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RESP

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Strategies and Policies in Recycling Food Waste: The Intermediary Role of Municipalities

Gıda Atıklarının Geri Dönüşümünde Stratejiler ve Politikalar: Belediyelerin Aracı Rolü

Seda Bostancı [a, *] , Valentin Vasilev [b] & Seda Yıldırım [c]

[a] Assoc.Prof.Dr., Tekirdag Namık Kemal University, Department of Public Finance, 59030, Tekirdağ / Türkiye
ORCID: 0000-0002-3559-2224
[b] Prof.Dr., Higher School of Security and Economics, 4004, Plovdiv / Bulgaria
ORCID: 0000-0002-0074-9578
[c] Prof. Dr., Tekirdag Namık Kemal University, Department of Business Administration, 59030, Tekirdağ / Türkiye
ORCID: 0000-0003-4367-6652

ANAHTAR KELİMELER

Gıda Adaleti
Gıda İsrafı
Geri Dönüşüm
Gıda Atık Yönetimi

ÖZ

Sürdürülebilir kalkınmadaki önemi göz önüne alındığında, "sıfır açlık" dünya çapında her zaman hayati bir konu olarak kabul edilir. Hem Milenyum Kalkınma Hedefleri hem de 2030 Sürdürülebilir Kalkınma Hedefleri açlığı azaltmaya ve uzun vadede gıda güvenliğini sağlamaya odaklanmıştır. Politika yapıcılar sürdürülebilir gıda politikaları belirlerken ve alternatif programlar başlatırken, gıda kaybı ve gıda israfı da gıda güvenliği için yeni zorluklara neden olmaktadır. Gıda israfı için çeşitli geri dönüşüm teknikleri olmasına rağmen, gıda israfı gıda kadar değerli bir ürüne dönüştürülemez. Hükümetler gıda israfının geri dönüştürülmesini ve gıda israfının azaltılması için kamuoyunun farkındalığının artırılmasını desteklemektedir. Gıda israfının geri dönüşümü gıda, atık ve kompost süreçlerinden geçer. Kompost, bitki ve hayvan gıdalarının belirli yöntemlerle nemli oksijen ortamında depolanarak organik gübreye dönüştürülmesi sürecidir. Gıda atıklarının geri dönüştürülmesinin sıfır atık yaklaşımları açısından faydaları olduğu düşünülmektedir. Ancak, gıda atıklarını temelde önleyen politikalar oluşturmak daha önemlidir. Bu çalışma, belediyelerin aracı rolü bağlantısı aracılığıyla gıda atıklarını ve gıda kaybını azaltmak için stratejileri ve politikaları keşfetmeyi amaçlamaktadır. Amaçlandığı gibi, bu çalışma dünya çapında gıda kaybı ve gıda atığı ve gıda atığı geri dönüşümü için son ve mevcut göstergeleri inceleyecektir. Buna göre, ikincil veriler kullanılacak ve tabloların yardımıyla gıda atığı yönetiminin önemi incelenecektir.

KEYWORDS

Food Justice
Food Waste
Recycling
Food Waste Management

ABSTRACT

"Zero hunger" is always accepted as a vital issue worldwide when considering its importance in sustainable development. Both of Millenium Development Goals and 2030 Sustainable Development Goals focused on reducing hunger and achieving food security in the long term. While policymakers set sustainable food policies and launch alternative programs, food loss and food waste also cause new challenges for food security. Although there are various recycling techniques for food waste, food waste cannot be transformed into a product as valuable as food. Governments supports for recycling food waste and promoting public awareness for reducing food waste. Recycling of food waste goes through food, waste and compost processes. Compost is the process of turning plant and animal foods into organic fertilizer by storing them in a humid oxygen environment with certain methods. It is thought recycling food waste has benefits in terms of zero waste approaches. However, it is more important to create policies that fundamentally prevent food waste. This study aims to explore strategies and polices for reducing food waste and food loss through the link of the intermediary role of municipalities. As it is purposed, this study will review recent and available indicators for food loss and food waste and food waste recycling worldwide. Accordingly, the secondary data will be used and with the help of tables, the importance of food waste management will be examined.

