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Teachers' Views About Turkey's Zero Waste Project (TZWP)

Ahmet Volkan Yüzüak[1], Sinan Erten[2]

[1]*Bartın University, Faculty of Education, Turkey ORCID ID: 0000-0002-4712-0259*
[2]*Hacettepe University, Faculty of Education, Turkey ORCID ID: 0000-0001-9546-2387*

ABSTRACT
The Zero Waste Project is likely to solve waste problems. This research aims to specify the opinions of teachers regarding Turkey's Zero Waste Project (TZWP). This study was carried out in the 2019-2020 academic year, with 126 participating teachers working in various disciplines, such as science, math, and social sciences, in the primary and secondary public schools. The semi-structured interview was used as a method in this research that covered qualitative data techniques. The obtained data was studied by using descriptive analysis. However, this study's findings suggested that most teachers did not know anything about the project implemented for four years. It was seen that teachers were not well-informed about or ignorant of zero waste. The educators are needed to achieve the goals of TZWP. Thus, it is suggested that environmental education be included in various disciplines and raise environmental awareness among individuals should become one of national education's primary objectives. It is a must, too, for all teachers and teacher candidates to develop environmental awareness.

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Introduction

Twenty years after the Stockholm Conference on the Human Environment, the United Nations Conference on Environment and Development was held in Rio de Janerio in 1992, focusing on international environmental issues. The government delegations reviewed all chapters of an agreement known as Agenda 21, a program approved by 177 governments for a global partnership towards sustainable development (United Nations, 1992; 1972). Sustainable development is related to ecological sustainability, socio-economic equality, and improving environmental health. It can be broadly defined as living, producing, and consuming in a way that meets the need of the present without risking future generations' resources. It has become a principal in the 21st century—the concept of sustainable development has been widely accepted following the World Commission on Environment and Development report. However, the governments are not the only ones to be regarded as liable for a sustainable future (WCED, 1987). The zero-waste concept has now become a movement (Kollikkathara et al., 2009, Matete & Trois, 2008).

Since the beginning of industrialization activities, human beings have devastated the environment, exploited the natural resources and consumed nature continuously and without mercy. The rising human population's consumption patterns have changed globally, and environmental problems have grown in number accordingly. Some of these ecological problems can be listed briefly as population growth, air pollution, water pollution, soil pollution, noise pollution and light pollution, animal and plant species' disappearance, global warming, climate change, and waste problems. The natural resources have increasingly been exploited; therefore, vast quantities of different types of solid wastes are being generated. Solid Waste Management (SWM) is a significant challenge for

administrators, engineers, and planners today. SWM includes activities related to generation, storage, collection, reuse, and recycling. Solid waste can be categorized as municipal waste, industrial waste, agricultural animal waste and hazardous waste (Erten 2003; Escobar 1995; Guerrero et al., 2013; Minghua et al., 2009; Rees 1992; Nag & Vizayakumar, 2005). The pattern of waste management as a way to minimize waste is shown in Figure 1.

Figure 1

Waste Management Hierarchy (EPA, 2020)

The principle of waste management lies in 3R: Reduction, Reuse and Recycling. SWM systems are needed to minimize the amount of waste generated, maximize reusability and recycling, and dispose of the remaining waste. The amount of garbage generated by today's human populations is growing enormously day by day, and much of it contains non-biodegradable plastics or toxic chemicals. For example, the total generation of municipal solid waste (MSW) or household waste in 2017 was 267.8 million tons in the USA. Of the MSW generated, nearly 67 million tons were recycled, and 27 million tons were composted. Municipal waste, which covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, as well as yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste if managed as household waste, is defined as waste collected and treated by or for municipalities (EPA, 2020; OECD, 2020).

Changes in lifestyle and consumption and the resulting impacts on the environment led to increased calls for strategies (Stern, 2006). "Almost all national energy plans or projects include four vital factors to sustain benefit from energy: the increased harnessing of renewable supplies, increased efficiency of supply and end-use, reduction in pollution and consideration of lifestyle" (Twidell & Weir 2006:4). Zero waste has now been implemented in different countries, i.e., New Zealand, China, India, Nova Scotia (Canada) and Western Australia (Greyson, 2007). The concept of precycling is a crucial way to reduce waste. EPA has emphasized that precycling is the preferred method of integrated solid waste management since it cuts waste at its source. The trash will be eliminated before it is created. It also refers to the reduction of household garbage. Consumers can diminish the amount of garbage by buying products that need less or no packaging and using recycled materials and reused products (Gillilan, Werner, Olson & Adams, 1996). Curran and Williams (2012, p.4) have cited ZeroWIN (Towards Zero Waste in Industrial Networks) as a consortium that defines zero waste as below:

> "A goal that is both pragmatic and visionary, to guide people to emulate sustainable natural cycles, where all discarded materials are resources for others to use. Zero waste means designing and managing products and processes to reduce the volume and toxicity of waste and materials as close to zero as possible, conserve and recover all resources and not burn or

bury them. The successful implementation of zero waste will eliminate all discharges to land, water or air that may be a threat to planetary, human, animal or plant health…"

Zero Waste in Turkey

Dr. Paul Palmer first used the term "zero waste" to refer to recovering resources from chemicals in 1973 (Palmer, 2004). The concept of zero waste was implemented in numerous provinces and nations such as California, Canada, South Australia, Victoria (Greyson, 2007). Turkey's Zero Waste Project (TZWP) has been launched by the Ministry of Environment and Urbanization (MoEU) in 2017 under sustainable development principles that focus on controlling wastes and leaving a cleaner and a more habitable world for future generations. TZWP increases efficiency, raises awareness of sustainability and enhances its prestige while decreasing environmental risks (MoEU, 2017a; Zero Waste, 2019). The aims of TZWP are illustrated in Figure 2.

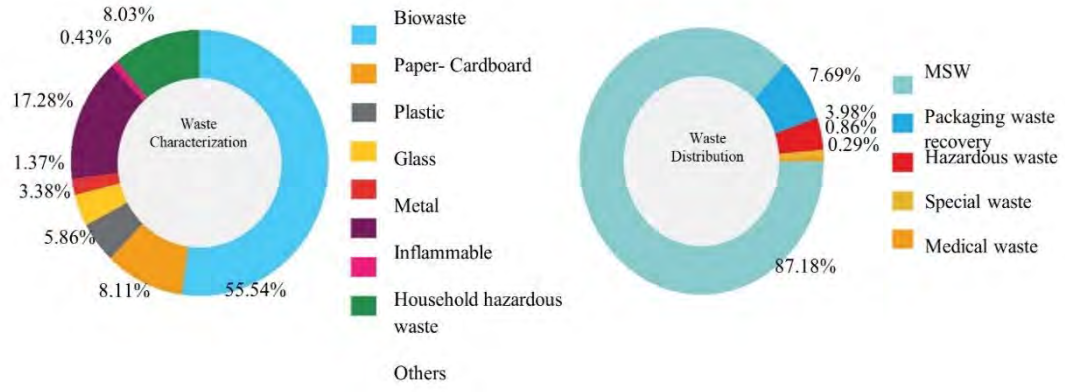
Figure 2

Aims of the TZWP

Performance and efficiency will have to rise as costs and environmental risks reduce to attain this goal. TZWP also aims to save $20M annually. The steps to install the zero waste system are determining focal points and current situation, planning, identifying needs and supplies, education and awareness, application, and reporting (MoEU, 2017a). Turkey aims to dispose of 35% of the existing waste by recovery and 65% by regular storage in 2023. Hence, the country seeks to separate packaging waste at its source and raise it to 12% in 2023 from 5.3% in 2014. Municipal waste is expected to recover by using biological methods from 0.2% in 2014 to 4% in 2023. By using mechanical biological processes, municipal waste is expected to recover from 5.4% in 2014 to 11% in 2023. Furthermore, it is foreseen that the municipal waste will be recovered by thermal methods from 0.3% in 2014 to 8% in 2023. Finally, municipal waste will also be recovered and decreased from 88.7% in 2014 to 65% in 2023 by waste storage method. In Figure 3, Turkiye's waste characterization is illustrated (MoEU, 2017b).

