WASTE MANAGEMENT - CHALLENGES AND OPPORTUNITIES IN ENSURING THE RIGHT TO A HEALTHY LIFE

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Abstract

Waste is an increasingly important issue globally, regionally and locally. Reducing the environmental impacts of solid waste generation will continue to be a priority of European Union (EU) environmental policy. Solid waste resulting from human activities is usually disposed of as unnecessary. As a result of the rapid growth of production and consumption, communities regularly produce more and more solid waste, which leads to an increase in the volume of waste generated from various sources. Solid waste has a high potential for pollution of all components, the environment: water, soil, air, biodiversity. Improper waste management poses considerable risks to public health, as well as additional costs in the short and long term, with negative implications for the environment, affecting ecosystems, often irrecoverable. Under these conditions, adequate solid waste management is the central pillar of long-term policies aimed at sustainable development, with priority given to minimizing the amount of waste generated, recycling, reuse and disposal of less polluting waste. However, despite the significant amount of financial resources allocated to the sector, many countries, including the European Union, face the challenge of meeting ambitious targets. For this reason, the company uses waste management, which brings aspects regarding the optimization of material flows, taking into account economic, technical and environmental parameters. This paper provides a short review of waste generation and those impact on the environment and health people.

Keywords: *waste, waste management, environment, recycling*

1. INTRODUCTION

Worldwide, 2.01 billion tonnes of municipal solid waste are generated annually, the amount of waste generated by one person per day ranging from 0.11 to 4.54 kilograms, reaching an average of 0.74 kilograms (Shah, et al., 2021).

As the statistics predicts the world population will increase from the current number of 7.8 billions to 9.8 billions in the year 2050, it is estimated that the global waste generation will be nearly doubled by 2050 and tripled by 2100 compared with current data, causing more pollution problems to the environment (Ferdous et al., 2021). According to The World Bank Data, when looking forward, global waste is expected to grow to 3.40 billion tonnes by 2050, more than double population growth over the same period (Kaza et al., 2018).

From figure 1, can be observed that the East Asia and Pacific region is generating most of the world's waste, at 23 percent, and the Middle East and North Africa region is producing the least in absolute terms, at 6 percent. However, the fastest growing regions are Sub-Saharan Africa, South Asia, and the Middle East and North Africa, where, by 2050, total waste generation is expected to more than triple, double, and double respectively. In these regions, more than half of waste is currently openly dumped, and the trajectories of waste growth will have vast implications for the environment, health, and prosperity, thus requiring urgent action.

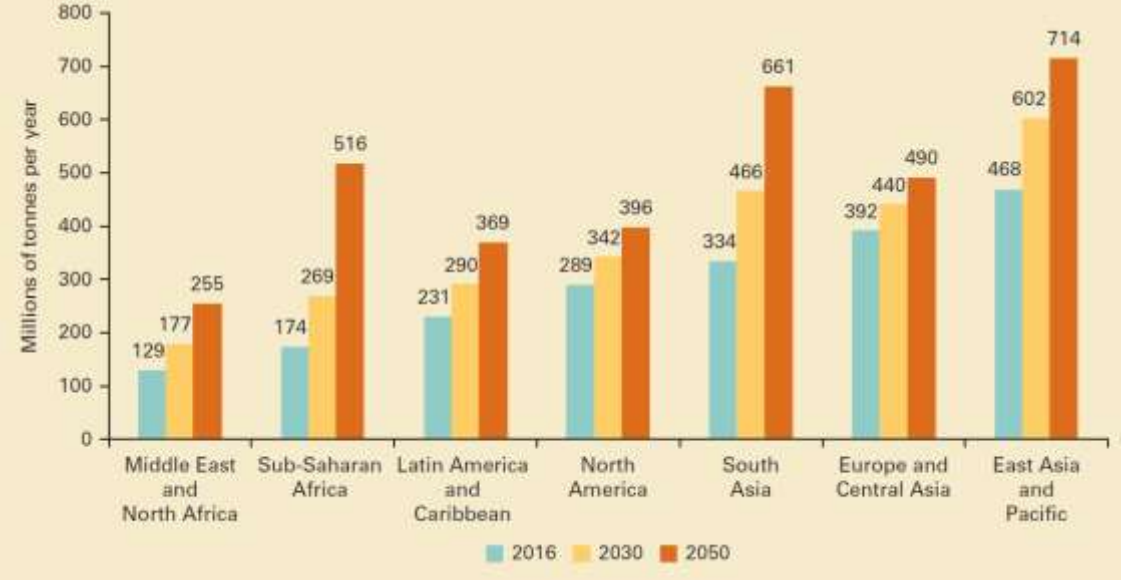


Figure 1. Projected waste generation, by region (millions of tonnes/year)

Source: The World Bank; (Kaza et al., 2018)

Waste and waste management remain a global priority, due to the impact they have on the environment (water, air, soil, plants, animals), on the health of the population and last but not least on national economies.

