. The proportion of hazardous waste in European countries varies between 1% and 8 % of total waste. For example, in Estonia the high share of hazardous waste is due to energy production from shale oil [19, p. 102].

There are more concerns about possible adverse effects of chemicals on human health and the environment. Awareness of the interdependence of environmental pollution and human health due to the further research in this area is among the main environmental activities related to handling chemicals [26, p. 10]. There is insufficient data for 100,000 existing chemicals, their effects on human health and the environment. 30,000 of these are produced in quantities of more than one ton per year per manufacturer [26, pp. 10-11]. The above provisions also concern waste having the specified properties.

The Council of Europe has set itself the ambitious goal of ensuring production and use of chemicals in a manner that does not pose significant threats to human health and the environment by 2020 [26, p. 11]. Undoubtedly, in achieving this goal, it cannot but affect generation of waste in the relevant industries as well as other wastes and the environment in which they are generated and located. Indisputably, such results will have a positive impact on human health and the environment.

Such industries as mining, construction, agriculture, processing and some others can be determined among those associated with generation of a significant amount of waste including the kind inclined to negative impact on human health and the environment.

At the level of the European Union, various health-related areas are identified including the one related to diseases caused by pollution [27, p. 9]. Although courses of these diseases may be different, waste is one of the causes.

Researching the impact of waste on human health and the environment, we note that health can be adversely affected both from direct interactions with waste and indirectly through the environment that has been affected by the negative effects of waste.

For example, provisions of the Eurostat Yearbook indicate that waste generation might also lead to the deterioration of human health (through the release into the environment of hazardous substances that some types of waste contain) [21]. Almost 3 billion tonnes of waste were generated in the EU-27 in 2006, which is 6 tonnes per capita. The quantity of waste generated in European countries reflects differences in the economic structure and consumption patterns as well the different degree of implementation of waste prevention policy (considering the methodologies used for the collection of data so far). On top of that, for example, Bulgaria produced over 30 tonnes of waste per capita in 2006, which is five times the EU-27 average, Luxembourg - 20 t per capita, Romania - 20 t per capita, Estonia - 15 t per capita, Finland - 14 t per capita and Sweden - 14 t per capita [19, p. 99].

The Preamble of the Constitution of the World Health Organization states [28] that health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Actually, health is a complex concept that combines the state of equilibrium between the mental and physical components of an organism that are provided with proper social well-being and the safe environment. The public health level has been affected by provisions of various Directives, in particular, those regarding monitoring certain working conditions, classification, packaging and labeling of hazardous substances and the environment protection [27, p. 9]. Life expectancy is an important indicator of health in a country, which is also determined at the theoretical level [29, p. 39]. Health is affected by a variety of environmental factors, namely, social conditions such as living conditions and income, accessibility and effectiveness of health care provision, disease prevention [27, p. 8-9]. The environment and a degree of its pollution that may be affected by waste are of not the last consequence among factors surrounding

humans and influencing public health. The world has faced various environmental problems, such as climate change, biodiversity conservation or promotion of sustainable use of natural resources [30, p. 150]. Attributing the role of the environment to a course of diseases and working out new valuation approaches aimed at taking into account the inherent complexity and uncertainty of the interaction of the environment and health remains the subject of intense debate [31, 32]. Anyhow, waste has its own impact on the whole spectrum of existing environmental problems. In addition, all the factors that are part of the concept of health can affect directly or indirectly. Such an impact is negative in case of its improper treatment.

In particular, impact depends on various factors, but the main one is the nature of waste generation and ways of its further utilization with minimal negative consequences. To achieve such a result, collection of relevant statistics, their analysis and obtaining relevant conclusions in the field of their occurrence and other processes associated with them are not of the last consequence. Nowadays, even though the mechanisms for obtaining statistical data are not perfect, there is a hope for improving such mechanisms and their obtaining [16, p. 22], and, accordingly, it will contribute to the process of reducing waste or its further use. Furthermore, record keeping in the waste management process is important, for example, while reducing generation of hazardous waste and ensuring sustainable development [33, p. 38].

