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# Cultural Aspects of Waste Management in Poland and China

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**Abstract:** The main aim of this article was to present differences in the social determinants of waste management and environmental protection in Poland and People's Republic of China. A research gap was identified related to the small number of studies comparing China and Poland in the field of waste management. A systematic review of the literature on waste management and society's approach to environmental protection was conducted, with particular emphasis on municipal waste. The article uses data from local databases, i.e. the Central Statistical Office (GUS) in Poland and The Ministry of Ecology and Environment of the People's Republic of China, as well as data from the World Bank and OECD. The method of comparative analysis and Hofstede's tool were used for selected aspects of the social approach to waste management in Poland and the People's Republic of China. Empirical research was conducted in August 2023. Literature review based on key groups of social factors that differ in the analysed countries. These include those related to purity, religious beliefs, respect for nature, responsibility and ecology. Chinese citizens approach the power supply in their environment in a more collective way than in Poland. The European Union's recommendations has positively affected management of municipal waste in Poland, while in People's Republic of China legislation is constantly updated. In the authors' opinion, in subsequent studies it is worth focusing on comparing other countries in terms of their social approach to environmental protection, as well as conducting surveys.

**Keywords:** waste management; municipal solid waste; social factors; cultural aspects of waste management; culture; Poland; People's Republic of China.

**JEL Classification:** A14; M14; Q53; Q58; Z13.

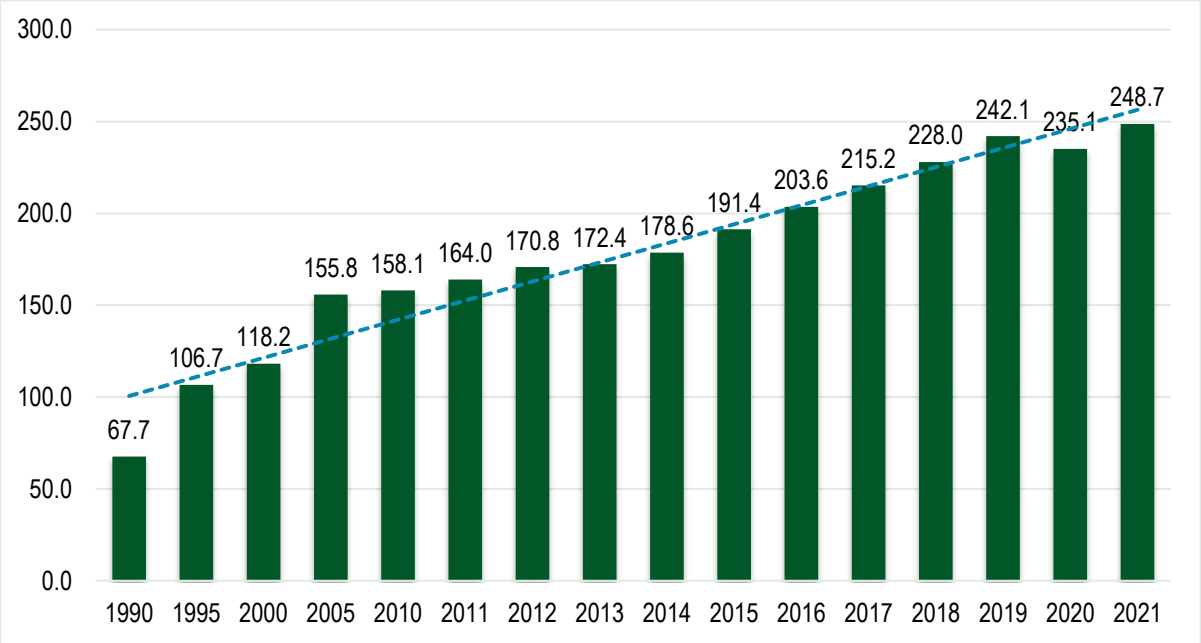
## Introduction

Nowadays, the issue of environmental protection and the rational utilization of natural resources is increasingly addressed. Environmental protection as a field has emerged as a result of a shift in human approach towards the utilization of the natural environment (Prandecki 2010). Technological and industrial development have negatively impacted the state of the natural environment. Significant issues have been raised concerning water and air pollution as well as the loss of biological diversity, both at the local and global levels (European Commission 2021). The adverse effects of industrial development have been observed worldwide, including in Europe and Asia (Kucinski 2009). Urbanization and population growth can also lead to intensified environmental degradation, increased waste production, and a deterioration in air quality (Brundtland 1987). Robin Leichenko and Karen O'Brien (2008) emphasized the role of globalization and industrialization in shaping contemporary environmental protection, using climate change as an example. These were not instances of local fluctuations or anomalies but rather incidents with global repercussions, most likely resulting from human expansion into natural resources.

One of the components of environmental protection has become efficient waste management (Marshall 2013). According to reports from the EPA (2023), the EEA (2016), and the World Bank (2018), current consumption patterns and the increasing volume of waste generation can lead to the intensification of atmospheric phenomena and a decline in urban living quality. Reports from East Asian countries (China, South

Korea, and Japan) also emphasize the importance of waste management as one of the crucial aspects of environmental protection (Enviliance Asia 2020, Kurniawan 2022, Municipal Solid Waste 2022) and indicate a rising quantity of waste (Figure 1) (Statista 2021). Since the late 20th century, the amount of stored waste in the People's Republic of China (China) has increased from 67.7 million tons (1990) to 248.7 million tons (2021).

Figure 2. Amount of Disposed Waste in China 1990--2021 (in million tons)




*Source:* Own elaboration based on https://www.statista.com/statistics/279117/amount-of-disposed-garbage-in-china/.