Environmental protection by reducing waste is an important global issue. Inadequate waste management is detrimental to human health, directly affects many ecosystems and species, by climate change and environment pollution. Apart from being unsightly, it causes air pollution, affects water bodies when dumped into the water, as well as depletes the ozone layer when burnt, thereby increasing the impact of climate change. Wastes are often improperly managed being burned, disposed into oceans, waterways, and dumped by the roadsides, open spaces. These practices breed insects and pests, release offensive odors, are unsightly and contribute to global warming by combustion, by generation of the greenhouse gas methane (Ayilara et al., 2020).

Based on the volume of waste generated, its composition, and how it is managed, it is estimated that solid waste–related emissions are anticipated to increase to 2.6 billion tonnes of CO_2-equivalent per year by 2050 if no improvements are made in the sector (Kaza et al., 2018).

This paper examines the current state of solid waste management and its challenges in environmental protection and health protection.

2. GENERATION OF WASTE IN EUROPEAN UNION AND REPUBLIC OF MOLDOVA

Reducing the environmental impacts of solid waste generation will continue to be a priority of European Union (EU) environmental policy. Successive directives on solid waste management have strengthened the rules and guidelines for implementation by EU Members; and the EU supports the development of the sector to the standards required by funding grants to Member States and candidate countries. However, despite the significant amount of financial resources allocated to the sector, many countries face the challenge of meeting ambitious targets. The European Commission has committed EUR 2.45 billion in grant assistance to support the implementation of national waste management strategies in Bulgaria, Croatia, Poland and Romania. However, solid waste management suffers the longest implementation delay if we compare progress with compliance with the “acquis communautaire” in these four countries. The first deadlines in the accession treaties have come, such

as the closure of non-compliant landfills, and the targets are missed. The new Member States are facing possible non-compliance procedures, some of which are already under way.

According to data provided by Eurostat, in 2018, the total waste generated in the EU by all economic activities and households amounted to 2 337 million tonnes, and 5.2 tonnes of waste were generated per EU inhabitant.

In figure 1 is presented the share of different economic activities and of households in total waste generation in 2018. It can be seen that the highest share belongs to the waste generated from construction activities (35.9%), and less waste are generated by agriculture, forestry and fishing activities (0.9), energy (3.4%) and other economic activities, mainly services (4.2%).

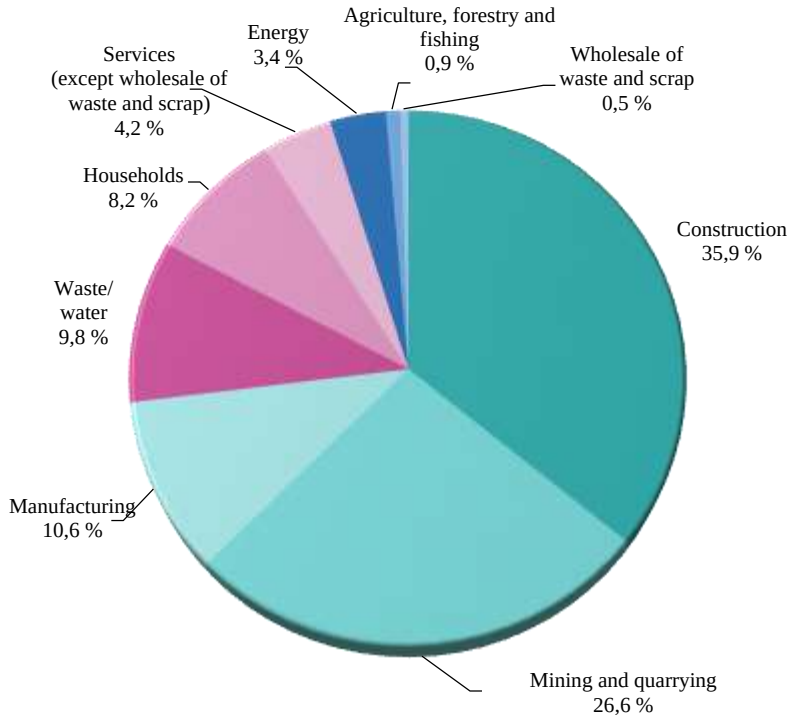


Figure 2. Waste generation by economic activities and households, EU, 2018 (% share of total waste)

