

**Karolina Gwarda**

Gdynia Maritime University  
e-mail: k.gwarda@wpit.umg.edu.pl  
ORCID: 0000-0002-4017-0448

---

**ASTUDYOFRESIDENTS’ECOLOGICALAWARENESS  
AND BEHAVIOUR IN THE CONTEXT  
OF THE TRANSFORMATION OF GDYNIA TOWARDS  
A ZERO WASTE CITY**

---

**BADANIE ŚWIADOMOŚCI EKOLOGICZNEJ  
I ZACHOWAŃ MIESZKAŃCÓW GDYNI POD KĄTEM  
REALIZACJI IDEI MIASTA BEZ ODPADÓW**

---

DOI: 10.15611/pn.2019.5.10

JEL Classification: Q01, Q53, D1, Q54, Q56

**Summary:** The problems of modern cities prompt the need to seek new solutions. An example of such a solution is the zero waste concept, which proposes an integrated approach to contemporary civilization changes and whose postulates perfectly fit into the specificity of cities. This includes a municipal waste management system based on the concept’s main principles, whose proper functioning rests to a large extent on the residents: they decide what will become waste, how much they will produce, and how it will be sorted. The aim of the article is to examine ecological awareness among residents and their behaviour in the context of making of Gdynia a zero waste city. A survey was conducted on the basis of a paper questionnaire, which contained statements covering the topics of knowledge, behavioural and attitude awareness, and emotional awareness. In addition was divided into three thematic areas: general ecological problems, the municipal waste management system, and consumer attitudes and behaviour. The results revealing that respondents showed a moderate level of ecological awareness.

**Keywords:** zero waste city, municipal waste management.

**Streszczenie:** Problemy współczesnych miast zmuszają do poszukiwania rozwiązań, które kompleksowo lub chociaż po części je rozwikłają. Takim przykładem może być idea miasta bez odpadów, proponująca zintegrowane podejście do współczesnych przemian cywilizacyjnych. Jej postulaty idealnie wpisują się w specyfikę miast. Elementem tej koncepcji jest system gospodarki odpadami komunalnymi oparty na jej głównych zasadach, a jego właściwe funkcjonowanie zależy od mieszkańców. Celem artykułu jest zbadanie świadomości ekologicznej mieszkańców i ich zachowań w kontekście transformacji Gdyni w kierunku idei miasta bez odpadów. Badanie sondażowe przeprowadzono w oparciu o papierowy kwestio-

nariusz ankiety, który podzielono na trzy obszary tematyczne: ogólne problemy ekologiczne, system gospodarki odpadami komunalnymi oraz postawy i zachowania konsumentów. Badał on wiedzę, zachowania, postawy i świadomość emocjonalną respondentów. Analiza i interpretacja wyników pozwoliła stwierdzić, że badani wykazali się średnim poziomem świadomości ekologicznej.

## 1. Introduction

The contemporary image of the world is extremely pluralistic in many respects. Mankind is increasingly aware that the Earth is about to face a whole range of problems and threats that either have not yet existed or were ignored until recently. These are mainly the byproduct of the rapid economic and civilizational development of the twentieth century. Forecasts for the upcoming decades warn of a significant demographic explosion, while the growing global population steadily increases the demand for food. In addition, the high standard of living in prosperous countries and overconsumption in emerging markets create a continuous, uncontrollable demand for an increasing number of commodities, natural resources and energy. The use of the natural environment in the management process consequently leads to the former's destruction and pollution.

It should be noted that cities are particularly vulnerable to the negative effects of the problems outlined above, as they contain half of the global population. Not only that, people are increasingly willing to settle in urban areas, leading to the overcrowding of cities. This generates a huge mass of municipal waste in an area, whereas improper management gives rise to a number of issues as well as excessive and uncontrolled waste. Therefore, solutions based on creating new models or concepts that meet the needs of the growing population should be sought in such a way as not to halt growth or further destroy the natural environment. The zero waste concept is the answer to this challenge. It focuses on reducing the amount of waste at source, putting an end to the storage and incineration of waste which are synonymous with the wastage of raw materials. Instead, it promotes a sustainable and closed-loop cycle in which waste generated after utilizing one product is incorporated into another.

