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RELEVANCE OF THE PROBLEM OF RISKS ASSOCIATED WITH WASTE ACCUMULATION

Waste generation and disposal is a global problem that almost every country faces today. Population growth, industrialization and many other factors have led to the generation of large amounts of waste. Improper management of such waste leads to air, water and soil pollution, which ultimately affects human health. Waste accumulation remains the most accessible and widespread method of waste management, although it is also the most unfavourable for the environment. The number of scientific publications devoted to research into the risks to the environment and public health arising from the accumulation of waste. Thus, over the past 20 years alone, 7,187 scientific publications have been published in the bibliographic and abstract database of peer-reviewed scientific literature Scopus (figure 1).

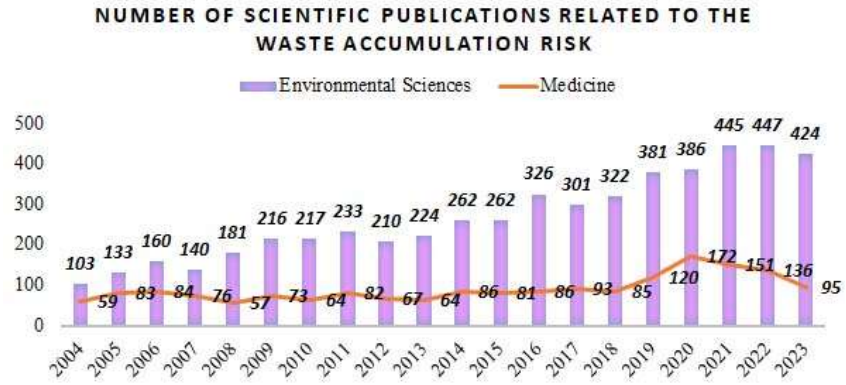

Figure 1 – **Number of peer-reviewed scientific publications on risks associated with waste accumulation**

Figure 1 clearly shows an increase in the number of publications, indicating an ever-increasing interest in this topic. At the same time, in Figure 1 presents two areas of knowledge: Environmental Science and Medicine, which have the largest number of publications in relation to other areas: Environmental Science more than 41%, Medicine more than 13%, other subject areas contributed to the development of risks with the accumulation of waste from 6% and less.

Environmental science is an applied science that studies the relationship between nature (its components) and humans, explores and explains environmental problems and the causes of their occurrence, and also aims to find ways to solve identified problems. Thus, this field of knowledge brings together various disciplines such as physics, chemistry and biology to understand what is happening on Earth, as well as the social, political and cultural processes that affect the state of the planet. Medicine ranks second among disciplines in the subject area, which can easily be explained by the serious negative impact of waste accumulation on public health.

Publications are represented by 137 countries/territories (Figure 2, showing the most numerous) in 14 languages (Figure 3).

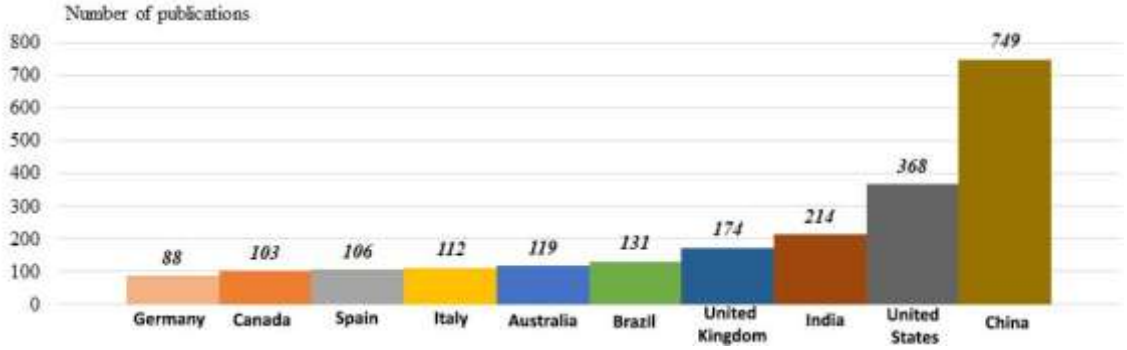

Figure 2 – **Countries and territories that have published the largest number of scientific papers on the topic under study**