One of the significant elements of waste management is the individual consumer's approach to waste disposal. Differences in the perception of sustainable development or the necessity of environmental protection can be observed even at the local level (Sebastian Jr 1972, Kountouris 2022). Due to cultural differences, the broader European community may perceive environmental protection differently than the inhabitants of East Asian countries such as China, Japan, and South Korea (Lee, 2020). At the same time, there is a lack of studies addressing the impact of cultural and social factors on the quality of environmental protection in specific groups of countries.

The aim of this article was to present differences in the social determinants of waste management and environmental protection in Poland and China. It identifies the main social factors in waste management and compares recommendations and the general approach to environmental protection within society.

The first part of the article provides a literature review on waste management in European countries (Poland) and East Asian countries (China) as well as the social determinants of environmental protection. Additionally, it introduces waste management concepts, taking into account various waste disposal methods.

The second, empirical part of the work is associated with presenting research results using a comparative analysis. The article concludes with a summary that includes conclusions and recommendations for further research directions concerning the social aspects of waste management.

## 1. Research Background

Contemporary waste management regulations in European and Asian countries appear to share common goals (Baskiewicz 2021). In many cases, they shape people's and organizations' approaches to waste management. For instance, Rachel Salas (2021) has addressed the issue of education and training in the field of medical waste management to minimize waste generation. Meanwhile, Sobczyk and Kowalska (2020) emphasize that one way to improve waste management in society is through the implementation of comprehensive "[...] educational campaigns on waste segregation principles, the location of selective waste collection points, and the handling of hazardous waste.".

In the literature, there are studies on local environmental protection policies (Zhu 2008, Adebayo 2010), changes related to waste management (Malmir 2016), and the impact of specific factors on environmental consciousness in society (Assuah 2023). There are also articles that utilize comparative analysis to compare countries with similar characteristics (e.g., located on the same continent) (Luna Juarez 1996, Ivanova 2022).

There is a research gap regarding the comparison of Polish waste management standards with corresponding legal acts in East Asian countries such as China.

Comparing Poland and China in the field of waste management can take place on several levels. One of these areas is the group of social factors in waste management (Table 1). Various publications, both by Polish and foreign authors, have commonly cited examples of such factors.

Table 13. Selected Social Factors of Waste Management in the Literature

| Factor | Publication | Description |
|---|---|---|
| Cleanliness of property | Assuah (2023) | A clean property indicates a good, responsible approach by the host. |
| Respect for nature | Assuah (2023) Ezeah (2013) Roberts (2017) | Respect for natural resources and the surrounding space, derived from social traditions. |
| Minimalization of generated waste | Assuah (2023) Milea (2009) | The desire to reduce the amount of waste generated is perceived positively by other community members. |
| Environmental awareness | Assuah (2023), Sobczyk (2020) Al-Khatib *et al.* (2009) | Recognizing the positive effects of proper waste management and improving the quality of life "in harmony with nature". |
| Propensity to consume | Mintz *et al.* (2019) Papamichael et. al (2022) | A diversified approach to the consumption of goods and the management of post-consumer waste. |
| Cleanliness culture | McAllister (2015) Mintz *et al.* (2019) | Depending on the region, a standardized approach to maintaining the cleanliness of spaces, e.g. streets, properties, means of communication. |
| Social responsibility | Mintz *et al.* (2019) Al-Khatib *et al.* (2009) McAllister (2015) Mosler *et al.* (2008) | Participation in pro-environmental initiatives resulting from community pressure. It often has a positive impact on improving the quality of waste management. |
| Religious beliefs | Mintz *et al.* (2019) Ezeah (2013) Roberts (2017) | Specific aspects of religion related to waste management and waste perception. |
| Perception of waste | McAllister (2015) O'Connel (2011) | Perceiving waste differently: in developing countries as a resource or as a way to generate income in a limited labor market. In developed countries, waste is perceived as a challenge and a problem that must be addressed. |
| Availability of waste containers | McAllister (2015) Henry et al., (2006) Al-Khatib *et al.* (2009) | Availability of waste bins and waste collection points (selected classes). |
| The level of waste litter in the area | McAllister (2015) Henry *et al.* (2006) | A high level of littering may have a negative impact on the perception of waste by residents and may lead to the repetition of inappropriate waste management patterns. |
| Waste labeling | McAllister (2015) Henry *et al.* (2006) | Proper, legible marking of garbage bins, streets and selective waste collection points can have a positive impact on the quality of waste management in society. |
| Waste management habits | Yousif and Scott (2007) Mrayyan and Hamdi (2006) | Despite the changes introduced in waste management, people do not change their habits. |

*Source:* Own elaboration.