Hence, measures should be taken to transform Gdynia's municipal waste management (MWM) system in order to convert it into a zero-waste city. However, this can only be done if residents are involved in the process. The purpose of the article is to examine ecological awareness among residents and their behaviour in the context of making of Gdynia a city without waste.

The first section of the study outlines the issues and threats that affect modern cities. The second section presents the most important assumptions of the zero waste city concept and of the MWM system that is compatible with it. The third section discusses the findings concerning Gdynia residents' awareness and behavior towards transforming the local MWM system into a zero waste city.

## 2. Factors affecting the current situation of modern cities

It is difficult these days to talk about city-specific problems, as different challenges and threats are predominant in different parts of the world. Having said that, there are some factors that affect either all or most cities in equal measure. Let us note that modern urban agglomerations reflect the anatomy of today's world, which is struggling with issues ranging from demographics and raw materials to energy and ecology. The ongoing depletion of natural resources, progressive climate change, urbanization, population growth, municipal waste and the ever-increasing expectations regarding living standards are becoming an important global challenge for cities.

Demographic trends indicate that the world is becoming an increasingly urban environment. In 2016 more than half of the global population lived in cities (54.5%). It is estimated that, by 2100, the world's rural population will remain unchanged, implying a marked increase in urban population and problems with overcrowding. All economic and demographic forecasts concur in that this process will continue to be very dynamic. By 2030, 60% of the world's population is projected to be settled in cities, while the world's urban population will more than double compared to the end of the last century (UN, 2016). This trend will be even more pronounced in Europe, where urban population increased from 515,416,422 (71.0%) in 2000 to 553,271,500 (74.4%) in 2018. Furthermore, it is estimated that the total population of European cities will stand at 76% in 2025, and may reach 82.1% in 2050.

The growing world population is responsible for increased consumption and production. It is estimated that by 2025, annual consumption in emerging markets will rise to \$30 trillion, compared to \$12 trillion in 2010 – this will account for nearly 50% of total global consumption (against 32% in 2010). Another pognisis is the increase in the number of residents with sufficiently high incomes who will become significant consumers of goods and services. Referring to the trend of urbanization, it is expected that approximately 6 billion of these residents will inhabit as few as 440 cities of emerging economies (McKinsey Global Institute, 2012).

Currently, due to the volume of consumption, the demand for natural resources exceeds 41% of the Earth's spare production capacity. If current consumption and production patterns are maintained until 2030, and the population forecasts of 11 billion people come true, humanity will need an extra Earth to be able to continue with our current lifestyle and consumption (WWF, 2016). According to an analysis of the pressure of needs that the human population exerts on the planet, conducted by the Global Food Network, the pool of natural resources for 2019 was used up in less than seven months. This means that humans are incurring ecological debt. The data shows that global consumption for the first time began to exceed the Earth's environmental capacity in the early 1970s (Global Footprint Network, 2016).

For the first time in history, urban waste is growing faster than the urbanization rate. According to the World Bank, by 2025 the urban population will increase by

1.4 billion people, each of whom will be generating a daily average of 1.42 kg of waste – over 15% more than the current average of 1.2 kg per day. If this trend does not change, and nothing suggests that it will, the annual growth of global municipal waste in this period is estimated to nearly double, from 1.3 to 2.2 billion tons per year (The World Bank, 2012). In addition, despite several measures adopted with a view to encouraging recycling, estimations indicate that only a quarter to a third of the total mass of municipal and industrial waste generated annually in the world is currently recycled (Chalmin, Gaillochet, 2009).

Solid waste is a significant source of methane, a very strong greenhouse gas that contributes to global warming. Each emitted ton of methane has a several dozen times greater climate warming effect than a ton of CO<sub>2</sub> (The World Bank, 2012). Methane from landfills releases 84 times more heat than carbon dioxide into the atmosphere. In the EU itself, it is responsible for approximately 19% of greenhouse gas emissions, while another 30% is generated by waste decomposition (Olivier, Schure, Peters, 2017).