Source: Eurostat (online data code: env_wasgen)

The amount of waste generated in 2018 amounted to 2337,670 million tonnes and increased by 4.25% compared to the reference year 2012 (2242.300 million tonnes of total waste), of which municipal waste generated in 2018 reached the quota of 220 million tonnes.In the European Union (EU), the amount of municipal waste generated per person in 2018 amounted to 492 kg, down by 5% compared with its peak of 518 kg per person in 2008, which proves the efficiency of implementing waste management in most economically developed countries. These countries have effectively addressed much of the health and environmental pollution issues associated with wastes generation (Amasuomo & Baird, 2016.

The highest amount of municipal waste was generated by Germany - 50 260 thousand tonnes of municipal waste in 2018 (Figure 3), followed by France (35 889 thousand tonnes), Turkey (34 533 thousand tonnes), United Kingdom (30 786 thousand tonnes), Italy (30 165 thousand tonnes), Spain (22 229 thousand tonnes) and Poland (12 485 thousand tonnes).

Nevertheless, with 766 kg, Denmark generated the most municipal waste per person among the EU Member States in 2018. Other countries that generated more than 600 kg municipal waste per person were Malta (640 kg), Cyprus (637 kg; 2017 data), Germany (615 kg) and Luxembourg (610 kg).

At the other end of the scale, Romania generated 272 kg of municipal waste per person in 2018. Three other EU Member States also generated less than 400 kg per person: Poland (329 kg), Czechia (351 kg) and Hungary (381 kg) (Eurostat).

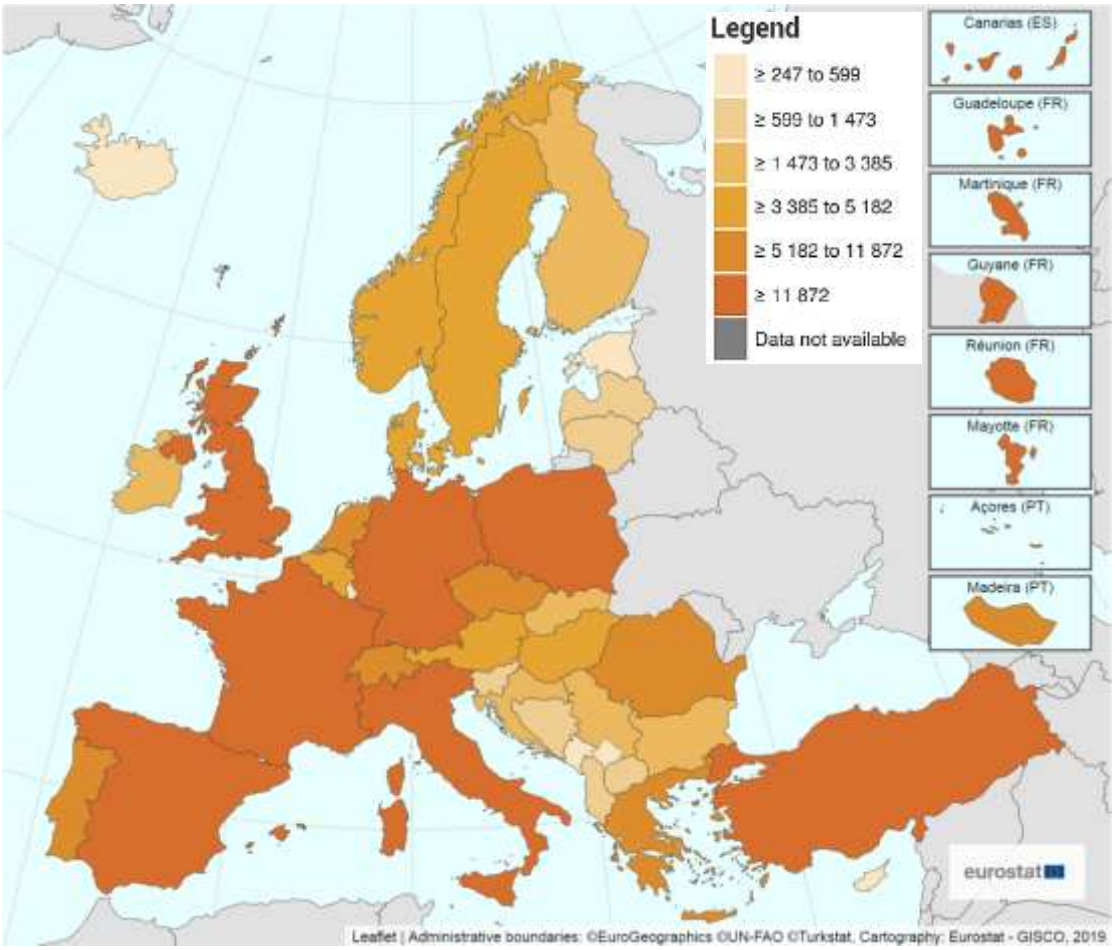


Figure 3. Municipal waste by waste management operations, thousand tonnes.