* *Sorumlu yazar/Corresponding author*.

e-posta: *shbostanci@nku.edu.tr*

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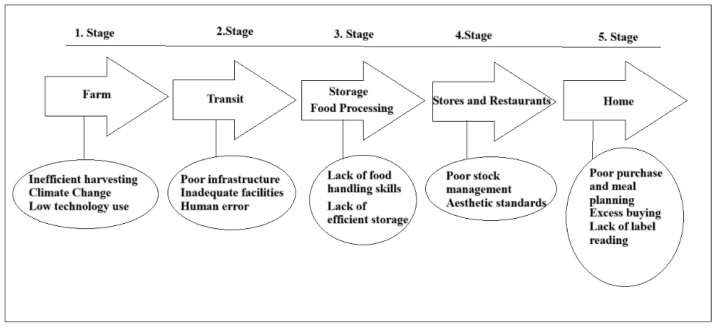
1. Introduction

Food waste and food loss are close concepts but contain some differences. While food waste generally refers to the leftovers of consumed food, food loss sometimes covers different situations such as products left in the field or products that have expired. According to this perspective, some scholars discuss the technical characteristics of food becoming waste and waste recycling and disposal aspects, while others discuss the conditions and policies that cause food waste. Food waste can be grouped as household waste, cafeteria or restaurant waste, and waste from food processing industries (Yasin, et al., 2013). The effect of the country's management systems and policies are seen in food waste disposal methods. Municipalities have a duty in garbage collection and disposal methods as a component of household and other wastes in countries with central and local management systems. While the visible face of food loss is seen as food waste, the fact that food waste that does not reach the table and cannot be recycled is another important problem of the process is evident. The reason why food waste is such a big problem is that hunger and malnutrition problems have not yet been fully solved worldwide. The relationship between food waste and greenhouse gas emissions is also an important indicator in terms of discussing the process for a sustainable future. "The carbon footprint of food produced and not eaten is estimated to be 3.3 Gt CO2 equivalent, without considering greenhouse gas emissions from land use change. Due to food waste, approximately 250 km3 of global surface and groundwater resources are depleted, and food produced but not eaten covers approximately 1.4 billion hectares of land, equivalent to approximately 30% of the world's agricultural land. (Munesue, et al., 2015).

The most problematic processes in terms of food loss can be considered as the stages between the production point and the point of sale. For example, Goodwin (n.d.) stated that while explaining food loss according to the stages between the production and point of sale, it is "farm, transit, storage, shop and home" (Goodwin, n.d.; Serrano, 2024).

Figure 1: Food Loss Journey



Source: based on Serrano (2024) and Goodwin (n.d.)

Although the "Zero Hunger" goal is second on the list of Sustainable Development Goals, the ongoing hunger problems are now being expressed as a hunger scandal. Because statistically, there seems to be enough food to feed people around the world, but approximately one billion people do not have enough food, there are people dying of hunger, and approximately one third of the food produced is thrown away. (Kieran, and Dolan, 2024). This is a serious social inequality and ethical problem. "SDG 2 Zero Hunger represents a unified global call to strategically respond to the immense challenge of global hunger through sustainable food production, distribution and consumption" (Kieran, and Dolan, 2024). According to the United Nations Hunger Report, hunger refers to periods in which a particular community or population experiences serious insecurity in food supply (Uvin, 1994). Hunger, malnutrition and food insecurity are among the most fundamental indicators that policies around the world need to be transformed.

These problems experienced in the food sector and the political dimensions of the process bring the issue of food justice to the agenda. Food justice, as a field of struggle and action, brings a critical approach to mainstream food systems and includes approaches that enable communities to produce their own solutions to food problems, which are among the sources of inequalities in society. Unequal access to healthy food causes settlement areas and geographical locations to be questioned (Heynen, et al., 2012). From this perspective, food justice has transformed the process into an important struggle for rights, along with the search for alternative solutions in the field of access to food.