In facing the expectations of the growing population, cities are expanding in space (by incorporating new territories) – not only to improve living functions, but also to acquire extra space required for collecting, segregating, storing and incinerating waste, which consequently deprives the previously natural habitats of fauna and flora. The outreach of this phenomenon is vast, given that waste treatment and landfill sites cover extensive areas and can potentially contribute to water, air and soil pollution, while waste incineration plants can emit harmful substances into the air.

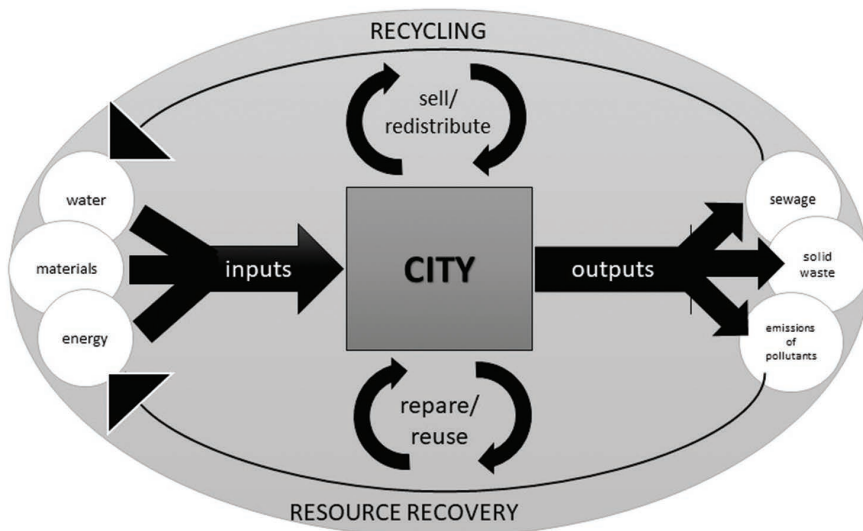
Cities cover just about 2% of the Earth's surface, yet urban dwellers consume over 75% of the world's natural resources and generate 70% of global waste (Ramsar, 2012). The generation of any waste depletes natural resources, uses up energy and water, pollutes the environment, and as a consequence, entails additional financial costs associated with waste management. Until aggressive sustainability scenarios are not successfully implemented, the “global peak of waste” may be reached as late as in 2100 (Hoornweg, Bhada-Tata, Kennedy, 2014).

The functioning of cities is therefore linked with striking a compromise between the pursuit of progress and the proper shaping of the natural environment matters related to MWM.

### **3. The concept of a zero waste city**

Due to population changes, economic growth and excessive consumption, cities must meet new requirements in the continuous pursuit of sustainable and resource-efficient development of their areas. In order to curb further depletion of natural resources, also at city level, the concept of sustainable consumption should be implemented with the introduction of strategic waste-management systems based on waste avoidance and material efficiency, along with the concept of resource recovery (Lehmann, 2010). In this case the zero waste concept which has been successfully adapted to urban land may be of help.

This economic/ecological set of principles aims to eliminate waste, which is viewed as a system error whose occurrence should not be allowed. However if waste production cannot be avoided, the most desirable solution is the 100% recycling of solid municipal waste and the 100% recovery of all resources from waste materials. This can only happen if waste is perceived as a resource that can be reused or recycled into something new. Therefore it should be treated with respect and managed responsibly, including through the use of the so-called circulatory metabolism in an urban ecosystem (Zaman, Lehmann, 2013). Under this solution, all streams of city-derived materials circulate until their optimal level of wear is reached. Therefore, at the end of their life cycle, products are repaired, sold or redistributed, thus being more effectively used through their re-utilization. Should this not be feasible, they are recycled or recovered from the waste stream and used as inputs, replacing the demand for the continued extraction of new natural resources. In a way, the model of urban metabolism presents a certain universal and comprehensive view of all actions and activities undertaken in the urban sphere. It also enables conducting a quantitative analysis of the total flow (in both directions) of energy, water, materials, raw materials, and waste in a city and its surroundings. This, in turn, provides comprehensive information on the current state of a city from a sustainable development perspective, i.e. energy efficiency, circulation of materials and raw materials, waste management and infrastructure efficiency (Borsa, 2014). Figure 1 shows the flow of material streams in a zero-waste city. The output product, which includes municipal waste among others, is seen as a resource and used as an input to the city's metabolism (Zaman, Lehmann, 2013).