Source: Eurostat (online data code:ENV_WASMUN)

Compared to the European Union, in the Republic of Moldova, the amount of municipal waste generated and stored in 2018 was 3043.1 thousand tonnes, an increase of 169% compared to the reference year 2001 in which 1130.80 thousand tonnes of waste were generated and stored.

According to the data provided by the National Bureau of Statistics of the Republic of Moldova, the amount of industrial waste generated in 2018 was 1597.3 thousand tonnes, a decrease of 22% compared to the reference year 2001 in which 2031 thousand tonnes of waste were generated, of which practically half (1004.7 thousand tonnes) were stored.

In the Republic of Moldova the most widespread method of waste disposal, the volume of generation of which has increased considerably in recent years, is their landfill, often in unauthorized, unsupervised and overloaded places, which have a huge negative impact on the environment and the health of the population, by polluting surface water, groundwater, soil, air and the environment in general, including contributing to the volume of GHG emissions.

About 98% of the amount of municipal waste collected by sanitation services, were disposed of by landfill, the selective collection being partially organized in Chisinau and several district centers. Waste recycling and recovery rates are very low. Many recyclable and useful materials are stored together with non-recyclable ones, thus losing much of their useful potential (paper, glass, metals, plastics). Being mixed and contaminated chemically and biologically, their recovery is difficult.

In the Republic of Moldova, the responsibility for municipal waste management belongs to the local public administrations, which, within the financial resources approved for this purpose by the local council for the respective budget year, are empowered to ensure the creation of an efficient integrated municipal waste management system. But the financial potential of these authorities is low. The morphological analysis of waste, on which an efficient waste management is based, is performed occasionally, most often through NGOs.

In the European Union, 38.5% of waste were landfilled and 37.9% were recycled in 2018. The amount of recycled waste reached new highs in 2018, both for material recycling and for composting. Recycling of materials rose to 67 million tonnes, corresponding to 150 kg per person. This was almost three times as much as the 23 million tonnes (54 kg per person) recycled in 1995. Correspondingly, 37 million tonnes (84 kg per person) of waste were composted in 2018, more than two and a half times more than in 1995 (14 million tonnes, or 33 kg per person).

Recycling is part of waste hierarchy of the Waste Framework Directive which lays down some basic waste management principles. The waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy (Figure 4).



Figure 4. The waste hierarchy pyramid.

Source: Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives

EU waste management policies aim to reduce the impact of waste on the environment and public health. The main purpose of these policies is to improve and streamline European resources by extracting as much as possible or obtaining high-quality resources from waste. In this regard, The European Green Deal was launched on 11 December 2019, which aims to ensure the sustainability of the EU economy, by turning climate and environmental challenges into opportunities in all policy areas and by ensuring a transitions that are equitable for all and conducive to the inclusion of all. The aim is to move to a modern economy (from the linear economy to the circular economy), resource efficient and competitive.

The European Green Pact will improve the well-being and health of today's and tomorrow's Europeans by supporting a number of actions, including improving waste management, which aims to ensure that products have a longer shelf life, which can be repaired, recycled and reused.

3. WASTE MANAGEMENT - CHALLENGES AND OPPORTUNITIES

Defective or improper waste management leads to negative effects on the environment, polluting water, air, soil, destroying ecosystems and thereby affecting human health (Ferronato & Torretta, 2019).

Some ecosystems, like the aquatic, coral reef, marine and coastal ones, can be severely affected by wastes and poor management of waste. Aquatic and, arine litter is a growing concern, and not only for aesthetic reasons: entanglement and ingestion constitute severe threats to many aqua-marine species.

Directly or indirectly, waste affects our health and well-being in many ways: methane gases contribute to climate change (Tzachor, 2020), air pollutants are released into the atmosphere, freshwater sources are contaminated, crops are grown in contaminated soil and fish ingest toxic chemicals, subsequently ending up on our dinner plates…

Illegal activities such as unauthorized landfills, waste disposal at random, burning or exports also affects the environment and human health, but it is difficult to estimate the full extent of such activities, or of their impacts.