Aim and Design

The aim of this study is to examine the technical and strategic aspects of food waste recycling together and to present suggestions regarding the intermediary role of municipalities. Generally, food waste combat strategies, which also examine the technical aspects of food waste recycling and food waste prevention policies, are addressed separately in different publications. In this respect, the original value of the study is to examine the relationships between the technical and political infrastructure of the process by considering food waste statistics. In this study, reports containing food waste and indicators related to food waste were examined. This study focuses on the link between food loss, food waste and recycling food waste. Accordingly, this study reviews available and open access data including recent indicators for global food loss and global food waste. It is thought to give a brief policy sheet for scholars and policymakers to launch new food security programs or strategies for reducing food loss and food waste in the long term.

2. Food Waste Statistics: Indicators for Food Waste and Food Loss

In social sciences, statistical data and indicators constitute a criterion for the strength of the scientific basis of academic studies. However, the sources of the data and the political tendencies of the institutions that produce these data are another dimension of the process. The purpose for which the data is examined and processed by which institution, as well

as the purpose for which these data will be used by policy makers, is a separate area of study. When the process is food waste and food waste, it is generally debatable how sound and comprehensive the data is obtained in which countries. In this point, examining indicators can provide a decisive framework for commenting on food waste. "Indicators on food waste come in two categories. Evidence that claims to have outer validity is often found in the grey literature, that is, in multifarious policy reports and documents from advocacy groups and non-governmental organizations. Evidence that claims to have internal validity, other than, tends to focus on narrow applications. While this general balance between external and internal validity is not unique to food waste, no evidence on food waste can claim to have both external and internal validity, which is problematic to say the least when it comes to an emotionally charged topic like food waste" (Bellemare, et al., 2017). Considering this approach, the following information has been compiled from various reports. The tables below, in addition to showing the dimensions of food waste and waste, have addressed indicators with specific approaches. These indicators are which sectors produce more food waste, a data analysis of food waste across continents worldwide, which food products are wasted more worldwide, which processes result in food waste, awareness against food waste in the context of social responsibility through a few sample countries, global food waste indicators for 2024 through selected countries and Top Food Companies' waste generation indicators have been examined. Thus, not only food waste and food waste data were presented, but also the extent to which social awareness was gained to reduce this and what responsible global companies were doing regarding waste generation were taken into consideration.

Table 1: Food Waste by Sectors (2021)

Sectors	Food Waste (million tonnes) -%
Food Service	244 – 27%
Household	569 – 62%
Retail	118 – 11%

Source: adapted from McCarthy, (2021).

The sectors where food loss occurs most are seen as retail, household and food service as seen in Table 1 (McCarthy, 2021). Among these sectors, the largest source of food waste is household-based, with a rate of 62%. In this respect, it can be seen how critical the changes people will make in their daily lives play in solving this problem.

Table 2 shows the percentage distribution of food loss by continent. When this table is examined, it is seen that food loss is less in developed countries and regions, while it reaches the highest levels in the least developed regions. From this perspective, it is seen that the regions with the highest food loss, as known by general indicators, are Africa and the Caribbean, where hunger is also experienced the most. The reasons for food loss include agricultural policies, problems in the supply chain, and climate change. In this respect, Table 3 was created to understand at which stages food loss occurs more so that the process can be examined in detail.

Table 2: Global Food Loss Indicators (2021)

Country	Food loss (%) at highest level	Country	Food loss (%) at lowest level
Western Africa	23.6	Eastern Asia	8.5
Caribbean	22.5	Southern Europe	8.1
Southern Africa	20.4	Western Europe	7.9
Sub-Saharan Africa	20.0	Micronesia	7.3
Small Island Developing States	19.0	Eastern Europe	5.0

Source: adapted from Fleck, (2024c).

Similarly, considering which products are less durable, Table 4 shows the distribution of global food loss by food products.