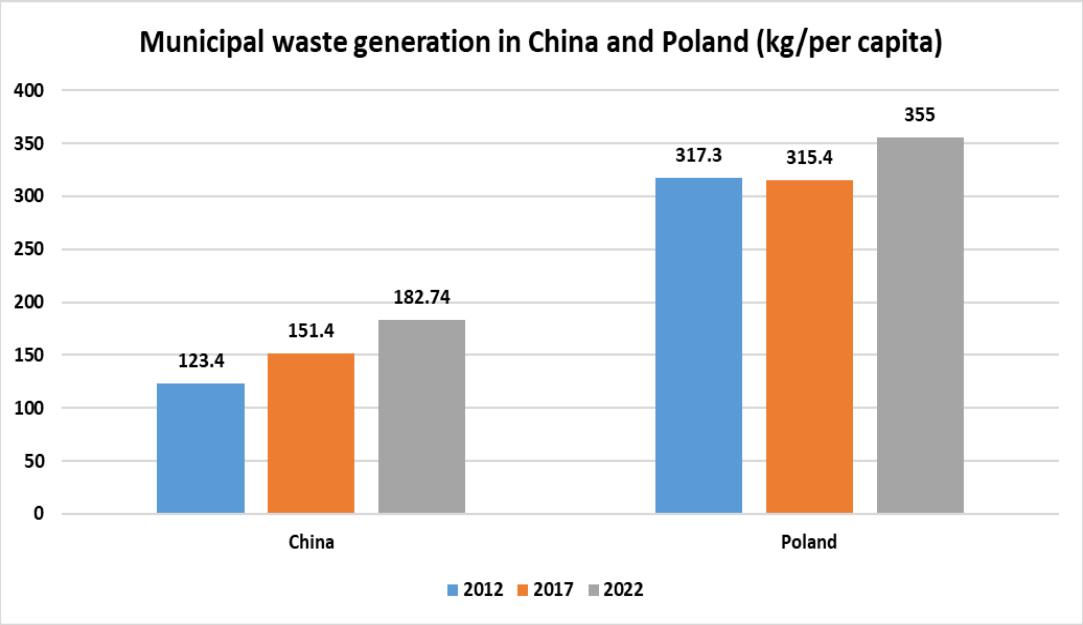
In the context of the comparative analysis of Polish and Chinese waste management approaches, the article selected 13 factors primarily related to differences stemming from culture, religion, and the level of waste management system development. Articles addressing local environmental protection aspects and country or regional comparisons typically mention municipal waste (Luna Juarez 1996, Chifari 2017, Mintz *et al.* 2019). This is because this type of waste is generated by households. Consequently, people have to deal with municipal waste more frequently than other types of waste, such as hazardous waste, electronic waste, etc. (Lee 2020). Therefore, the comparison of people's behavior and approaches to waste management in Poland and China

focused on municipal solid waste. From a legal standpoint, the term "waste" refers to any substance or object of which the possessor disposes, intends to dispose of, or is obligated to remove (Waste Act 2012). European Directive 2008/98/EC defines "waste" as "any substance or object of which the holder disposes or intends to dispose of" (European Directive 2008). In Chinese legal acts, "waste" is defined as "solid waste generated in daily life or in connection with services, and solid waste that is identified as household waste in accordance with laws and regulations" (Law of the People's 2004).

In the literature, a few social factors that can influence people's local approach to waste management can be found. In some Asian countries that are producers of inexpensive clothing imported to Europe, the desire for profit often outweighs the environmental consequences of manufacturing processes (Papamichael 2022). However, it is challenging to establish a clear hierarchy of social factors. As a result, publications on the social determinants of waste management approach the issue of prioritizing factors in various ways. Nikoleta Jones (2010) highlighted the significant impact of social factors, alongside economic and legal factors, on waste management in Greece. According to the author, during the analyzed period, Greece faced challenges related to the environmental awareness of its residents.

Between 2014 and 2022, Europe witnessed an increase in municipal waste generation per capita. During the same period, Poland saw an increase from 272 kg per person to 355 kg per person, marking an almost 33% rise. According to the U.S. Environmental Protection Agency (EPA) report, over the last 40 years, the total annual production of municipal waste in the United States increased by 77% to 292.4 million tons annually (EPA 2020). Both China and Poland have observed an increase in the volume of waste generated. In the years 2012—2022, the amount of waste per capita in China increased by 48.08%, from 123.4 kg to 182.74 kg (Figure 2). However, it is important to note that according to World Bank data (2023), China's population is 37 times larger than that of Poland, which significantly contributes to a much higher overall quantity of generated waste.

Figure 2. Municipal Waste Generation in China and Poland (2012-2022)




*Source:* Own elaboration based on https://data.oecd.org/waste/municipal-waste.htm; https://ec.europa.eu/eurostat/databrowser/view/env_wasmun/default/table?lang=en; EEC: 中华人民共和国生态环境部, Ecological Environment in the People's Republic of China, Ministry of Ecological Environment, 2022.

By 2030, the European Union's action plan for waste management aims to achieve a level of 65% recycling and reuse of municipal waste, 75% recycling and reuse of packaging waste, reduce landfilling of municipal waste to 10%, and eliminate the landfilling of segregated waste (Jastrzebska 2017). In 2019, Poland adopted and initiated a transformation towards a circular economy. Achieving these goals requires long-term commitment at various levels, from national authorities to businesses and citizens. Until December 31, 2021, Poland followed the regulations outlined in the Waste Act of December 14, 2012. Starting from January 1, 2022, new rules and regulations specified in the Act of November 17, 2021, amending the Waste Act and some other acts, came into effect (Ustawa o odpadach 2012, Ustawa o zmianie... 2021).

Due to the dynamic socio-economic development, the increasing volume of generated municipal waste, and the growing population, China's waste management system faces a significant and globally relevant challenge. According to a 2005 World Bank report, Chinese authorities should prioritize changing the waste management hierarchy, focusing more on waste reduction, reuse, recycling, and recovery methods such as composting and fermentation. This strategic approach aims to substantially reduce the amount of waste requiring disposal or landfilling (World Bank 2005).

The first legal regulations concerning waste management and environmental protection in China were introduced through the "Environmental Protection Law" in 1979. In 1995, the first detailed law addressing solid waste pollution, known as the "Law on the Prevention and Control of Environmental Pollution by Solid Wastes," was enacted. This law establishes legal obligations for entities emitting pollutants. Since its introduction, the law has undergone revisions in 2004, 2013, 2015, 2016, and 2020 (Enviliance 2022). In line with global trends and international recommendations, China's waste management system is moving towards a circular economy (Lee 2020). The management of solid waste in China has evolved from recycling to harmless processing, resource utilization, and source pollution reduction (Guo 2021).