A problem in the waste hierarchy is the landfills and the dumping of waste in open spaces. Organic waste is subjected to the decomposition process, eliminating methane gas in the atmosphere, with a greenhouse effect that leads to global warming. By decomposing the waste, toxic compounds are formed that drain into the soil and then into the water, and some of the substances are eliminated into the atmosphere, being responsible for the unpleasant, sometimes unbearable smell. All these have the effect of boomerang, entering the planetary circuit of water, carbon, nitrogen (Ferdous et al., 2021).

In addition to the toxic substances that form, pathogenic microorganisms also develop, which also pass into the soil and water. Landfills, considered the last resort in the waste hierarchy, release methane, a very powerful greenhouse gas linked to climate change. Methane is formed by microorganisms present in landfills from biodegradable waste, such as food, paper and garden waste. Depending on the way they are built, landfills might also contaminate soil and water.

Decomposing organic waste attracts animals, vermin and flies. Flies may play a major role in the transmission of faecal-oral diseases, particularly where domestic waste contains faeces (often those of children). Rodents may increase the transmission of diseases such as leptospirosis and salmonella, and attract snakes to waste heaps. Solid waste may also provide breeding sites for mosquitoes. Mosquitoes (of different genus) are responsible for the spread of dengue and yellow fevers, malaria, microfilariases.

Another major problem with landfills is the areas required for them. The greater the amount of waste, the greater the areas needed for its storage, thus reducing agricultural areas.

This can be stopped by the correct implementation of waste management and compliance with the five steps of the waste hierarchy: prevention, reuse, recycling, recovery and disposal (Directive 98/2008/EC article 4). Preventing waste is the preferred option, and sending waste to landfill should be the last resort.

Part of the waste might be incinerated or recycled. Energy from waste can be used to produce heat or electricity, which might then replace the energy produced using coal or other fuels. Energy recovery of waste can thus help reduce greenhouse gas emissions.

A significant part of municipal waste is biodegradable waste. By proper collection they can be recycled by composting. Composting is an aerobic process where complex degradable materials are degraded and transformed by microorganisms into organic and inorganic byproducts. The byproducts contain ‘humic-like’ compounds that differentiate them from those found in native soil, coals, and

peats. Composting is a means of transforming different degradable wastes into products that can be used safely and beneficially as biofertilizers and soil amendments. (Ayilara et al., 2020) Composting is a great way to protect water, soil, air, plant and animal species, reducing the amount of organic waste going to the landfill (Sorathiya et al., 2014).

Recycling along with reducing and reusing materials saves energy, money and reduces the use of precious natural resources. Recycling can help even more to lower greenhouse gas emissions and other emissions. When recycled materials replace new materials, fewer new materials need to be extracted or produced in the first place.

By use waste as a resource, could be reduced the demand for extraction of new resources. Extracting fewer materials and using existing resources would help environmental protection. Turning waste into a resource is one of the key objectives of the EU's Roadmap to a Resource Efficient Europe. Resource efficiency means using the Earth's limited resources in a sustainable manner while minimising impacts on the environment.

Improved management of municipal waste resulted in significantly lower greenhouse gas emissions, mainly attributable to lower methane emissions from landfill and emissions avoided through recycling. If, by 2020, all countries fully meet the Landfill Directive's landfill diversion targets, they could cut an additional 62 million tonnes of CO_2 equivalent of greenhouse gas emissions from the life cycle — which would be a significant contribution to the EU's climate change mitigation efforts. An improved waste management system could reduce global CO_2 emissions by up to 15% (Ferdous et al., 2021).

4. CONCLUSIONS

The growth of population number has led to increase consumption of natural resources and the generation of considerable amounts of waste. At the same time, the increase in the number of population and consumption has led to the development of the manufacturing industry and the economic processes in the chain: processing-manufacturing-consumption-waste. Thus, waste management in tandem with natural resource management, becomes a priority of every citizen.

On the global level and especially on the European Union's level several normative acts are elaborated that contain provisions regarding the efficient waste management, pollution reduction policies, strategies for waste processing. Through various government programs, which are financed from national budgets, but also from EU funds, actions are promoted to raise public awareness about the damage caused by incorrectly deposited and unprocessed waste. Therefore, it is desired to increase the degree of involvement of the population in the correct management of waste, to reduce the risks caused by them, but also to reduce the forecasted indicators that show the rate of soil, water and air pollution.

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