Figure 3

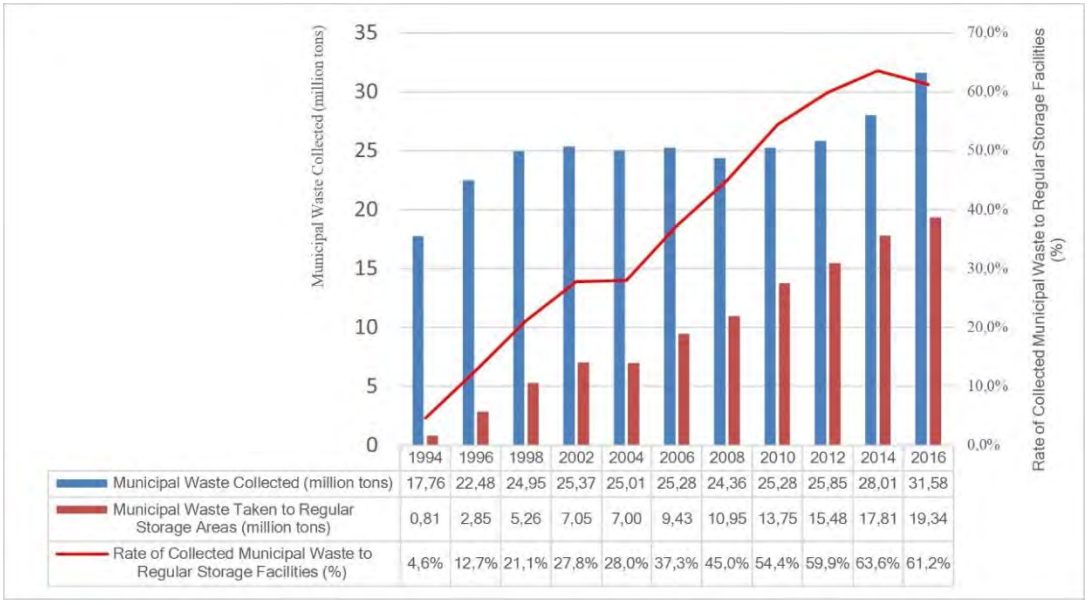
Turkiye's Waste Characterization and Waste Distribution in 2014



MSW (87.18%) is the most generated type of waste in Turkey, and the other 12.82% is packaging waste, medical waste, hazardous waste, and particular waste. These data do not include construction waste, earthmoving, and mining sectors' waste (MoEU, 2017b). For the European Union - 28 countries (2013-2020), MSW generated in terms of kilograms per capita is 492 kg, and for Turkey, it is 424 kg for 2018. The European Union - 28 countries' (2013-2020) MSW generated in terms of kilograms per capita is 483 kg, and for Turkey, it is 426 kg for 2016 (EUROSTAT, 2020). The amount of MSW collected and regular storage by years is shown in Figure 4.

Figure 4

Amount of Collected MSW and Regular Storage Rate by Years



	1994	1996	1998	2002	2004	2006	2008	2010	2012	2014	2016
Municipal Waste Collected (million tons)	17,76	22,48	24,95	25,37	25,01	25,28	24,36	25,28	25,85	28,01	31,58
Municipal Waste Taken to Regular Storage Areas (million tons)	0,81	2,85	5,26	7,05	7,00	9,43	10,95	13,75	15,48	17,81	19,34
Rate of Collected Municipal Waste to Regular Storage Facilities (%)	4,6%	12,7%	21,1%	27,8%	28,0%	37,3%	45,0%	54,4%	59,9%	63,6%	61,2%

The waste amounts stored increased in years. 61.2% of 31.6 million tons of waste collected in municipalities was sent to common storage areas, 28.8% of it was sent to municipal dumps, and 9.8% was collected in recycling facilities. 0.2% of waste was disposed of by burning, burying and pouring it into streams or land (TurkStat, 2017). Table 1 illustrates the MSW statistics in 2016 and 2018.

Table 1

MSW Statistics in Turkey

Aims	2016	2018
Total number of municipalities	1 397	1 399
Total number of municipalities providing waste service	1 390	1 395
The ratio of the municipal population providing waste service to total municipal population	98.6	98.8
The amount of waste collected (thousand tons)	31 584	32 209
The average amount of waste per capita		
The ratio of collected waste according to disposal and recycle methods		
Regular storage	61.2	67.2
Municipal dumpster	28.8	20.2
Recycling facilities	9.8	12.3
Other disposal techniques	0.2	0.2

According to the results of the 2018 Municipality Waste Statistics Survey applied to all municipalities, 1395 of 1399 towns were found to provide waste services. The average daily waste collected per capita was calculated as 1.16 kg. 67.2% of 32 million tons were sent to regular storage facilities (TurkStat, 2019). In an about one-year period in which the project was being implemented, 2.2 million tons of packaging waste, 58,000 tons of waste electrical and electronic goods, 38,000 tons of vegetables and 80,000 tons of mineral waste oil, 184,000 tons of waste rubbers at source were collected separately and recycled (Zero Waste, 2019).