**Fig. 1.** Material flow in a zero waste city

Source: (Zaman, Lehmann, 2013).

Developing and applying the zero waste city model is undoubtedly a highly complex process stretched over a long time horizon and requiring a series of comprehensive solutions based on the key principles of sustainable development. To achieve this, many entities need to be involved – including residents, entrepreneurs, local and national authorities – and a number of measures must be adopted (Song, Li, Zeng, 2014). Building a city without waste must be done in stages. First, midway goals should be set that will eventually provoke a scenario where there is no such thing as waste. However, this cannot be done without an efficient, clear and transparent MWM system that corresponds to the idea of zero waste.

### 3.1. Municipal waste management consistent with the zero waste concept

A reliable and efficient MWM system should take into account the relationships and connections existing between its components (generation, collection, pick-up, handling, transportation, storage, processing, and disposal), bearing in mind the costs and negative environmental impacts. At the same time, the main priority of a MWM system consistent with the zero waste concept should be, first, to reduce waste generation, and then in line with the waste hierarchy of: reutilization, recycling, energy recovery, and the removal of residues (Hannon, Zaman, 2018).

Figure 2 shows an example of a simplified MWM system. It should be noted that there are residents at the very top of this structure and it is the mass of municipal waste generated by them that dictates its functioning. The shaping of the municipal waste generation parameter is strongly linked to the affluence of society (Dyson, Chang, 2005), the adopted consumption model (Liu, Li, Gu, Wang, 2019), and most importantly, to the level of ecological awareness among residents (Desa, Kadir, Yusoooff, 2012), which is understood as a combination of information

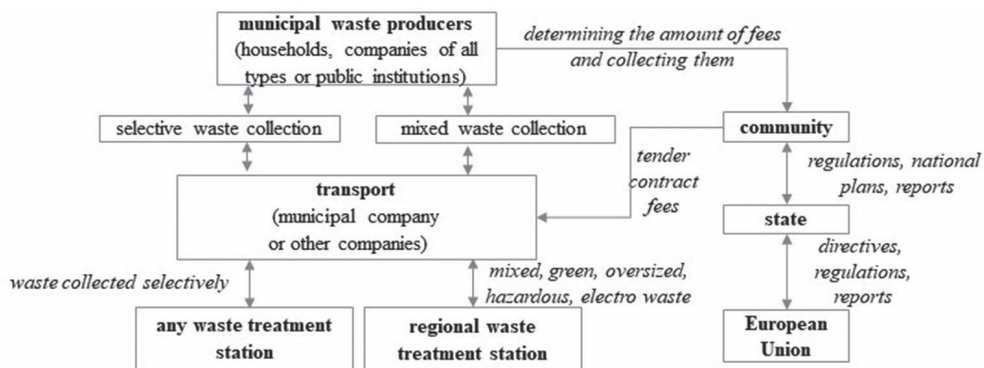


Fig. 2. Example of a simplified municipal waste management system

Source: own elaboration.

and beliefs about the natural environment and the perception of the relationship between the condition and character of the natural environment and the conditions and quality of human life (Burger, 1986). The basic components of ecological awareness, as implied by the literature review, are: ecological knowledge, expressed in the knowledge and understanding of the way human and nature coexist, ecological sensitivity, manifested in the form of an emotional attitude to nature; pro-ecological attitudes, i.e. actions taken to protect the natural environment (Kwiatek, Skiba, 2017). Knowledge in the area of ecology helps change human behaviour towards the environment (Ballantyne, Connell, Fien, 2006).