Table 3: Food loss based for different stages (from production to sale)

Stage	(%) Food Loss
Farm stage	11
After harvest	8
Processing	1
Stores	8
Home and restaurant	10

Source: adapted from Mulhern, (2021).

When Table 3 is examined, it is seen that the highest food loss is in the agricultural stage, but this food loss is also experienced at a high rate in the home and restaurant process. The lowest food loss is in the processing stage, but it is seen that the areas that can be intervened and improved the most are technically processing and stores. In addition, these indicators have given slightly different percentages in other studies. Here are a few findings of important studies on this subject. The McKinsey report states that food suffers from various percentage losses in the stages from the producer to the point of sale. (Mulhern, 2021). According to FAO data, approximately 13% of global food is lost from farm to point of sale. Food loss is a global problem and has a negative impact on food security (Fleck, 2024c).

Table 4: Global Food Loss (2023)

Food	food loss (%)
Fruit and vegetables	45
Fish and seafood	35
Cereals	30
Dairy products	20
Meat and poultry	20

Source: IFCO SYSTEMS, (2023).

When Table 4 is examined, it is seen that the area where the most food loss occurs on a global scale is fruit and

vegetables, with a significant rate of 45%. This also shows that almost half of the fruit and vegetables are lost. The loss of these products, which meet people's vitamin needs and provide a healthy and balanced diet, without being used, is an important problem. In order to solve this, it should be considered to accelerate public policies such as organic food markets, local food initiatives and farm to school (Yıldırım, et al., 2024).

Table 5: Food Waste Awareness (2023)

Country	(%) of adults who search for food waste
China	37
Brazil	34
Germany	32
France	31
US	26
UK	26
Mexico	24

Source: Fleck, (2024b).

Statista (2023) surveyed respondents from several countries to find out how much food waste they have searched for in the last 12 months. According to this survey result seen in Table 5, food waste is most popular in China, while it is least popular in Mexico (Fleck, 2024b). The most effective way to recycle food waste is to consider citizens contributing to the recycling process of food waste in the household process shown in Table 1. The condition for achieving this is for citizens to develop food waste awareness and cooperate in this area. When Table 5 is examined with this approach, it is seen that in China and Brazil, which have quite large populations, the fact that awareness is high among adults in this area is an important advantage, but the fact that this awareness level has not even reached more than half is seen as a problem for a sustainable future and food security.

Table 6: Global Food Wastes Indicators (2024)

Country *	Tonnes (total food waste) *	Food waste (kg) per capita (estimated)*
China	108.667.369	76
India	78.192.338	55
US	24.716.539	73
Brazil	20.289.630	94
Germany	6.502.860	78
UK	5.097.005	76
Russia	4.829.772	33
France	3.942.430	61

Source: Fleck, A. (2024a). *UNEP Food Waste Index Report 2024.

Considering the connections with Table 5, when Table 6 is examined, it can be seen as an advantage that the amount of food waste in China is high, and that citizens have a high level of awareness in this area. However, each of the tables shows how food losses, waste and waste have reached critical levels.

Food loss or food waste can be thought of as resource loss. Boston Consulting Group (BCG) determined that food waste is worth approximately $230 billion. Other negative effects such as resource waste and carbon emission release also occur because of food waste. Therefore, food waste management strategies are an important topic (Greyb, 2024). According to the study compiled by Greyb (2024), some of the prominent companies in the food waste management sector are summarized in Table 7.

Table 7: Waste Generation in Top Food Companies

Firms	Market Capitalization ($ Million), 2022 September	Total Waste Generated (Thousand Tonnes), 2021
Nestle	298.409	1.568
Mondelez	75.148	275
General Mills	45.471	337
Hershey	45.193	61
Danone	32.166	400

Source: adapted from GlobalData, (2022).