## 2. Method

The research materials used for this study were of a secondary nature. Within the article, a literature review was conducted on waste management, with a specific focus on social factors. Data was collected using the following sources:

- Statistical data from the World Bank
- Statistical data from the OECD
- Statistical data from the Central Statistical Office (GUS) in Poland
- Statistical data from the 中华人民共和国生态环境部 (The Ministry of Ecology and Environment of the People's Republic of China)
- Bibliometric data from the Web of Science database

The sources employed included literature, online resources, and legal acts. Empirical research was conducted in August 2023. The analysis utilized Hofstede's analysis and the method of comparative analysis of the social determinants of waste management in Poland and China. Descriptive, graphical, and tabular methods were applied to present the research results. Additionally, the main social factors influencing waste management were identified as part of a systematic review of the literature in the Web of Science database.

Initially, 487 articles were considered for analysis, from which social factors were selected for the comparative analysis. The analysis included articles available in the Web of Science database based on the following criteria:

- Scientific articles in the English language
- Published between 1994 and 2023
- Containing the keywords: "social factors", "municipal", and "waste"

The keywords were chosen based on a review of previous research in the field of bibliometric analysis of literature in the area of municipal waste management.

## 3. Research Results

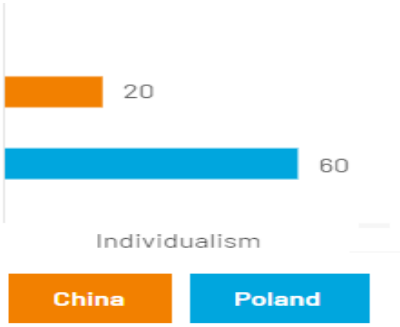
Cultural values have a decisive influence on interpersonal communication and, as a result, the definition of cultural differences (Bond 1996, Bouvier 2003, Hsu and Huang 2016). The division between Chinese and Western cultures is clearly delineated (Li 2001). At the same time, it is acknowledged that certain Chinese cultural values are in opposition to Western cultural values and vice versa (Bouvier 2003). In contemporary China, cultural values are constantly evolving (Hsu and Huang 2016). Similar transformations characterize Poland after its accession to the European Union (EU): local and global influences blend, and external tasks stimulate ongoing development and transformation.

The first important comparative category among social factors in waste management relates to **cleanliness**. Research emphasizes the cultural significance of cleanliness on one's property, habits related to waste management, and the prevailing culture of cleanliness in the context of waste disposal and recycling behaviors.

In interpersonal interactions, the Chinese exhibit conciliatory tendencies (Bouvier 2003), which are associated with the collective nature of Chinese culture. The distinction between collectivist and individualistic cultures was introduced by Geert Hofstede (1991). Within Hofstede's model, he described the contrast between individualistic societies, which emphasize individual autonomy, and collectivist societies, where greater

importance is placed on community and group cohesion. According to Hofstede's framework, East Asian cultures, including China, are characterized as extremely collectivist due to numerous social attributes that underscore the primacy of the group and the significance of community. Chinese culture boasts a rich historical tradition in which society and family have played crucial roles. One of the most important virtues of Confucianism is 孝, *xiao*, filial virtue. The Chinese model fosters a bond based on the respect and obedience of the son toward the father, knowing that, in turn, the father will be respected by the son, and so forth. Principles such as reverence for elders and authorities, loyalty to family, and a commitment to the community are paramount. Based on these values, the significance of the group far surpasses that of the individual (Zhou 2003, Hsu and Huang 2016). Consequently, the Chinese may demonstrate a strong concern for the cleanliness of public spaces out of a sense of empathy and commitment to the common good. In contrast, individualistic cultures prioritize the well-being of the individual (Figure 3); in these cultures, individuals are expected to take care of themselves.

Figure 3. Hofstede's individualism: China and Poland



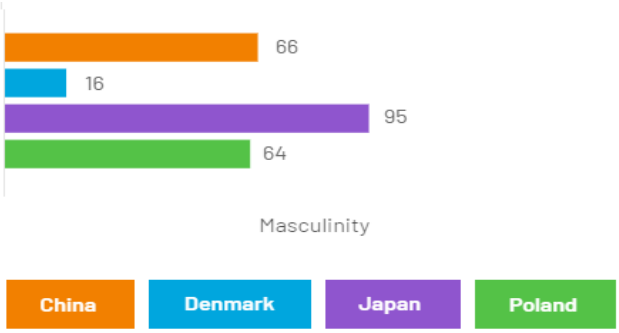

*Source:* Own elaboration based on: https://www.hofstede-insights.com/country-comparison-tool?countries=china%2Cpoland

Poland is situated between two cultural regions. On the one hand, its Slavic heritage inclines Polish culture towards a more collectivist orientation, while on the other hand, the influence of Western Europe, characterized by extreme individualism, balances the societal character. Regarding waste management, the primary regulations are driven by the European Union's economy, which, in this aspect, could be considered as promoting an individualistic culture in Poland. This is evident in statistics related to actions such as COVID-19 vaccinations. It is estimated that 91% of the Chinese population (over one billion people) is vaccinated against COVID, whereas in Poland, approximately 60% of the population has received a full dose (NYT 2023). In Poland, the care for the cleanliness of one's property is typically expressed through waste segregation. Increasing environmental awareness and EU recommendations have encouraged Poles to actively participate in waste segregation programs. In major cities, publicly accessible posters explaining waste segregation rules have been displayed, including in the Ukrainian language, since mid-2022 in areas such as Warsaw. Similarly, in the largest cities in China, posters and waste segregation bins have been introduced.