Art. 13 of Directive 2008/98/EU separately provides that Member States shall take the necessary measures to ensure that waste management is carried out without endangering human health, without harming the environment and, in particular: (a) without risk to water, air, soil, plants or animals; (b) without causing a nuisance through noise or odours; and (c) without adversely affecting the countryside or places of special interest.

In particular, the problems linked to waste management are reaching saturation by existing disposal facilities and protests over the localisation of landfills and incineration facilities due to their potential environmental and health impacts. Movement of waste, both within and outside the EU, needs to be carefully monitored for the risk posed to human health and to the environment. It is of paramount importance that waste is managed in such a way that it does not cause any harm either to human health or to the environment and so that it reduces the inefficient use of resources [19, p. 99]. In some countries, restrictions have been imposed on the landfill of certain waste streams and a great proportion of total waste generated is now recovered or incinerated [19, p. 131]. The disposal of waste can have a serious environmental impact, taking up space and potentially releasing pollution into the air, water or soil [30, p. 157].

In other words, the respective subjects are obliged to properly organize and manage waste management activities in such a way that, firstly, it does not harm both individual natural resources and the environment as a whole, and secondly, it does not damage human health through various impacts, notably noise, smells, etc., and thirdly, it does not create threats for particularly valuable objects because of their importance.

In particular, studying the waste management in certain European countries, one can consider the activities of Finland and Sweden. Namely, the main objectives of the National Waste Plan for 2016 are as follows: Finland's waste policy specifically aims to prevent waste and reduce its negative effects on human health and the environment. To meet this objective it is important to: - prevent the generation of waste; - promote the reuse of waste; - promote the biological recovery of waste and the recycling of materials; - promote the use of waste unsuitable for recycling as energy; ensure that the treatment and disposal of waste does not cause harmful impacts.

Waste management goals and the policy instruments required to achieve these goals come under eight categories: 1. Increasing waste prevention by promoting material efficiency; 2. Increasing recycling; 3. Promoting the management of hazardous substances in the context of waste; 4. Reducing the harmful climatic impact of waste management; 5. Reducing the negative health and environmental impact of waste management; 6. Improving and clarifying the organisation of waste management; 7. Developing expertise in the waste sector; 8. Establishing criteria for safe and well-managed transfrontier waste shipments.

One of the main targets is to maintain the volume of municipal solid waste at the 2000 level and then achieve a decrease by 2016. Another target is to recycle 50 % of municipal waste, obtaining energy from 30 % and ensuring that no more than 20 % are disposed in landfills.

The National Waste Plan includes a separate national waste prevention programme [34].

Whereas, the polluter-pays principle (PPP) is one of the cornerstones in financing environmental measures and protection in Sweden.

In Sweden there is producer responsibility for: - packaging; - wastepaper; - batteries; - tyres; - cars/end of life vehicles (ELV); - waste electrical and electronic equipment (WEEE); - certain drinking containers; - light bulbs and certain light fittings.

Recovery and material recycling has increased since producer responsibility for packaging was introduced in 1994. There is also a trend towards less packaging per kilo sold product.

The environmental impact from waste management in Sweden has decreased over the last 15 years. Less waste is going into landfills, while more is being recycled, biologically treated, or incinerated. But the waste amounts are still increasing [35].

## CONCLUSIONS

Thus, at the level of the European Union, solution of the waste problem is given considerable attention precisely in the context of its possible negative impact on human health and the environment. Its solution is carried out with the use of an integrated approach, which is seen both in enacting statutory acts and amending existing ones, as well as elucidating its various aspects at the scientific, methodological, statistical and other levels. The issue of the negative impact of

waste has been and will be important as it is directly related to human activities which generate it. Ensuring a balance between possible negative effects of waste generated due to human activities in various fields and expected results from it is becoming increasingly relevant and needs to be studied.

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