TZWP, run by the Ministry of Environment and Urbanization (MoEU), can solve the waste or garbage problem, one of many other persisting environmental issues. Individuals can learn about this solution through education; therefore, this issue should be taken seriously and involved in education programs. Beyond any doubt, teachers, one crucial element of knowledge and the education system, are essential in maintaining education. Though not being included in the curriculum under this name, TZWP is directly or indirectly associated with various units, and the Ministry of National Education expects the studies and reports to link to this project regularly. It is related to teachers to provide students with desired behaviours as part of this curriculum and program. Therefore, the teachers' views on the program (to be) applied are directly related to the successful implementation.

Increasing awareness of sustainable development is one of the main objectives of Turkish science education curriculum (MoNE, 2018). This study was meant to reveal which problems concern TZWP, develop suggestions to make the project more efficient, and promote an environmentally friendly attitude in our society. The review was to determine whether the teachers have a formal education covering TZWP, what they know about this project, what activities they do, how much they understand the project's purpose, and what they think about it.

Methods

This is qualitative research in which a case study was used. This research aims to find out the opinions of the Turkish teachers on the zero-waste project. Open-ended questions designated by the researchers were asked to collect data. The case study allows teachers to examine a phenomenon or event that the researcher cannot control, based on their thoughts on the zero-waste project and how and why questions. Semi-structured interviews were held with teachers to gain an insight into the situation.

Working Group

Participants were selected according to purposeful sampling for a better collection of in-depth data, and those practicing the teaching profession were chosen under this sampling (Patton, 2014). The study group of the research included 126 Science and Math Teachers and Social Science Teachers (Informatics-Technology Design-English-Physical Education-Religious Culture and Moral Knowledge-Turkish-Literature-Music) who work in various disciplines in the primary and secondary public schools of the Eastern, Central and Southeastern Regions of Turkey. 21% of the teachers of this study group are male, while 79% are female. No data on the gender, age, hometown, and family status was needed for and included in this study. The teachers from the study group of this research voluntarily participated in this research.

Gathering Data

A semi-structured interview was used to gather data during this study that was carried out to determine teachers' opinions about the zero-waste project. The questions were read by three teachers and two field experts for the clarity. The semi-structured interview starts with the questions that had been previously prepared by the researchers. It is a method in which the researcher can ask the participants independent questions. Here, the researcher can ask or add items if he/she considers it necessary. There are no certain standard time limits. The data of the research were collected in the fall semester of 2019. A questionnaire for an interview was prepared to obtain the views of teachers. After finalizing this interview questionnaire, a pilot study was started and carried out, and necessary corrections were reflected in the questions. Ten questions were asked, three of which were removed after the pilot study. Problems with comments were added and asked at the end of the interview.

Data Analysis

The descriptive analysis method was used to examine the qualitative data obtained during the research. Techniques such as transcribing speech texts and limiting the answers received are used to determine the results in descriptive and systematic analysis systematically. Frequency and percentage calculations were performed as part of descriptive analysis. In the research, a framework was developed under descriptive analysis and the findings were interpreted.

Findings

Table 2 indicates the participants' breakdown by a particular teaching profession: Science and Math Teachers and Social Science Teachers (Informatics-Technology Design-English-Physical Education-Religious Culture and Moral Knowledge-Turkish-Literature-Music).

Table 2

Questions and Answers Related to TZWP

Questions and answers	Science and Math Teachers		Social Science Teachers		Total	%
1. Do you know TZWP?		%		%		
Yes, I do.	30	38	39	90.7	69	56.6
No, I do not.	49	62	4	9.3	53	43.4
2. Did you ever participate in meetings that inform about TZWP?						