In association with the strong collectivism observed in East Asian cultures, a distinctive characteristic often attributed to representatives of these cultures is their diligence and frugality (Nowicka and Zhanaev 2022). However, the assertion that Asians segregate more waste than individuals from other regions of the world has not been conclusively proven (Mintz *et al.* 2019). Research indicates that those most prone to improper disposal of waste are children, teenagers, students, seniors, and individuals with a basic education. Studies have found that local waste management culture influences individual recycling behaviors, with a more pronounced impact in regions with more heterogeneous populations (Kountouris 2022). Both China and Poland can be considered homogeneous populations (OECD 2022).

Furthermore, many studies emphasize that men tend to dispose of waste more frequently than women and are less likely to adhere to municipal waste segregation guidelines compared to women. Women are more often in positions of authority regarding waste management decisions (Al-Khatib *et al.* 2009, Milea 2009, Mintz *et al.* 2019, Kountouris 2022). Research cited by Issam A. Al-Khatib *et al.* (2009) shows that men and women think and respond differently to environmental issues. Adriana Milea (2009) even suggests that social campaigns related to waste management should be specifically targeted at women, as they hold decision-making authority and have the most significant influence. Regarding financial status, researchers have conflicting opinions (Milea 2009, Kountouris 2022), eliminating the possibility of using this criterion.

Figure 4. Hofstede's masculinity: China, Denmark, Japan and Poland




*Source:* Own elaboration based on: https://www.hofstede-insights.com/country-comparison-tool?countries=china%2Cdenmark%2Cjapan%2Cpoland

This comparison illustrates masculine cultures, characterized by culturally described virtues typically attributed to men, including endurance, strength, independence, material success, activity, and achievement. In such cultures, gender differences in society are prominently delineated. On the opposite pole are feminine cultures, where traits culturally ascribed to women, such as nurturing and emotional bonds, solidarity, compromise, cooperation, and care, take precedence.

China and Poland emerge as masculine cultures (Figure 4) at very similar levels (66 vs. 64); they prioritize hard work over leisure and exhibit strong intergroup competition. In China, the gender differentiation in terms of masculinity and femininity is high (almost 37 million more men than women in a population of 1.4 billion), while in Poland, there are approximately 1 million more women than men in a population of 38 million (UP 2021). Despite significant numerical differences between men and women, both countries display a similar masculinity index in their cultures. In the context of waste management, this may translate to lower waste segregation rates in both cultures, especially in China due to the numerical dominance of men and in both due to the masculinization of Chinese and Polish cultures. Research suggests that gender can also determine the type of waste disposed of: among men, cigarette butts are often discarded, while among women, food waste is more commonly disposed of (Al-Khatib *et al.* 2009).

Rules also play an important role in the context of order in traditional Chinese culture, *fengshui* (风水). Energy flow: *qi* (气) is strictly related to home cleanliness. Space for the community is much clearer than in Poland. Not only individual residents but also local communities care about cleanliness in such places.

Another category of social factors highlighted by researchers pertains to **religious beliefs**. Roberts and Orekeke (2017) consider the research question related to beliefs about waste within communities. They refer to studies concerning waste disposal practices and extract implications. In one study, it was observed that waste was discarded into open drainage channels with the expectation that rain would cleanse the dirt, while in other cases, waste was not only perceived as dirt but also as sustenance for spiritual beings. Sermons and church bulletins can also enhance social awareness regarding waste management (Al-Khatib 2009, McAllister 2015). It can be argued that religious beliefs contribute to a better reception of the concept of volunteerism for the common good (Al-Khatib 2009).

From Al-Khatib's study, another interesting finding emerges: individuals who self-identify as religious tend to litter less than those with weak or no religious convictions, highlighting the role of growing moral and religious convictions as one of the most effective factors.

The cultural roots of Chinese traditions and values can be attributed to several schools of thought, including Confucianism, Taoism, and Buddhism, with Confucianism being the most influential and widespread among them (Hsu and Huang 2016). Among the most common values are harmony (Confucian), respect for authority, the cultivation of relationships – (*guanxi*, 关系) and group orientation. In opposition to China, Polish culture and tradition are rooted in the values set by European history.

In Poland, the majority of the population identifies as Christians, primarily Catholics. According to data from previous years, approximately 81—92% of Poles were affiliated with the Catholic Church (GUS 2018). The remaining part of the population mainly consists of non-religious individuals and those following other religions, such as Protestantism, Orthodoxy, or Judaism, although none of these groups is large. In China, the religious landscape is more diverse, with 50% of the Chinese population declaring no religious affiliation [Paw, 2012].

Among the religions present in China, Buddhism is the most widespread (Paw 2012). However, the issue of religiosity among the Chinese is not extensively covered by the National Bureau of Statistics of China (NBS 2023).

Following the Al-Khatib, one might expect that Poles, as a nation with theoretically stronger religious convictions than the Chinese, would be less prone to littering. Perhaps this is because the Catholic Ten Commandments do not imply behaviors related to lifestyle that could significantly affect waste management (e.g., dietary matters) as much as, for instance, Orthodox Islam. Chinese culture is closely tied to a respect for history, tradition, and philosophy. Traditions are associated with the previous criterion of cleanliness, as found in principles such as *fengshui* (Hall 1966, 1975).

