

Review

# Resources Management for a Resilient World: A Literature Review of Eastern European Countries with Focus on Household Behaviour and Trends Related to Food Waste

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**Abstract:** Increasing concern about food waste and the consequences of human lifestyle on the environment have intensified attention on this topic. While waste and loss of food occur in all stages of the food chain, more than 50% of the blame relies on the consumers' shoulders, regardless of their geographical location, age, culture, or historical roots. Ideally, wasted food (from agricultural production to storage and transportation stages, down to final consumers) should return to the habitat it came from (circular economy concept), but man-made materials do not naturally decompose quickly, or they decompose in several hundreds of years, destroying untouched resources. Simply presented, reducing lost or wasted food means more food for us all in the future, more visible economic growth (especially in low-income countries), and less pressure on the environment. While these concepts are largely being investigated in Western economies, Eastern Europe lacks a proper understanding, especially in the best relevant practices. Therefore, this systematic review highlights the need for further research on Eastern European households' attitudes and the importance of identifying long-term trends in changing behaviour causing wastage. This can only be done properly if past experiences, societal culture, traditions, and food habits are mirrored in future predictions by considering the inherent factors influencing the decision-making process.

**Keywords:** waste prevention; resilience; sustainability; environment; household behaviour; circular economy; food loss and waste (FLW)



**Citation:** Moldovan, M.-G.; Dabija, D.-C.; Pocol, C.B. Resources Management for a Resilient World: A Literature Review of Eastern European Countries with Focus on Household Behaviour and Trends Related to Food Waste. *Sustainability* **2022**, *14*, 7123. <https://doi.org/10.3390/su14127123>

Academic Editors: Raffaele Silvestri, Mariantonietta Fiore and Francesco Contò

Received: 11 May 2022

Accepted: 8 June 2022

Published: 10 June 2022

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## 1. Introduction

The food loss and waste phenomenon has begun to receive attention and has become a very debated topic in the last three decades due to its economic, political, ethical, and social implications, considering the increasing world population and growing demand for food [1,2]. At the global level, statistics related to the world's population reaching 9.5 billion by 2050—20% more than now [3]—to the almost 2 billion people suffering from malnutrition [4] and the 1.3 billion tonnes of wasted food per year [5], with huge associated costs, show us the urgency of responsible resource management for a sustainable world [1,6].

In Europe, the lack of full awareness and careless handling of food will soon increase food demand [7–11] and generate shortages, which might result in higher food prices—the so-called foodflation [12] and possible government intervention impacting mainly producers. Several European Union policies [13–15] aiming at the regulation of food waste management in Europe and some interesting studies conducted by the European Commission through Eurostat are ringing the bell to signify the importance of green behaviour, but the solutions offered have not fully been assessed by governments, public

organisations, or private companies [16]. One of the reasons might be the fact that there is an unclear distinction between the defined “food loss” and “food waste” terms in literature: food loss is mainly used to highlight problems that occur during production processes, whereas food waste is usually generated by consumers after the food goes through a supply chain and reaches the end-users [17,18]. Nonetheless, both are included in the food loss and waste concept (FLW) and are very often studied together as food process losses. Regardless of the causes, the final problem which is outlined in FLW research is the one dealing with the fact that consumers are not benefitting from already produced food [5,19–21]. Another attempt to define FLW would be within the framework of the Food and Agriculture Organization (FAO) [22] where the food waste phenomenon sees three distinct notions: food loss, food waste, and food wastage. While food loss refers to a decrease in mass or nutritional value (quality) of products intended initially for consumption (due to an inefficient supply process, poor technology and management skills, or a lack of infrastructure or access to market), food waste regards already produced food being discarded from consumption (due to poor preservation or oversupply, or poor shopping/eating behaviours of consumers), while food wastage is approached regarding lost and wasted food because of deterioration [6,18]. Consequently, this third term, wastage, represents an umbrella term that includes the two notions of loss and waste [22,23].