Yes, I did.	14	17.7	3	7.0	17	13.9
No, I did not.	65	82.3	40	93.0	105	86.1
3. Which institution/organization is responsible for this project?"						
I do not know	43	54.4	10	23.8	53	43.8
Ministry of National Education	0	0.0	2	4.8	2	1.7
Ministry of Environment and Urbanization	22	27.8	25	59.5	47	38.8
Ministries	0	0	1	2.4	1	0.8
the Turkish Presidency	14	17.7	4	9.5	18	14.9
4. What does the "zero waste " project mean?						
I know what it means	39	67.2	7	16.3	46	45.5
I do not know	13	22.4	12	27.9	25	24.8
The person gave the wrong answer.	6	10.3	24	55.8	30	29.7
5. Did you hear about any work (being) done under TZWP at school?"						
Such works were being carried out	18	32.7	28	49.1	46	56.1
Works were being done to seperate the garbage	16	29.1	13	22.8	29	43.9
They did not know what these works were for.	2	3.6	6	10.5	8	12.1
Related works were not being done	19	34.5	10	17.5	29	43.9
6. What is the aim of TZWP?						
Environmental protection	54	57.4	35	66.0	89	60.5
Financial concern	40	42.6	18	34.0	58	39.5
7. Under what lesson(s) were works related to the project being done?						
Science lesson	12	26.1	22	40.0	34	33.7
Other subjects	23	50.0	21	38.2	44	43.6
No information related to the project.	11	23.9	12	21.8	23	22.8
Total	79		43	122.0	122	

In Table 2,

- *1st question*: "Do you know TZWP?"

38% of math-science group teachers said they knew this project, while 62% were ignorant of this project. 90.7% of social sciences teachers were found to hear about the project, while the remaining 9.3% expressed that they heard about it. Generally, as seen in the table, 56.6% of all teachers knew this project, while 43.4% did not.

- *2 nd question*: "Did you ever participate in meetings that inform about TZWP?"

17.7% of math-science group teachers answered yes, whereas 82.3% answered no. 7% of teachers in the social science group answered yes, and 93% said no. Of all teachers, 13.9% answered yes, while 86.1% answered no.

- 3 rd question: "Which institution/organization is responsible for this project?"

54.4% of math-science group teachers said: "I do not know." In comparison, 27.8% and 17.7% of the group said it was the Ministry of Environment and Urbanization and the Turkish Presidency responsible for this project, respectively. 23.8% of social science teachers said: "I do not know." In comparison, 4.8%, 59.5%, 2.4%, and 9.5% of the group said it was the Ministry of National Education, the Ministry of Environment and Urbanization, the Ministries, and the Turkish Presidency. 43.8% of the teachers were found to have no idea about this project. 1.7% of the teachers said the Ministry of National Education, 38.8% said the Ministry of Environment and Urbanization, 0.8% said the Ministries, and 14.9% said the Turkish Presidency in response.

- *4 th question*: "What does "the zero waste project" mean?"

67% of math-science group teachers said, "I know what it means," while 22.4% of math-science group teachers said they did not know the meaning, and 10.3% of math-science group teachers

gave the wrong answer. 16.3% of social science teachers said, "I do not know," and 27.9% of them told them that they knew the meaning, and 55.8% had the wrong word. It was understood that 45.5% of the teachers did not know the right answer, 24.8% of them knew the meaning, and 29.7% answered it wrong.

- *5 th question*: "Did you hear about any work (being) done under TZWP at school?"

32.7% of the mathematics-science teachers said that such works were being carried out, while 29.1% said these works were being done to separate the garbage, 3.6% said they did not know what these works were for, 34.5% said related works were not being done. 49.1% of social science teachers said that such works were being carried out, 22.8% said that these works were done to separate the garbage, 10.5% were of another opinion, 17.5% said related works were not being done. 56.1% of all teachers answered that related works were being carried out, 43.9% said that these works were being done to separate the garbage, 12.1% were of another opinion, and 43.9% said related works were not being done.

- *6 th question:* What is the aim of TZWP?

57.4% of mathematics-science teachers said the protection of the environment, and the other 42.6% said that it had been done due to financial concerns. 66% of social sciences teachers said the aim was to protect the environment, while the remaining 34% said it had been done due to financial concerns. In brief, 60.5% of all teachers said it was protecting the environment, while 39.5% expressed that it had been done due to financial concerns.

- *7 th question*: Under what lesson(s) were works related to the project being done?

26.1% of the mathematics-science group teachers said they were being done under science while 50% of the teachers said 'under other subjects.' 23.9% said they knew no word about it. 40% of verbal group teachers answered as 'under science' whereas 38.2% said they were being carried out as part of other subjects. 21.8% said they did not know any answer to this question. 33.7% of all teachers answered as science, while 43.6% said 'under other subjects' and 22.8% knew no word.