Therefore, one of the first stages of the transformation of an MWM system towards zero waste should be education and a high enough ecological awareness of residents. Environmental policy instruments such as surcharges and fines, are another solution that can support these activities.

#### 4. Ecological awareness of Gdynia residents in terms of transforming the municipal waste management system

There are 226,350 people living in the Gdynia City Commune (Polish: *Gmina Miasta Gdyni*). 94% of households (multi-family and single-family housings) state that they conduct selective waste collection (UM Gdynia, 2018). Unfortunately, this is not in any way reflected in the statistics (Table 1).

**Table 1.** Amount of municipal waste collected from the area of the Gdynia City Commune from residential real estates in 2014-2018

Specification	2014	2015	2016	2017	2018
Average amount of unsorted municipal waste per capita (kg/person/year)	232.22	238.86	219.23	221.23	229.49
Average amount of waste from selective collection per capita (kg/person/year)	39.01	38.99	46.25	50.20	53.78
Average amount of municipal waste per capita + green, oversized, ash waste (kg/person/year)	274*	282*	292	301	317
Percentage share of unsorted waste in the total amount of municipal waste (%)	85	85	75	73	72

\* Excluding green waste and ashes.

Source: own elaboration based on (UM Gdynia, 2014-2018).

It can be observed that the residents of the Gdynia City Commune collect increasingly more waste selectively, and the amount of generated mixed waste remains stable at a similar level. Having said that, the share of unsorted waste in the total amount of municipal waste generated (%) may be worrying. The disparity between the statements and the average amount of waste from selective collection

indicates a potential system loophole. In addition, there is a noticeable increase in the number of municipal waste per capita, which stood at 317 kg in 2018.

#### 4.1. Method

To achieve the formulated goal of the article, the decision was made to conduct a survey at source, that is among the residents themselves. The indirect measurement method (survey questionnaire) was chosen, which is characterized by the fact that a set of questions (together with suggestions) is directed directly to the respondents. The study was to verify the current state of ecological awareness among residents and their behaviour in the context of making Gdynia a zero-waste city, as well as to answer the following questions: are the residents of Gdynia ready to gradually introduce the zero waste concept? What kind of actions should be taken in order to prepare residents for this change?

The results of this study are part of a larger project whose task is to develop the scope of necessary changes to ensure the integrated management of municipal waste in Gdynia in a manner consistent with the concept of a zero-waste city.

#### 4.2. Participants

The survey was carried out between March and June 2019 and the sample consisted of 1,063 Gdynia residents, of which 500 were women (47%) and 563 were men (53%). The majority of the respondents were aged 45-65 (40.3%) or 25-44 (31.2%). Those over 65 years of age and up to 24 years of age constituted 21.5% and 7%, respectively. The sample is representative in terms of demographic variables, namely gender, age, education, and income. The maximum estimation error for a random sample of 1,063 people is  $\pm 3\%$ , and the level of significance is set at 5%. The sample was selected so that its composition corresponded to the actual structure of Gdynia residents.

#### 4.3. Instrument

The survey was conducted on the basis of a paper questionnaire that contained 30 statements on ecological awareness, including knowledge, behavioural and attitude awareness, emotional awareness, and four demographic questions. The questionnaire was divided into three thematic areas:

- general ecological problems,
- the MWM system, taking into account the situation in Gdynia,
- consumer attitudes and behaviour of Gdynia residents.

Respondents were asked to respond to each of the statements, meaning to determine the extent to which they agree with them (accept them, observe them). Just as in many other such studies, a Likert scale was used to examine ecological awareness. Attitude intensity was measured using a five-degree bipolar ordinal scale described verbally.



#### 4.4. Results

Table 2 shows the means, standard deviations (sd) and total percentages (SA+A) of Gdynia residents' responses for each statement. It was assumed that the level of ecological awareness corresponds to the obtained mean value (where 1-2.33 is low, 2.34-3.66 is medium, and 3.67-5.00 is high).