Some other reasons could be that questions such as who, how, where, and why food waste is generated are not answered within a methodical process of logical reasoning. Wasting food equals wasting resources for every step taken along the way [24] within the entire supply chain from production to end consumer selling and preservation. Water (agriculture accounts for 70 percent of the water used worldwide), land usage, labour, and fuel [25–27] are not endless resources. Even though everything, from fashion items to construction materials for buildings, is based on natural resources, man’s everyday actions significantly affect the environment and its resources and, sadly, in many cases, this is not for the better [28]. With higher consumer awareness about responsible consumption and resource redistribution, the situation could significantly change [29] if the younger consumer generations, similar to Xers, Millennials, or Zers would largely embrace a more sustainable consumption and/or if they rely more eagerly on a circular economy [30–32].

Knowing this, a trend has been identified throughout this literature review: changes in societal culture significantly affect how people consume. To the Music Television—MTV Generation born before 2000 [33] and the Facebook-addict youth born after 2015 [34], one can also speak of the “stay-at-home” and “remote-working” coronavirus pandemic (COVID-19) induced consumer generation [35–37], the latter being compelled to consume more than what’s needed [38]. Both in Western and Eastern European regions, consumption of goods constitutes a function of human culture and defines it [39,40], because only by producing and selling things and services does capitalism in its present form manage to survive and report growth. The more is produced, the more is purchased, with progress and high prosperity as fulfilment for everyone [37,41]. Informatively, the list of the most wasted food products in Eastern Europe of plant origin contains bread, potatoes, and fresh fruit, and those of animal origin include cheese, milk, poultry meat, and eggs as well as rice [4,13]. These products are also on the list of the most wasted in other countries of the world. With regards to Eastern Europe, besides the fact that from the quantitative perspective these products are the most produced, they are of first necessity for the population and are used, daily, in different combinations, in homemade meals and restaurant recipes [30,38].

On the topic of consumers and households’ behavioural trends in Eastern European countries [23,42,43], as well as the direct connection between food waste and people’s wealth, no studies have explicitly managed to draw a direct line between the last two, should it be in the United States, European Union, the European continent, developed, or emerging countries alike. Additionally, still little is known due to the multidisciplinary nature of the problem and the cultural, historical, social, economic, political, anthropological, and geographical drivers.

This paper aims to review the available literature on food waste and loss generation in Eastern European countries and the strategies for waste reduction in the agri-food industry, with a focus on consumers. Furthermore, this paper also aims in identifying trends in food waste management and their use for further research.

## 2. Research Method

The investigation is based on a systematic literature review, known for its explicit and practical way of identifying, selecting, and critically evaluating results [44,45]. This approach is appropriate for this research as it provides rigor and opportunities for developing further research directions.

From the interrogation of the Web of Science, Scopus, and Google Scholar databases, a total of 176 European-focused scientific articles published in the last 20 years (80% between 2014–2021) were identified, categorised, interpreted and, in the end, used to highlight research directions. The raw data were taken from fully or partially open sources (academic articles, scientific studies, and reports) edited or published almost exclusively in English, all scientific papers assessing the impact of food waste on the European territory, out of which, at least 80 explicitly drawing attention to the sensitive issue of Eastern European FLW phenomenon and 60% having been edited during the COVID-19 pandemic. The articles were selected based on the keyword vs. region algorithm, established when the research model was formulated. Using descriptive statistics and semantic similarities (for example the keyword *Eastern Europe* includes Eastern EU countries, Eastern European countries, and also individually taken countries which are located in those areas, such as Romania, Bulgaria, and Poland; the *resources management* keyword also comprises food-related resources, such as fresh water, fertilisers, and oil), the combination of one or two terms plus the time horizon were kept in mind (publishing year; decade-based range, very important for the trends generation), some examples being presented in Table 1.