Discussion and Conclusion

In this part of the research, the findings from the analysis of teachers' answers to open-ended questions regarding the zero-waste project will be discussed. Environmental problems draw global attention. Human activities generate waste materials. Hence, waste management has become one of the most critical issues. According to zero waste management, the first target is to prevent and reduce waste while producing it. The primary goal for consumers should be to reduce waste production individually. In doing so, both resources are conserved, saved, and environmental problems are prevented (Zero Waste, 2019). The reasons why 38% of teachers from the mathematics-science group were aware of the "Zero Waste" project, while 90.7% of verbal teachers were mindful of the zero-waste works are as below:

1. Technology design teachers were coordinating these works, and
2. The subject of zero waste was not handled in the primary schools.

In general terms, it was seen that 56.6% of all teachers knew this project, while 43.4% were found to be unaware of this project. Even though many researchers in many parts of the world are working on environmental consciousness and attitude as part of environmental education (Ahmad et al., 2020; Jain et al., 2020; Tekbiyik, & Celik, 2019; Kautiish et al., 2019; Sánchez-Llorens et al., 2019; Xiong, 2020; Uzun et al., 2019; Aydos & Yağcı, 2015) behaviour is related to zero waste is not at the desired level.

Recycling is one step towards zero waste but informing consumers about its significance will encourage individual recycling involvement (Austin et al., 1993, Thogersen, 1994, Nyamwange, 1996). 17.7% of the mathematics-science group teachers were informed about the "Zero Waste" project, while it was 7% among teachers of verbal lessons. 13.9% of all teachers answered yes, and 86.1% answered no. It was understood from these results that teachers were not informed about zero waste. How can this project's goals be achieved if most teachers do not know (about the significance of) this project?

The Minister of Environment and Urbanization stated that TZWP is a project on sustaining austerity and efficiency during the summit. 2.2 million tons of packaging waste, 58,000 tons of waste electrical and electronic equipment, 38,000 tons of waste vegetables and 80,000 tons of mineral waste oil, 184,000 tons of end-of-life tires were collected separately and recycled in one year. We have refunded 3.5 billion TR out of these works. Our goal is to extend this practice to the whole country with the Zero Waste Regulation that we will publish in the coming days" (Zero Waste Summit, 2018). Zero waste awards could be given to schools that do exciting studies on this subject, rather than large companies or well-known institutions. Practising includes preventing raw material waste and energy consumption, collecting waste separately at the source, and ensuring recycling. Even though panels about "Zero Waste Good Practice Examples," "Reflections of Zero Waste Practices into the Sector," and "Social Dimension of Zero Waste Management" have been held, a more critical panel for "Education for zero waste" is still out of scope. The Zero Waste Summit was held with the broad participation of members and representatives of public and local administrations, the private sector, foreign missions, non-governmental organizations, and media.

Regarding which institution/organization is responsible for this project, 43.8% of the teachers were found to have no idea. When asked the question, "What does "Zero Waste" project mean / what do you understand from it?" 45.5% of teachers said they did not know; 24.8% knew, while 29.7% said they knew the project in wrong terms. As for the opinion of teachers about the works (being) done at school as part of this project; 56.1% of the teachers said that works were being done, 43.9% of them said that works were done to sort out garbage, 12.1% of them said these works were being done for other purposes, and 43.9% of them said no works were being performed. Eco-centric and anthropocentric approaches hint about the ethical understanding of human beings towards nature. Materialist thinkers represent human-anthropocentrism, whereas abstract thinkers think along eco-centric lines (Thomson & Barton, 1994; Kortenkamp & Moore, 2001). Consistent with Erten and Aydogdu's (2011) study, teacher candidates exhibit anthropocentric attitudes in Turkey.

Placing more pressure on natural resources and disrupting the world's balance highlight the efficient use of natural resources and the importance of resource loss. Therefore, in recent years, practising zero waste has become widespread both individually, institutionally, and throughout municipalities. In this study, since waste is concerned, the reasons and consequences are briefly emphasized: consumer society, splurge behaviour, not recycled waste in an efficient way, and lack of education (Erten, 2003).