**Table 2.** Mean score, standard deviation and total percentage “strongly agree (sa)” and “agree (a)”

Item	Statement	Mean	Sd	Total% (SA+A)
1	2	3	4	5
1	I am concerned that the state of nature has deteriorated globally over the past few years.	4.37	0.91	83
2	Unless there is a radical change in the thinking of governments, businesses and society, we will soon experience a major environmental disaster.	3.61	0.99	65
3	Human combustion of fossil fuels (oil, coal, gas) contributes to the greenhouse effect.	4.00	0.98	76
4	I am worried that the population of wild animal species has drastically decreased over the past few decades.	3.54	0.96	62
5	I do not see any real environmental problems resulting from rapid economic growth, because it only brings benefits.*	3.22	1.05	53
6	We consume the Earth's resources faster than nature can renew them.	3.81	0.93	68
7	Excessive consumerism leads to increased rainfall.	4.22	0.97	76
8	Microplastics have a degrading effect on flora and fauna.	4.09	0.90	81
9	I am completely opposed to measures that would force the industry to use recycled materials if this made products more expensive.*	2.95	0.98	31
10	Man, through his individual actions, has an impact on the state of natural resources.	3.78	1.05	72
Overall (1-10)		3.76	0.05	67
11	Selective collection of municipal waste in households should be made mandatory.	3.22	0.94	41
12	Waste from selective collection is subject to reprocessing.	3.92	0.89	69
13	I always know how to sort waste and which container to throw it into.	2.58	1.02	32
14	There is a need to reduce the production of municipal waste, as incineration plants cannot solve the problem of their increasing amount.	2.97	0.97	31
15	When throwing away waste, I have not noticed that containers for plastics were overfilled.	2.23	1.21	34

Table 2, cont.

1	2	3	4	5
16	In the Gdynia MWM system, metals and plastic go into the same container.	4.12	0.85	81
17	I think that getting rid of used electronic equipment and bulky waste without extra fees is a bad solution because people often throw away good and working items.	2.44	0.91	32
18	I know where to give away or resell fully-comestible food, unnecessary clothes, good furniture and working appliances.	2.99	1.09	33
19	The current fee system in Gdynia does not encourage the minimization of municipal waste.	3.52	1.12	57
20	I am satisfied with the current functioning of the Gdynia waste management system.	3.37	1.06	54
Overall (11-20)		3.14	0.11	46
21	Sadly, I must admit that too much food is wasted in my household.*	2.13	0.81	90
22	When going shopping, I make a list of products I need so I don't buy too much.	2.45	1.32	19
23	When buying products by weight, I avoid packing them in plastic bags (I carry my own packaging, i.e. fabric bags, reusable containers, jars).	3.09	1.23	40
24	When shopping, I use reusable bags.	3.56	1.25	65
25	When shopping, I try to choose products without packaging or choose products that can be returned or reused.	2.89	1.06	21
26	I do not buy water in disposable bottles (I drink tap water or use reusable bottles).	3.45	1.08	51
27	I try to repair broken devices instead of getting new ones.	2.96	1.55	46
28	I buy products that have a long useful life and that can be repaired or recycled.	2.83	1.04	34
29	I give or sell items for reuse.	3.22	0.91	46
30	I try to limit the buying of new clothing and footwear (e.g. by exchanging with friends or using second-hand stores).	2.89	1.52	42
Overall (21-30)		2.96	0.23	45
Overall (1-30)		3.36	0.17	53

\* Reversed coded items.

Source: own elaboration.

Table 3 shows the percentage share of SA and A responses for each of the statements from the categories of knowledge, behavioural and attitude awareness, and emotional awareness.