**Table 1.** FLW phenomenon-related publications (2000–2021).

Keyword 1	Keyword 2	Number of Papers	Highest Publishing Time Range	% Semantic Retrieval
Waste	Eastern Europe	63	2018–2021	75%
Sustainability	Eastern Europe	25	2019–2021	85%
Resources management	Eastern Europe	144	2015–2020	70%
Food security	Eastern Europe	74	2018–2021	80%
Environment	Food waste	14	2016–2019	78%
Circular economy	Food resources	23	2019–2021	85%
Consumer behaviour	Eastern Europe	18	2019–2021	90%
Wasted resources	Climate	2	2020–2021	95%
COVID-19	Food waste	7	2020–2021	95%

Source: Own development based on the retrieved data.

The systematic literature review revealed that misconceptions accompanying us during the first stage of this research suffered change, faced with the number of interesting documents finally found, a visible signal that the need for the understanding of concepts such as food waste, circular economy, and waste management in Eastern European countries started years ago, increased significantly from 2015, and remains an on-going process due to the specificity of the region and driven by COVID-19 dynamics [46–49]. The highest share of expenditures on food in 2020 belonged to Eastern European countries: Romania (26.4%), followed by Lithuania (21.7%), Estonia (21.6%), and Croatia (21.4%), whereas the lowest rates belonged to Luxembourg (9.5%), Ireland (9.8%), and Switzerland (9.7%) [50–53]. To avoid the over-inclusion of documents, a set of eligibility criteria was identified and applied, such as time period or cultural, ideological, or linguistic range.

Regardless of the country where the authors were affiliated, the studies showed that the main factors contributing to food waste and loss at the different levels of the supply chain (see Table 2) are similar in Western and Eastern European countries, the difference mostly relying on the level of risk, where the management of procedures and standards are noticeably better handled in Western regions than in Eastern ones.

The possible main factors which limit food waste management, particularly in Eastern Europe, are the lack of proper regulations, food safety policies, and clear labour procedures, and also the lack of education and outreach initiatives. Finally, the collected data could not help pointing out how this will change in the long run, considering past ranges of time (horizontal linearity pre- and post-year 2000 for example) or external drivers (vertical line factors such as generation swift, digitalisation, artificial intelligence applied to the food industry, and education improvement).

**Table 2.** Factors determining FLW in Western vs. Eastern Europe according to the stage of the supply chain.

Stage of the Food Supply Chain in Agriculture (Plants Science and Livestock)	FLW Contributing Factors	High Risk in Western Europe	High Risk in Eastern Europe
Production process	Not adapted seeds/fertilisers/breed	yes	yes
	Damaged crops during harvesting process	yes	yes
	Death of animals on the farm	no	yes
	Death of animals up to slaughterhouse	no	yes
	Products eliminated at farm gates	no	yes
	Overproduction required by supply chains	yes	yes
Manufacturing process	Quality loss due to contamination	no	yes
	Overstocking due to cancellation procedure	yes	yes
	Overproduction of supermarkets' brands	yes	yes
	Rigorous packaging requirements	yes	yes
Wholesale distribution	Damage due to poor planning of cold chain	no	yes
	Packaging flaws	yes	yes
	Retailers' overbuying to get discounted prices from producers	yes	yes
	Failure of food safety standards	no	yes
	Overstocking due to poor demand forecast.	no	yes

Source: Own development, based on retrieved papers. The “yes/no” criteria were deducted based on the information derived from the literature [5,10,18,23].

Table 2. Cont.

Stage of the Food Supply Chain in Agriculture (Plants Science and Livestock)	FLW Contributing Factors	High Risk in Western Europe	High Risk in Eastern Europe
Restaurants and catering (hospitality domain)	Oversized dishes due to poor forecasting of customers' need	no	no
	Inclusion of all-you-can-eat practices in the menu	yes	no
	Failure in assessing the daily number of clients	yes	yes
	Failure to comply with hygiene rules	no	yes
Consumers and households	Lack of cooking skills	yes	no
	Purchasing of discounted products or use of buy-one-get-two distribution labels	yes	yes
	Failure of storage management (inadequate storing pantry, labelling, and wrapping)	yes	yes
	Poor experience in planning meals (preparing oversized dishes, failure in using leftovers for new meals)	yes	no

Source: Own development, based on retrieved papers. The “yes/no” criteria were deducted based on the information derived from the literature [5,10,18,23].