The concept of zero waste is an effective way to solve the municipal concrete waste problem, and recycling lies at the center of the zero-waste project. Individual production of wastes and garbage was not mentioned, however. Also, raising mindful consumers is being highlighted while the term 'consumer society' is not addressed. Limited resources are targeted. However, it is not stressed that more than 80% of our energy needs are imported, and the emissions sent out in energy production cause all environmental problems. The zero-waste project cannot be fully accomplished unless we bring environmental awareness to the new generations. We do not inherit the earth from our ancestors; we borrow it from our children.

Adopting environmentally friendly attitudes is essential in solving waste problems that cause environmental issues. The necessary tool for this rests with environmental education. Environmental education should be included in supra-disciplinary books and providing individuals with environmental awareness should become one of the main objectives of the education system. Likewise, all teachers and teacher candidates should be equipped with ecological awareness because this is the only possible way to raise individuals with environmental awareness.

References

Ahmad, W., Kim, W. G., Anwer, Z., & Zhuang, W. (2020). Schwartz personal values, theory of planned behavior and environmental consciousness: how tourists' visiting intentions towards

eco-friendly destinations are shaped? *Journal of Business Research*, *110*, 228-236. https://doi.org/10.1016/j.jbusres.2020.01.040

Austin, J., Hatfield, D., Grindle, A. & Bailey, J. 1993. Increasing recy-cling in office environments – the *effects of specific informativecues. Journal of Environmental Systems, 6, 355–368.* https://doi.org/10.1901/jaba.1993.26-247

Aydos, E., & Yağcı, E. (2015). Examination of the teacher candidates' environmental attitudes via NEP scale in terms of different variables. *Journal of Education in Science Environment and Health*, *1*(1), 20-27. https://www.jeseh.net/index.php/jeseh/article/view/3.

Curran, T., & Williams, I. D. (2012). A zero waste vision for industrial networks in Europe. *Journal of hazardous materials*, *207*, 3-7. https://doi.org/10.1016/j.jhazmat.2011.07.122

EPA/ United States Environmental Protection Agency, (2020). National overview: facts and figures on materials. *Wastes and Recycling,* https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials.

Erten, S. & Aydogdu, C. (2011). The ecocentric, anthropocentric and antipathetic attitudes toward environment in Turkish and Azerbaijani students. *Hacettepe University Journal of Education, 41*, 158-169.

Erten, S. (2003). By the study of a teaching model on development of awareness on "garbage reduction" for the fifth class students. Hacettepe University Journal of Education, 25, 94-103.

Escobar, A. (1995). *Encountering development: the making and unmaking of the third world.* Princeton: Princeton University Press.

EUROSTAT. (2020). *Municipal waste by waste management operations*, https://ec.europa.eu/eurostat/tgm/download.do?tab=table&plugin=1&language=en&pcode=cei_pc031.

Gillilan, S., Werner, C. M., Olson, L., & Adams, D. (1996). Teaching the concept of precycling: a campaign and evaluation. *The Journal of Environmental Education, 28*(1), 11-18. https://doi.org/10.1080/00958964.1996.9942810

Greyson, J. (2007). An economic instrument for zero waste, economic growth and sustainability. *Journal of Cleaner Production, 15*, 1382–1390. https://doi.org/10.1016/j.jclepro.2006.07.019

Guerrero, L.A., Maas, G., & Hogland, W. (2013). Solid Waste Management Challenges for Cities in Developing Countries. *Waste Management*, *33*(1), 220-232. https://doi.org/10.1016/j.wasman.2012.09.008

Jain, S., Singhal, S., Jain, N. K., & Bhaskar, K. (2020). Construction and demolition waste recycling: investigating the role of theory of planned behavior, institutional pressures and environmental consciousness. *Journal of Cleaner Production*, 1-11. https://doi.org/10.1016/j.jclepro.2020.121405

Kautish, P., Paul, J., & Sharma, R. (2019). The moderating influence of environmental consciousness and recycling intentions on green purchase behavior. *Journal of Cleaner Production, 228*, 1425-1436. https://doi.org/10.1016/j.jclepro.2019.04.389

Kollikkathara, N., Feng H., & Stern E. (2009). A purview of waste man-agement evolution: special emphasis on the USA. *Waste Management 29*, 974–985. https://doi.org/10.1016/j.wasman.2008.06.032

Kortenkamp, Katherine V., Moore & Colleen F. (2001). Ecocentrism and anthropocentrism: moral reasoning about ecological commons dilemmas. *Journal of Environmental Psychology, 21*, 261-272. https://doi.org/10.1006/jevp.2001.0205