**Table 3.** Share of “sa + a” responses including the examined elements of ecological awareness

General ecological problems			
	0.0-39.9%*	40.0-69.9%**	70.0-100%***
Knowledge		2, 5, 6	3, 7, 8
Behavioural and attitude awareness	9		10
Emotional awareness		4	1
Municipal waste management system			
	0.0-39.9%*	40.0-69.9%**	70.0-100%***
Knowledge	13, 14, 18	12, 19	16
Behavioural and attitude awareness	15, 17	11	
Emotional awareness		20	
Consumer attitudes and behaviour			
	0.0-39.9%*	40.0-69.9%**	70.0-100%***
Knowledge			
Behavioural and attitude awareness	22, 25, 28	23, 24, 26, 27, 29, 30	
Emotional awareness			21

\* Done reluctantly/rarely; \*\* done/occurred to a moderate medium degree; \*\*\* done/occurred frequently.

Source: own elaboration.

## 5. Discussion

Looking at the obtained results, it can be said that the ecological awareness of Gdynia residents in the context of transforming the MWM system consistent with the zero waste concept is at an average level – standing at 53%. Meanwhile, the thematic area of general ecological problems has a high level of awareness (3.76). On average, 67% respondents agreed with the proposed statements, while as many as 83% are concerned about the deteriorating condition of the natural environment. On the other hand, the respondents' knowledge of general ecological problems is at a fairly good level. However, emphasis should be put on making residents aware that rapid economic growth, excessive consumerism, which entails the depletion of resources and the growing mass of waste (76%), are responsible for the planet's environmental problems. It is also worrying that only 31% of respondents see the need for implementing solutions that would force the industry to use recycled materials that could increase products' prices. In the second thematic area (the MWM system, taking into account the situation in Gdynia), the respondents demonstrated an average level of ecological awareness (3.14). To raise this, educational and informative measures should be implemented in the area of correct segregation – types of waste, their thermal transformation, the possibility of giving away or reselling fully-comestible food products, unnecessary clothes, furniture in good condition or working appliances, making residents aware that any item they throw away has a negative impact on the environment. Here, such actions should be initiated by entities responsible for waste

management at central level (Ministry of the Environment) as well as at local level (City Hall's Department of the Environment). The last area concerned respondents' shopping behavior and attitudes. In this case, the participants also scored an average level of awareness, albeit with a clearly lower mean value – 2.91. It is precisely in this area that large-scale solutions should be adopted to change the behavior of both consumers and manufacturers. Examples of such measures include additional fees, fines, or higher prices of packaged products that are harmful to the environment.

A good example are cities in which the assumption of the concept of “zero waste” was successfully implemented. These include Capannori, in which the level of selective collection increased to 82% (with a 39% decrease in the amount of waste generated) over the past six years. Another example is Parma, where in four years the amount of waste that went to landfills or incineration plants was reduced by 60% (Mesjasz-Lech, 2018).

## 6. Conclusion

The problems of modern cities, such as increasing population, urbanization, overcrowding, limited natural resources, excessive consumerism, waste of resources and the growing mass of municipal waste, prompt the need to seek solutions that can solve them, either comprehensively or at least partly. An example of such a solution may be the “zero waste” concept, which proposes an integrated approach to contemporary civilization changes and whose postulates perfectly fit into the specificity and problems of cities. This includes an MWM system based on the concept's main principles, whose proper functioning rests to a large extent on the residents themselves: they decide what will become waste, how much they will produce, and how it will be sorted. The aim of the article is to examine ecological awareness among residents and their behaviour in the context of making of Gdynia a zero-waste city. A survey involving 1,063 Gdynia residents was conducted on the basis of a paper questionnaire, which contained 30 statements covering the topics of knowledge, behavioural and attitude awareness, and emotional awareness. Attitude intensity was measured using a five-point Likert scale. In addition, the survey questionnaire was divided into three thematic areas: general ecological problems, the MWM system, and consumer attitudes and behavior. The results were later analyzed and interpreted, revealing that respondents showed a moderate level of ecological awareness.

To sum up, as a result of the analysis it was found that Gdynia residents are not yet ready to incorporate the zero waste concept into the city's MWM system. However, there should be more emphasis placed on changing consumer behaviour and education in the area of correct waste segregation and the environmental problems threatening the planet.