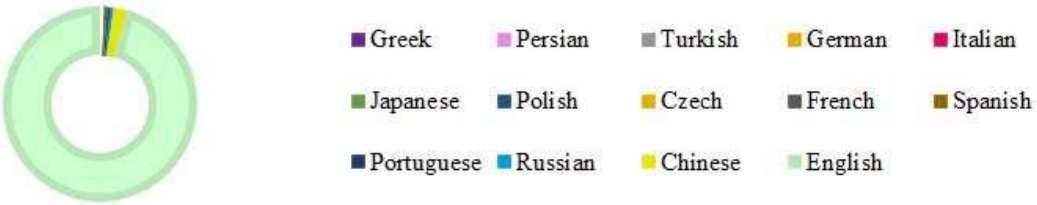

Figure 3 – **Languages of analyzed scientific publications**

A detailed study of the publications identified on this topic revealed the following. Solid waste landfills are sites used for the disposal of both biodegradable and non-biodegradable waste; however, these facilities directly or indirectly affect soil, water and air quality. All kinds of substances from waste diffuse into the soil, then penetrate into groundwater through leaching, and through weathering and evaporation they are dispersed into the atmospheric air.

Soils in the areas around landfills are constantly enriched with heavy metals contained in leachates such as Nickel, Iron, Manganese, Arsenic and Fluoride, etc., which can subsequently migrate into groundwater [1]. The results showed that the soil properties in the vicinity of the waste dump changed significantly compared to the local background. The level of soil contamination was very high, indicating the possible migration of pollutants into the subsoil and groundwater [1]. In China, a study of the effect of landfill leachate on groundwater showed that 35% of groundwater samples had at least one value exceeding drinking water

standards. The main characteristic pollutants were iron, arsenic and fluoride, with average pollution indices of 12.91, 1.1 and 2.47, respectively [2]. Human exposure to environments containing high levels of nickel can cause various pathological effects. Accumulation of nickel and its compounds in the body due to chronic exposure can cause a variety of adverse human health effects, such as pulmonary fibrosis, kidney and cardiovascular diseases, and respiratory tract cancer. There has been a high incidence of nasal and lung cancer in workers exposed to nickel and its compounds [3]. In addition, pathogens and bacteria present in waste can cause diseases such as cholera, dysentery, etc.

Mathematical modelling is an important method for risk assessment, in particular the management of solid waste at a landfill [4]. Within this topic, we can highlight:

- Environmental risk assessment, that is, the potential impact of human activities on the environment is assessed. Such an assessment identifies potential threats to natural resources and ecosystems, namely their functioning, air, water and soil quality, and biodiversity.

- Health risk assessment, that is, the potential health risks associated with exposure to chemicals, biological agents, physical hazards or other harmful substances are assessed. This assessment identifies pathways of exposure, dose-response relationships, and other factors affecting human health.

Scientific publications on the study of risks associated with the accumulation of waste in the field of Computer Science – 17 publications, and in the field of Mathematics – 7 publications. Since risk assessment is extremely important in matters of waste management, environmental conservation and public health, these areas need active development.

Used information sources:

1. Bernardo, B., Candeias, C., & Rocha, F. (2022). Soil properties and environmental risk assessment of soils in the surrounding area of Hulene-B waste dump, Maputo (Mozambique). Environmental Earth Sciences, 81(24), 542.

2. Guo, Y., Li, P., He, X., & Wang, L. (2022). Groundwater quality in and around a landfill in northwest China: characteristic pollutant identification, health risk assessment, and controlling factor analysis. Exposure and Health, 14(4), 885–901.

3. Genchi, G., Carocci, A., Lauria, G., Sinicropi, M. S., & Catalano, A. (2020). Nickel: Human health and environmental toxicology. International journal of environmental research and public health, 17(3), 679.

4. Chinchodkar, K. N., Jadhav, O. S., & Bajaj, V. H. (2017). Some contributions of statistical studies on decision support tools for waste management: A review. Journal of the Indian Society for Probability and Statistics, 18, 119–146.

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