GlobalData (2022) explored the market value and food waste amounts of some leading companies in the food sector in its study (see Table 7). Accordingly, Nestle is a company with a market value of $ 298,409 million for September 2022 and produced 1,568 thousand tons of waste according to 2021 records. Mondelez International Inc (Mondelez) has a market value of $ 75,148 million (2022) and produced 174 thousand tons of food waste (2021). General Mills Inc (General Mills) has a market value of $45.471 million (2022) and produced 1.71 thousand tons of food waste (2021). Hershey has a market value of $45.193 million (2022) and produced 61 thousand tons of waste (2021). Danone SA (Danone) has a market value of $32.166 million (2022) and produced 400 thousand tons of food waste (2021)

3. Techniques of Recycling Food Waste

From a technical perspective, recycling food waste is an important part of saving resources and reducing environmental impact. There are various techniques for recycling food waste. Some of these techniques are discussed below.

Composting is the most well-known food waste recycling technique. It involves the process of transforming various organic food wastes such as vegetables and fruit scraps, eggshells into a fertilizer that will increase the fertility of garden soil. In the composting stages, collect organic wastes such as fruit peels, coffee grounds, fine nut shells, and create a well-ventilated area for compost by creating a pile or bin. Add green materials such as grass and brown materials such as cardboard and dry leaves around it. Keep it moist and turn it regularly to aerate. Among the environmental effects of food waste composting are bad odor problems (Cerda, et al., 2018). Especially considering the bad odor issue, it is thought that households' desire to compost in their homes has decreased, and therefore it would be beneficial for municipalities to develop innovative approaches in

collecting this household waste at the beginning of composting.

Anarerobic digestion is a biological process that breaks down organic matter including food waste without oxygen, producing biogas methane and digestate solid material. “Anaerobic digestion is a promising technology for food waste management, but has not yet been fully applied due to a few technical and social challenges” (Xu, et al., 2018). One of the main technical problems in this area is the easy production of harmful intermediate components.

Upcycling food waste is the practice of transforming surplus food or food scraps into new products that are still edible and often nutritionally valuable. Upcycling food refers to products made from food product components that would otherwise be considered waste or by-products (Bangar, et al., 2024).

Food waste recycling in industrial settings, large scale food production facilities can implement advanced recycling methods, such as converting food waste into biofuel or animal feed these two cases are detailed below:

- Converting food waste into biofuel, food waste turning into biofuel through various technical processes contributes to the fields of renewable energy sources and sustainable waste transformation (Hafid, et al., 2022). “Biofuels are prepared from edible biomass such as food waste. However, this situation creates a debate among civil society members about whether it is food or fuel. In the future, industrial production of biodiesel and bioethanol from food waste can contribute to the solution of waste disposal, energy scarcity and energy security problems” (Karmee, and Lin, 2014).
- Food waste from animal feed which are available for eating can be recycling to animal feed. The most important case in this area is ensuring food is safe and non-toxic for animals. Incorporating food waste into feed for fish, pigs, poultry, rabbits and ruminants is possible with the necessary sterilization and precautions, making it an important component in preventing food waste (Rajeh, et al., 2021).

Food waste to energy system, “anaerobic digesters, generally suitable for organic wastes with high moisture contents, have been commercially successful for food waste to energy applications, with the potential for wider deployment to municipal and commercial waste generators” (Ghose, and Franchetti, 2018).

Smart food waste recycling bin, a technique developed using naturally occurring fermentation microorganisms placed on wooden biochips (bio-catalysis), enables the conversion of food waste into energy (Yeo, et al., 2019). Today, techniques like this example are diversifying.

Donation of excess food, food banks and charitable organizations can accept donations of food near or past its sell by date but still safe to eat. Charity and civil society-based websites are being established to support food donations (Jethwa, et al., 2018). However, food donation is a sensitive issue, most institutions do not accept donated food, and sometimes there are various problems in this area regarding the reputation of donors. The most difficult parts of food donation are the reliability of the timing and the health criteria of the donated product.

The techniques discussed here provide a cross-section of different approaches in this field. However, the techniques applied by companies in the food waste management sector are examined in Table 8.