Matete, N. & Trois, C. (2008). Towards zero waste in emerging countries– a south African experience. *Waste Management*, *28*, 1480–1492. https://doi.org/10.1016/j.wasman.2007.06.006

Minghua, Z., Xiumin, F., Rovetta, A., Qichang, H., Vicentini, F., Bingkai, L., Giusti, A., & Yi, L. (2009). Municipal solid waste management in Pudong New Area, China. *Waste Management, 29*(3): 1227-1233. https://doi.org/10.1016/j.wasman.2008.07.016

Ministry of National Education. (2018). *Science education program*, Ankara: MoNE. Retrieved from http://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=325

MoEU. (2017a). *Zero waste handbook,* webpage available at https://cdn.bartin.edu.tr/sifiratik/fc2341df3d399bc7e6ea74a7c5f9e46e/sifir-atik-el-kitapcigi.pdf.

MoEU. (2017b). *National waste management and action plan,* webpage available at http://sifiratik.csb.gov.tr.

Nag, A. & Vizayakumar, K. (2005). *Environmental education and solid waste management*. New Delhi: New Age International (P) Ltd., Publishers.

Nyamwange, M. (1996). Public perception of strategies for increasing participation in recycling programs. *The Journal of Environmental Education* 27: 19–22. https://doi.org/10.1080/00958964.1996.9941471

OECD. (2020). Waste: Municipal waste, *OECD Environment Statistics* (database). https://doi.org/10.1787/data-00601-en.

Palmer, P. (2004). *Getting to zero waste*. USA: Purple Sky Press.

Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage publications.

Rees, W. E. (1992). Ecological footprints and appropriate carrying capacity. *Environment and Urbanisation, 4*(2): 121-130. https://doi.org/10.1177/095624789200400212

Sánchez-Llorens, S., Agulló-Torres, A., Del Campo-Gomis, F. J., & Martinez-Poveda, A. (2019). Environmental consciousness differences between primary and secondary school students. *Journal of Cleaner Production*, *227*, 712-723. https://doi.org/10.1016/j.jclepro.2019.04.251

Stern, N. (2006). *Review of the economics of climate change*. London, UK.

Tekbiyik, A., & Celik, M. (2019). Education for sustainable development in primary school: improvement of students' ecocriticism skills. *Journal of Education in Science Environment and Health*, *5*(2), 178-191. https://www.jeseh.net/index.php/jeseh/article/view/221.

Thogersen, J. (1994). A model of recycling behaviour with evidence from danish source separation programs. *International Journal of Research in Marketing, 11*, 145-163. https://doi.org/10.1016/0167-8116(94)90025-6

Thompson, S.C.G. and Barton, M.A. (1994). Ecocentric and anthrocentric attitudes toward the environment. *Journal of Environmental Psychology, 14*, 149-157. https://doi.org/10.1016/S0272-4944(05)80168-9

TurkStat. (2017). *Municipal waste statistics, 2016*, webpage available at http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24876

TurkStat. (2019). *Municipal waste statistics, (2018)*, http://www.tuik.gov.tr/PreHaberBultenleri.do?id=30666

Twidell, J. & Weir, T. (2006). *Renewable energy sources (second edition).* Taylor & Francis Group: New York USA.

United Nations. (1972). Report of the United Nations conference on the human environment, stockholm, 5-16 June 1972. http://www.un-documents.net/aconf48-14r1.pdf.

United Nations. (1992). *Rio declaration on environment and development*, webpage available at http://www.unesco.org/education/information/nfsunesco/pdf/RIO_E.PDF

Uzun, N., Gilbertson, K. L., Keles, O. & Ratinen I. (2019). Environmental attitude scale for secondary school, high school and undergraduate students: validity and reliability study. *Journal of Education in Science Environment and Health*, *5*(1), 79-90. https://www.jeseh.net/index.php/jeseh/article/view/175.

WCED/World Commission on Environment and Development. (1987). *Our common future*. http://www.un-documents.net/our-common-future.pdf.

Xiong, W. (2020). The way to improve the consciousness for water resources protection of Chinese college students. *Journal of Coastal Research*, *104* (SI): 48-53.

Zero Waste Summit. (2018). http://zerowaste.gov.tr/.

Zero Waste. (2019). What is zero waste, webpage available at http://zerowaste.gov.tr/en/zero-waste/what-is-zero-waste.