Aspects related to the **respect** for nature are intertwined with categories concerning cultural cleanliness and beliefs. The concept of environmental concern is used in the literature to refer to a range of perceptions, emotions, knowledge, and attitudes related to the environment. It is measured using the New Ecological Paradigm (NEP) scale developed by Dunlap and others (2000). This scale gauges individuals' worldviews regarding their relationship with nature and their ecological awareness.

As Keren K. Mintz (2019) suggests, support for environmental protection is generally high in both developed and developing countries. One of the cultural dimensions that can moderate the relationship between environmental orientation and pro-environmental behavior is the dimension of individualism and collectivism. In individualistic Western cultures, motivation for appropriate actions primarily stems from internal preferences and values, while in collectivist cultures, this motivation arises from a culturally embedded openness to others and norms.

Researchers also discuss environmental ethics based on two belief systems: anthropocentric and eco-centric. Anthropocentric perceives human beings as the most important, central, and more valuable than other organisms within the ecosystem. As Milea (2009) points out, this attitude has its roots in the Judeo-Christian idea of human superiority over nature and the Enlightenment drive to dominate nature.

On the other hand, in an eco-centric worldview, intrinsic value is attributed to nature and every organism. All living beings have the same right as humans to inhabit our planet. This latter dimension somewhat revolutionizes the intuitive understanding of environmentalism in individualistic Poland and collectivist China. It also suggests that Poles, entrenched in the contexts and paradigms of Judeo-Christian tradition and the European Enlightenment, may exhibit attitudes characterized by less reverence and humility toward nature. Measuring respect for nature in different cultures is, therefore, exceedingly challenging and complex, and researchers must be cautious not to fall into the trap of their own cultural paradigms.

Another category encompasses aspects related to **responsibility**, including social responsibility, ecological awareness, and consumption tendencies. It is consumerism that has been one of the key factors driving the United Nations to take action in combating waste (Milea 2009). Al-Khatib and colleagues (2009) argue that the current situation of excessive waste is a result of a consumptive, materialistic way of life. New sources of pollution and new types of waste are increasingly emerging (Sobczyk 2020). The increase in littering rates in public spaces can be primarily attributed to the lack of realistic penalties or consistent enforcement, as well as a lack of knowledge regarding the environmental consequences of littering. To ensure the effectiveness of waste management programs, it is essential to define the appropriate division of responsibilities, powers, and roles. Communities should be engaged in decision-making regarding waste management strategies (Yousif and Scott 2007, McAllister 2015).

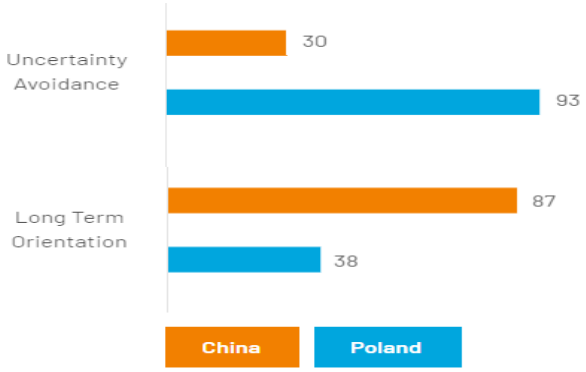
Social responsibility is closely tied to the collectivism of a culture. In Chinese culture, a strong tradition of hierarchy and authority exists, which is reflected in both family and societal life. The emphasis is typically placed on cooperation and interdependence within a group. Chinese culture values long-standing commitments to the community and the pursuit of social harmony. The ability to collaborate effectively is highly prized. In hierarchical societies, people may be more inclined to adhere to regulations and authorities' recommendations, including those related to waste segregation and recycling.

However, according to researchers, China has not yet developed clear and detailed regulations regarding the relationship between one supervisory and managerial body – the Department of Environmental Protection – and other relevant waste management authorities, partly due to rapid development. The Chinese model is characterized by contradictions in Chinese legislation, ambiguity in some waste management principles, and a lack of legislation concerning waste classification (Ivanova and Wu 2022). In the Chinese language, the expression "four-character phrase," which conveys a lot of information in just a few words, is considered a desirable skill (Bouvier 2003). Conventions are highly regarded, and indirect expression, conventionality in

communication, and symbolism dominate. The content of messages and official texts is typically concise, which is also the case with regulations related to waste management.

High contextuality in Chinese culture is associated with two more dimensions of culture identified by Hofstede, namely, uncertainty avoidance and long-term orientation (Figure 5). Poland clearly avoids uncertainty by maintaining rigid codes of beliefs and behaviors. China, on the other hand, thrives in ambiguity, as indicated by the mentioned ambiguity and implied meanings in communication.

Figure 5. Hofstede's uncertainty avoidance and long term orientation: China and Poland




*Source:* Own elaboration based on: https://www.hofstede-insights.com/country-comparison-tool?countries=china%2Cpoland

The difference between these cultures also emerges in the dimension of long-term orientation. China has a highly pragmatic culture. People believe that the truth depends largely on the situation, context, and time. Poland, with a relatively low score, is more normative than pragmatic. Low-context cultures prioritize clarity and literal communication. At the extreme end of the contextuality axis, Hall placed North America and Western Europe.

Not only legal acts, as mentioned in the previous section, but also researchers conclude that China should clearly accept the concept of a closed-loop economy in waste management to specify the division of responsibility (Ivanova and Wu 2022). Most of the waste in China is not recycled (over 90% of industrial waste) but rather disposed of in landfills (Ivanova and Wu 2022), due to the scattered responsibility for vast construction sites and rapid development. Chinese cities are becoming increasingly overloaded with landfills; since 2010, two-thirds of Chinese cities have been surrounded by waste landfills (Lee *et al.* 2020). China is trying to shift the focus from landfilling to incineration, primarily due to the lack of space for more landfills, although this is met with numerous protests (Lee *et al.* 2020).