Table 8: Firms from food waste management sector

Firms	How it works?
Winnow	Winnow (based in London) uses computer vision and AI technology to track food waste in commercial kitchens. The technology used by Winnow involves training the machine in photography and imaging discarded food. It provides some data to help companies reduce food waste in the kitchen and minimize their footprint to save money.
Rendisk	Rendisk is a company that provides technological solutions for dishwashing logistics and food waste management used in professional kitchens. The company's important products include "Solus Eco (reduces food waste and water waste), Transfer Eco (a pump-based food waste system that can process heavy and oily waste such as bones, shells, carbohydrates, coffee, etc.), Flex WasteDispo (reduces waste)" and the company has a very effective "Circular composting system (converts food waste into fertilizer)".
BioteCH4	BioteCH4 (based in the UK) converts food waste into compost and biogas using anaerobic digestion technology.
LeanPath	LeanPath works to reduce food waste by tracking and analyzing food waste data in commercial kitchens.
KITRO	KITRO uses AI-powered SaaS solutions in commercial kitchens and reduces food waste.
Wastelink	Wastelink has a recycling platform for food waste. It recycles food waste into animal feed.
Copia	Copia offers technological solutions for food waste management. It is specifically involved in donating excess food from food donors.
TotalCtrl	TotalCtrl (based in Norway) offers inventory optimization using automated expiration systems.)
Phood Solutions	Phood (based in USA) offers a waste tracking system for kitchens.

Source: adapted from Greyb, (2024).

When Table 8 is examined, it is seen that companies in this field have developed innovative approaches based on artificial intelligence, circular composting systems, biogas production, food waste data management, production of

animal food, and platforms developed through donating excess food from food donors. In this field, web-based applications have the potential to create different job opportunities for young entrepreneurs.

4. The Strategies for Recycling Food Waste

In this section, there is a discuss on the policies of different countries regarding food waste, the countries with the highest food waste and their reasons are given in Table 9.

Table 9: Countries with the most food waste

Country	Why food waste is so high
United States	The USA is among the countries with the most food waste globally. It is estimated that around 30 to 40 percent of the food supply is wasted. Unfortunately, 36 million tons of food is wasted in the USA every year.
United Kingdom	The UK has a serious food waste problem. It is estimated that 9.5 million tonnes (approximately) of food is wasted each year. It is also considered to have a significant food waste problem.
Australia	It is estimated that Australia wastes 7.3 million tons of food (approximately).
Canada	Canada is one of the countries with the highest food waste problem. It is estimated that 35.5 million tons of food is wasted each year.
Germany	Germany is one of the countries with the highest food waste among European countries, with an estimated 11 million tons (approximately) of food wasted per year.

Source: adapted from Waste Managed, (2024).

When Table 9 is examined, the USA, where almost half of the food waste is generated, is also the country where food justice issues are most discussed worldwide due to its large population and its lifestyle that causes food waste. Again, the fact that the countries in the Table are the most developed country in the world reveals that the living habits in these countries should be questioned in terms of sustainable food security.

The countries in Table 10 are the countries that have achieved food waste reduction. How these countries have achieved this is summarized in the table.

As seen in Table 10, to prevent food waste, strategies need to be developed in addition to techniques. For the strategies developed in this respect to be permanent, legal regulations are also necessary, as seen in the Danish example. Again, trainings have important contributions to raising public awareness, as seen in the Japanese example. Based on these approaches, various issues for municipalities' food waste recycling strategies can be examined in items.

Promoting source segregation, generally in developed and many developing countries, systems have been developed by municipalities to collect plastic, paper and glass waste separately. However, considering the odor issue, it is very difficult for people to store food waste in a certain area, so when municipalities create easily accessible or alternatively develop supporting community compost hubs, significant progress can be made in this area. Municipalities can prepare a community compost exchange guide on this issue. This guide contributes to community-based waste management and establishes a link between municipal food organic waste and soil management (Dirks, 2021). With this approach municipalities establish centralized composting facilities where organic waste is processed for agricultural and landscaping purposes.