Therefore the recommended measures should be implemented first, after which the residents' level of ecological awareness should be measured again.

The conducted research will be further analysed in order to determine possible correlations between age, gender, education, income and ecological awareness.

## Bibliography

- Ballantyne, R., Connell, S., and Fien, J. (1998). Students as catalysis of environmental change: a framework for researching intergenerational influence through environmental education. *Environmental Education Research*, (4), 285-298.
- Borsa, M. (2014). Zrównoważony metabolizm miejski w scenariuszach rozwoju aglomeracji warszawskiej. *Przegląd Urbanistyczny*, VIII, 12-14.
- Burger, J.M. (1986). Increasing compliance by improving the deal: the that's-not-all technique. *Journal of Personality and Social Psychology*, 51(2), 277-283.
- Chalmin, P., and Gaillochet, C. (2009). *From Waste to Resources*. Paris: Veolia & Cyclope.
- Desa, A., Kadir, N.A., and Yusoooff, F. (2012). Environmental awareness and education: a key approach to Solid Waste Management (SWM) – A case study of a University in Malaysia. *Waste Management*, (5), 101-112.
- Dyson, B., and Chang, N.B. (2005). Forecasting municipal solid waste generation in a fast-growing urban region with system dynamics modelling. *Waste Management*, (25), 669-679.
- Global Footprint Network. (2016). National Footprint Accounts, 2016 Edition. Retrieved from [www.footprintnetwork.org](http://www.footprintnetwork.org)
- Hannon, J., and Zaman, A.U. (2018). Exploring the phenomenon of zero waste and future cities. *Urban Science*, 2(3), 90.
- Hoorweg, D., Bhada-Tata, P., and Kennedy, C. (2014). Peak waste: When is it likely to occur? *Journal of Industrial Ecology*, (19), 117-128.
- Kwiatk, A., and Skiba, M. (2017). Świadomość ekologiczna młodych ludzi. *Zeszyty Naukowe Politechniki Częstochowskiej, Zarządzanie*, 28(2), 127-136.
- Lehmann, S. (2010). Resource recovery and materials flow in the city: zero waste sustainable consumption as paradigms in urban development. *Sustainable Development Law and Policy*, (11), 28-38.
- Liu, J., Li, Q., Gu, W., and Wang, Ch. (2019). The Impact of Consumption Patterns on the Generation of Municipal Solid Waste in China: Evidences from Provincial Data. *International Journal of Environmental Research and Public Health*, (16), 1717.
- McKinsey Global Institute. (2012). Urban World: Cities and the rise of the consuming class. Retrieved from <https://www.mckinsey.com>.
- Mesjasz-Lech, A. (2018). Filozofia zero odpadów a strategię środowiskowe miast. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie*, (127), 133-134.
- Olivier, J., Schure, K., and Peters, J. (2017). *Trends in Global CO<sub>2</sub> and Total Greenhouse Gas Emissions*. Hague: PBL Netherlands Environmental Assessment Agency.
- Ramsar. (2012). Background and context to the development of principles and guidance for the planning and management of urban and periurban wetlands. Retrieved from: <http://ramsar.org>.
- Song, Q., Li, J., and Zeng, X. (2014). Minimizing the increasing solid waste through zero waste strategy. *Journal of Cleaner Production*, (104), 199-210.
- The World Bank. (2012). What a waste: A global review of solid waste management World Bank. Retrieved from: <https://openknowledge.worldbank.org>.
- UM Gdynia. (2014-2018). Analiza stanu gospodarki odpadami komunalnymi na terenie Gminy Miasta Gdyni. Retrieved from: <https://www.gdynia.pl/bip>.
- UN. (2016). The World's Cities in 2016. Retrieved from: <https://www.un.org>.
- WWF. (2016). Living Planet Report. Risk and resilience in a new era, <http://wwf.panda.org>.
- Zaman, A.U., and Lehmann, S. (2013). The zero waste index: a performance measurement tool for waste management systems in 'zero waste city'. *Journal of Cleaner Production*, (50), 123-132.