According to Jessica McAllister (2015), people who own property have the motivation to take care of it, in contrast to public property. It can be assumed that collective Chinese individuals will take better care of the cleanliness of public spaces than the more individualistic Poles. Researchers point out the lack of concern for the aesthetics of the environment among Poles. Even though there are always trash bins at bus stops, people scatter garbage around them. Researchers conclude that Polish cities are littered, in part because residents do not take care of cleanliness, do not feel responsible enough for environmental issues, and do not take care of communal spaces. This leads to phenomena such as widespread littering and the creation of "illegal dumps" (Sobczyk 2020). As research indicates, waste management regulations can exist in both collective and individualistic cultures (cf. Japan and Germany in Mintz *et al.* 2019). The solution for both China and Poland would involve greater community engagement and increased social awareness, which can be achieved through proper waste management education (Yousif and Scott 2007, McAllister 2015). It has been found that both external motivation (monetary reward) and internal motivation (personal satisfaction) influence recycling behaviors (Milea 2009, McAllister 2015, Sobczyk 2020). Awareness of problems does not necessarily mean that people consider solving them to be their duty (Milea, 2009).

It has been recognized that the main factor determining littering and waste segregation is a sense of responsibility for one's own waste, which could be addressed by better environmental education (Al-Khatib *et al.* 2009, McAllister 2015). Social campaigns aimed at increasing knowledge, monetary rewards, and better infrastructure, such as easily accessible separate trash containers for collecting sorted waste, can be an antidote to the waste problem. The sense of responsibility for waste management appears to be a significant factor in

maintaining cleanliness and should receive the highest attention in policies, programs, or projects aimed at changing behaviors in this direction (Milea 2009).

Environmental awareness and the availability of infrastructure can be developed in another category closely related to **ecology**: the level of littering in locations, the perception of waste, the availability of waste containers, waste labeling, and waste reduction. In pursuit of achieving the goals of sustainable resource utilization and waste reduction, national governments and international organizations encourage the recycling of household waste (Kountouris 2022).

Over the past two decades, China has experienced a rapid increase in domestic waste production. Undoubtedly, the causes of this phenomenon include China's growing population, urbanization, industrialization, changes in consumption patterns, and rapid economic development, including a sustained growth in GDP (Yousif and Scott 2007, Ezeah 2013, McAllister 2015, Roberts and Okereke 2017, Lee *et al.* 2020, Kurniawan *et al.* 2022). Since the introduction of economic reforms and Deng Xiaoping's policy of opening up to the world, China's per capita GDP growth has consistently exceeded 8% annually (Kurniawan *et al.* 2022). The increasing number of all types of waste poses a significant challenge for China. Since the 1980s, China has imported solid plastic, paper, and metal waste as raw materials for production and construction to compensate for the shortage of domestic resources in the face of rapid economic development. The first environmental protection and waste management laws were enacted in 1989 and 1996, respectively. The main legal provisions concerning the management of solid waste are the Waste Disposal Law and the Resource Recycling Law (Kurniawan *et al.* 2022). Legal regulations are continuously updated (PRC GOV 2023). To address the deepening waste crisis, the Chinese government issued a ban on the import of foreign waste in 2017. In 2019, a standard for classifying segregated waste was introduced: green for food waste, blue for recyclable waste (e.g., paper and plastics), red for hazardous waste, and black for residual waste (Lee *et al.* 2020). As Chukwunonye Ezeah (2013) notes, the composition of solid waste generated depends on dietary habits, culture, lifestyle, and climate. The most frequently chosen materials suitable for recycling include plastics, paper, metals, glass, and PET bottles. The situation is similar in both Poland and China, although the color codes are entirely different. In Poland, the first legal regulations governing waste management were formulated in the 1990s. The legal framework has since evolved to align Polish law with EU standards (Sobczyk 2020).

Littering in cities and insufficient segregation efforts are issues that affect both China and Poland. The literature often cites the lack of access to recycling-related infrastructure as a contributing factor (McAllister 2015, Mintz *et al.* 2019, Sobczyk 2020). According to Al-Khatib *et al.* (2009), one of the most effective factors in preventing street littering is the increased availability of trash bins, a finding also supported by Milea (2009). In her research, 40% of participants never segregated their waste, while a total of 60% segregate their waste to varying degrees. Simultaneously, 54% of respondents stated that they would segregated more if there were separate waste bins on the streets. Knowledge and accessibility appear to be key to improving the situation (McAllister 2015) in China, Poland, and worldwide.

## 4. Discussion and Summary

Researchers agree that assessing the impact of traditions on attitudes and behaviors in waste management can help explain differences in recycling rates between countries. At the same time, values and practices characteristic of a given culture can influence individual preferences and attitudes towards environmental protection. In Poland, there has been an increase in environmental awareness in recent years, although it is considered insufficient. In China, economic considerations dominate, affecting the pace of implementing eco-friendly measures. In both countries, inconsistency and ignorance regarding waste segregation can be observed. Among Polish people, cultural factors, individualism and short-term perspectives can be identified. The EU's waste management goals have compelled Poles to engage in waste segregation. In larger cities, information about increased fees for municipal waste collection if it is not segregated is often seen. As Wiktoria Sobczyk and Anna Kowalska (2020) point out, Polish people do not feel responsible for the waste crisis.