### 3. Results and Discussions

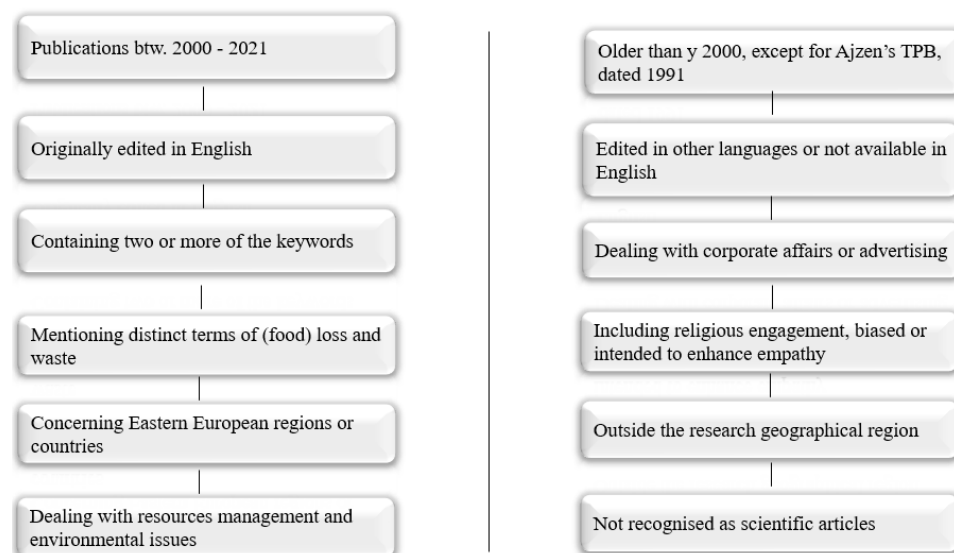
The next sub-sections underline what evidence could be found mainly on FLW reasons occurring at the Eastern European consumer level. An overview of theoretical and practical perspectives will be followed by the dominant awareness versus application situation according to the literature findings. Additionally, insights will be provided into existing practices of shopping, storing, and cooking based on childhood routines in Eastern European households. All these habits and their interconnection and interdependence play a significant role in the FLW phenomenon and could predict a possible evolution for future research.

#### 3.1. Consumer Behaviour and Practices—A Theoretical Perspective

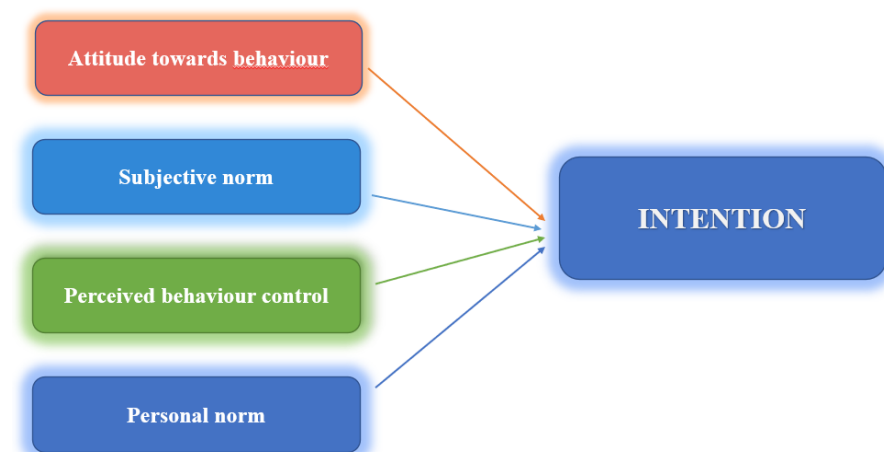
With progress comes freedom in consumption and today, more than ever, humans are entitled to choose what they want, when they want it, even though their behavioural need for wish-fulfilment is at the cost of the environment. To make all those factors affecting food waste and loss more visible and understandable, the study called upon the comprehensive theoretical model around behaviours by integrating different views: the theory of planned behaviour—TPB [54]; the theory of interpersonal behaviour—TIB [55], and the theory of environmental behaviour—TEB [56].