Table 10: Countries for Food Waste Reduction

Country	Implications for reducing food waste
South Korea	Comprehensive policies have been implemented to reduce food waste at all levels (industry, government, household). For example, technology-focused solutions and public awareness programs have been implemented.
Netherlands	Strategies have been developed to prevent food waste at the production and retail levels. In particular, practices have been promoted to reduce food waste in packaging and distribution processes.
Denmark	Legislation includes regulations to prevent food waste. Consumer education and technology-focused solutions are also policies that are being considered together to reduce food waste. Redistribution and recycling practices are being addressed.
Japan	Food waste is being combated through consumer education and technology-focused practices. Food redistribution and recycling practices are prominent.

Source: adapted from Waste Managed, (2024).

Utilizing anaerobic digestion technology, many municipalities are investing in anaerobic digestion plants, recognizing their potential to reduce greenhouse gas emissions and contribute to the circular economy. Investments in facilities where this technology is produced are closely related to the countries' policies in this area (Massaro, 2015).

Encouraging public awareness and engagement, “examine householders’ attitudes, motivations and behaviors towards recycling, potential food waste segregation and prevention activities” (Rispo, 2015). To achieve this, various events can be organized with citizens and public opinion surveys can be conducted.

Integrating food waste recycling into the circular economy, food waste recycling approaches are also among the contributions of municipalities to the circular economy. “A sustainable food cycle in a circular economy can have five stages: food production, processing, distribution, food consumption, and food waste management” (Ojha, 2020).

Incentivizing participation and public participation increase strategies are among the most important functions of municipalities today. “Waste management represents a core

responsibility of local governments and holds a prominent position on the urban policy agenda due to its critical implications for the environment, public health, and public investments" (Fiorillo, and Merkaj, 2024). In this respect, they can encourage various participatory approaches in this area, such as giving awards to site residents who compost in their gardens, providing encouraging information to citizens about food donations, and providing compost training to school students.

5. Conclusions

Food waste is not only an environmental and health problem, but also a social justice issue. In a world where hunger and malnutrition are not prevented, food waste and food waste have reached enormous proportions. Studies on food waste have a wide place in the literature. In addition, indicators on food waste, economic and statistical studies, socio-political dimensions of food waste, technical and engineering dimensions of the process such as food waste recycling and disposal techniques are becoming the subjects of separate publications. This study has an innovative and interdisciplinary content that combines these dimensions but approaches each of them within a summary framework. First, various indicator tables were prepared from the information obtained on food waste and food waste by examining the current 2023-2024 reports. As stated in the previous sections, beyond providing statistical information on the amount of food waste, a simplified framework of trends in this area is presented with data such as which products food waste increases in and which countries are more conscious about the food waste process. This study is thought to give a brief policy sheet for scholars and policymakers to launch new food security programs or strategies for reducing food loss and food waste in the long term.

When it comes to recycling in the field of food waste, the first thing that comes to mind is composting. When food waste is processed and recycled correctly, an efficient fertilizer is obtained, and when this is done with the cooperation of citizens and the municipality, it creates an environmentally friendly social responsibility opportunity for citizens. In addition, in the study, among the food waste recycling techniques, anaerobic digestion, upcycling food waste, food waste recycling in industrial settings as converting food waste into biofuel and food waste to animal feed, Food waste to energy system, smart food waste recycling bin, donation of excess food topics are briefly mentioned together with compost. When these contents are examined, it is seen that innovative approaches for food waste recycling techniques are increasing and diversifying.

A significant part of the food waste problem that occurs because of food waste is also due to consumer habits and commercial practices. When viewed from this perspective, it is seen that a policy change is needed in this area. Food supply systems should also be reconsidered in a way that will reduce food waste.

Since municipalities are the public administration units primarily responsible for the collection and disposal of food waste, they are also responsible for the recycling of the process. In general, municipalities can carry out activities to raise awareness among citizens about food recycling, produce innovative projects in this field with companies, supporting community compost hubs, and integrating food waste recycling into the circular economy. They can take initiatives in cooperation with governments to make legal arrangements for these activities to become permanent. Municipalities can play a pivotal role in addressing the global food waste crisis and building a more sustainable future.

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