Chinese people also do not feel responsible for the waste crisis. Despite China being the world's largest construction site and landfills being a common sight around cities (Ivanova and Wu 2022), Chinese culture, with its characteristics such as high-context culture, tends to blur responsibility. China's development is happening at such a rapid pace that society has not yet fully internalized waste segregation principles. China's situation differs from that of its close neighbors, such as South Korea and Japan, where recycling rates are higher.

Moreover, researchers also agree on the significantly negative impact of ineffective waste management on the environment. This impact includes increased fire risks due to flammable landfill gases, the release of ozone-depleting gases into the atmosphere, air pollution, soil contamination, leachate infiltration from landfills into the

soil, groundwater, rivers, lakes, and oceans, as well as urban waste overload (Yousif and Scott 2007, Milea 2009, Mintz *et al.* 2019, Lee *et al.* 2020, Kurniawan *et al.* 2022, Ivanova and Wu 2022). Consequently, further research on the social factors of waste management and the development of appropriate patterns and tools should be pursued.

Our study compares two ways of waste management that are geographically, historically and traditionally very far from each other, with a focus on its cultural aspects, which exposes completely new motivations and helps to understand the consequences of waste management deficiencies in both countries, as well as neighboring countries. Researchers emphasize the importance of waste management studies, calling for the standardization and calming of waste management due to the pressing problem of environmental pollution caused by municipal waste. Research in the field of sustainable development and climate change is very important today not only because of its scientific nature, but also because of the alarmingly bad condition of our planet. The cultural aspects of waste management are something new, something interdisciplinary, helping to understand and take specific actions in the future to reduce environmental pollution with waste: precisely by shifting the burden to the cultural aspects. The importance of this area of research continues to grow as the world's pollution problem worsens. This determines the relevance of research in this direction.

## Credit Authorship Contribution Statement

**Kalina Maria Taczkowska**: conceptualization, investigation, methodology, project administration, software, formal analysis, writing – original draft, supervision, data curation, validation, writing – review and editing, visualization

**Maciej Borkowski**: conceptualization, investigation, methodology, project administration, software, formal analysis, writing – original draft, supervision, data curation, validation, writing – review and editing, visualization

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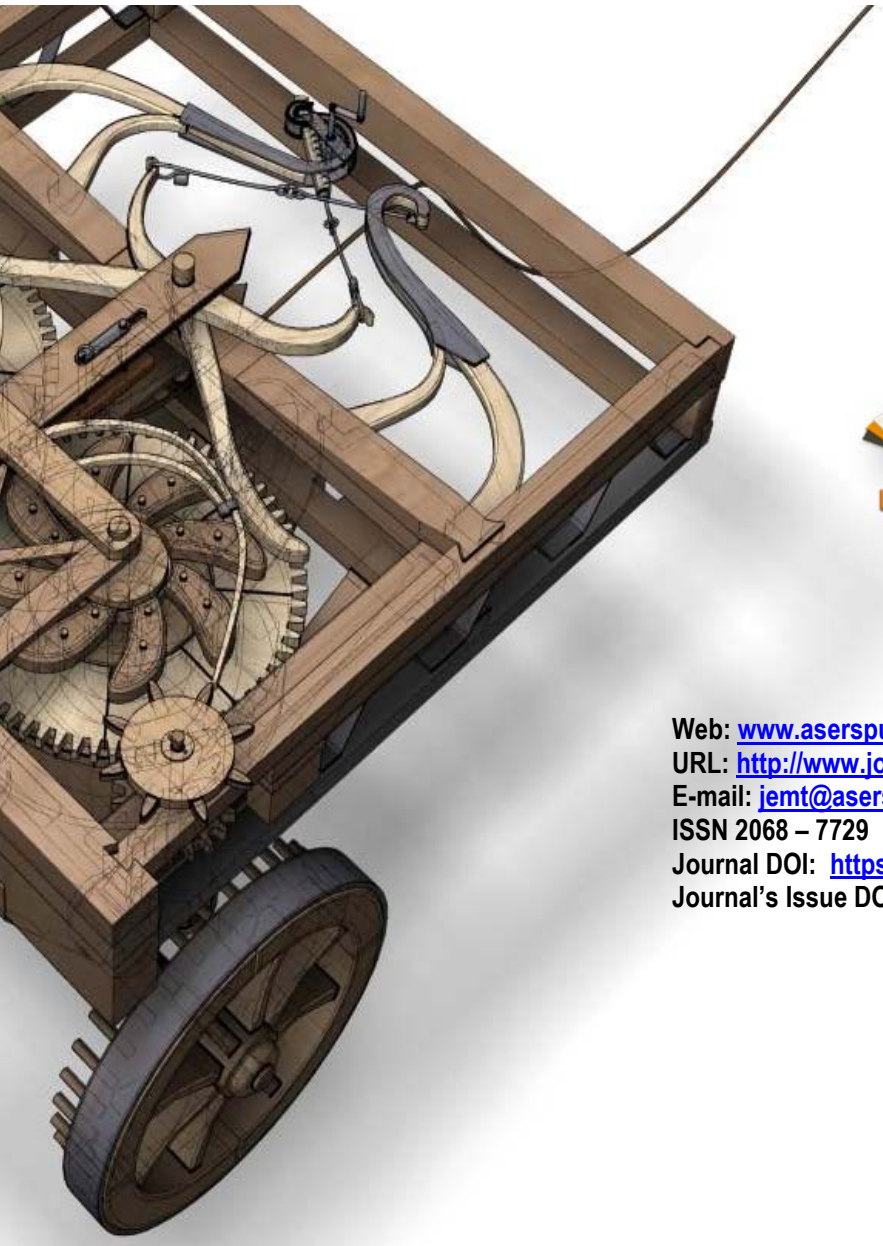

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