The TPB represents a psychological theory that links beliefs to behaviour by maintaining three components at the same time: attitude, subjective norms, and perceived behavioural control [54]. They altogether shape the behavioural intentions of human beings and define the TPB as behaviour directly determined by intentions (see Figure 1). As a rule, when individuals show a favourable attitude toward a specific behaviour, the attitude follows the norms, and consequently, the individuals feel as if they have control over the behaviour [57]. When the opportunity arises, the individuals will carry out their intentions and fulfil the expected behaviour. In the case of the chosen topic, attitudes towards this

issue will be positively related to individuals' intentions to reduce food loss and waste. Thoughts on subjective norms are perceptions related to what family or friends, and also society, expect of them when performing a particular behaviour, something which is called social influence and is measured by evaluating the attitudes of a specific social group (with the extension of personal norms, see Figure 2). All these factors are not necessarily considered consciously during decision-making, but they do form the food-related decision-making process [58–60].



**Figure 1.** Flow diagram of paper inclusion (left) and exclusion (right) criteria for the systematic review.



**Figure 2.** The theory of planned behaviour extended to the personal norm, according to Ajzen [54].

Although the TPB received strong support in explaining environmentally relevant behaviours, some scholars say that it does not consider the non-cognitive determinants of behaviour, mainly human habits, or emotions [56,61]. Because food waste behaviour has less visibility to the social group individuals belong to (family members, neighbours, and classmates) than other sorts of environmental behaviour (green mobility for instance), the social normative influencing factors of food waste practices are likely to be less meaningful than for other domains. Nevertheless, the TPB is not enough to predict to what extent behaviours are guided by habits or routines [62,63], but also, very importantly, by feelings or emotions [23,64]. For this reason, the theory of interpersonal behaviour (TIB) needs to be added to the initial equation to bring along the positive and negative emotions and their direct predictor of food-related behaviours [65].



This suggests that feelings do affect behaviour in two ways: directly and indirectly [65–67] because they provide a motivational incentive [66]. Both positive and negative emotions in response to food waste directly impact food waste behaviour in a negative way. These insights are aligned with the findings of Triandis [55] who suggested that past habits were particularly important in describing the origin of present or future behaviours (applied to food waste, too). Consequently, food waste or loss is likely to include a stronger habitual element [68] than many other habits individuals show daily. Finally, a pro-active environmental attitude (the theory of environmental behaviour—TEB) could be linked with the feeling of a personal responsibility to save energy and water, reduce pollution, and recycle goods, actions which will stop or reduce food waste as well, as an attitude present both in Western and Eastern European countries [56,69].

### 3.2. *Habits and Practices: Awareness vs. Application*

In the context of food waste generation, studies have shown that habits within households include steps such as planning (creating lists of food products needed for the coming days, checking recipes online and identifying needed ingredients, and even ordering exotic spices); purchasing or shopping (identifying markets closer to home, visiting a certain number of stores before buying); storing (labelling products, tidying up pantries, and ordering storage bags); cooking (using food influencers' ideas and buying recipe books); eating (according to the regional custom, each meal is more or less important for each member of the family, but mainly dinners remain respected-family-moments whereas lunches keep their work-allure appeal); and managing leftovers (fridge/pantry best management techniques and purchasing leftovers' special bags) [35,70,71]. All these steps play a very important role in Eastern European households' provisioning and improved waste management techniques [6,23,72]. A correct assessment of the quality and quantity of food products all along these steps, with regards to edibility, will provide an appropriate food (re)distribution.

#### 3.2.1. Correct Shopping Routine and Meal Planning

A reflection on what goes to the garbage bin each week or month (because fresh products get mushy in the fridge, are completely untouched, or neglected leftovers in week-old pots) can help consumers to become more resourceful and realistic about what they eat. A well organised shopping trip, with a grocery /diary list to stick to, compiling meal plans, checking inventories before shopping, and aiming at a certain quantity of ingredients for a 1–3-day recipe range of time, could be that one thing preventing unused ingredients spoiling in pantries. Careful planning of shopping represents an effective tool to prevent overbuying and waste [2]. Just by using a shopping list and keeping an inventory of the pantry, the amount of food thrown away per capita was found to be reduced by 20% [73]. Additionally, better communication and connection among family members prevents buying too much (or already existing in the house) food items [74,75].

Very busy families in Eastern European regions are tempted to stockpile items for un-planned situations or visits (a time-saver, traditionally transmitted from one generation to another), this practice being one of the buy-more-than-needed case (a time-winner which can quickly turn into a resource-waster in most occasions). Bulk purchases, promotional offers such as buy-one-get-two, or regular end-of-day /end-of-week special discount strategies (more and more present in Eastern European stores) prove very often to be bad from the food resource-preservation point of view [2]. The frequency of shopping also plays an important role in determining the best waste management technique: the higher the frequency, the lower the food waste level, regardless of the geographical location (proximity to markets, local producers, and accurate delivery) within the 21st century Europe [76].

Food planning and food budgeting (purchasing) habits are not as frequent and as accurate as expected in lower-income countries [2,23,77], however, a very clear connection between proper planning, optimisation of costs, and reduced food waste level in countries such as Poland and Romania, for example, has not been found [30,78].

### 3.2.2. The Importance of “Reasonable” Home Cooking

From the food-waste perspective, there is no such thing as a perfect cooking routine. Good cooks, who plan their meals, purchase and use the perfect ingredients at the right moment in time, and offer the best possible nutrient experience, love this process and do it too often—resulting in many leftovers. Bad cooks, meanwhile, are unorganised and uninspired regarding recipes, quantities of products, and appropriate moments to offer them. They lack knowledge and buy too many ingredients or deliver bad culinary experiences—resulting in food being thrown away; either way, by-myself cooking strategies are pro-waste. We are not sure that homemade vs. delivery meals are easy to put in balance, nevertheless limited improvisation is something cooks should constantly keep in mind [79,80]. An effective possible waste prevention strategy might be one based on meals cooked with products stored at home [23] but using already tested and liked recipes (too much creativity in the kitchen may very well equal a mess). Grandmother’s recipe notebook (with good meals tested a hundred times and liked for another hundred years), smaller dishes and plates, correct size portions, predicting hunger moments during the day, or testing before buying exotic groceries are all barriers to food-waste [81,82].

### 3.2.3. Childhood Habits and Family Traditions

At the European level, considering the ongoing generation swift from X to Millennials and from Millennials to Z and Alpha, the re-engineering of the household’s mindset in terms of resource management [83] represents a viable solution for the FLW. Studies show that when it comes to food (including warnings and regular alerts over potential scarcity), parents’ education positively influences the importance given to the subject of food waste in adulthood [30]. Having the opportunity to spend holidays in a village, or being involved in agricultural activities; helping parents/grandparents buy/manufacture food and then cook homemade meals; tidying up the houses, and also the domestic animal shelters (this is more the case in Eastern than Western European regions); and learning from an early age how to deal correctly with leftovers, either by using them the next day or by turning them into food for animals, are some basic practices which can have a strong impact on teenagers’ relation with food and food wastage [79,84,85]. In addition, inside kitchen activities such as finishing up a plate, washing the dishes, and thinking of the items needed for the next meal manage to empower teenagers in this respect (for the benefit of their families). Nevertheless, statistics require better adjustments in terms of age, gender, education level, and economic situation of a determined European region (FLW represents \$990 billion a year [86,87]) to draw certain conclusions, particularly since in Western vs. Eastern European comparisons, those children with a good situation and higher level of understanding would be significantly more likely to have a diet made of carbs, meat, vegetables, and fruit more often compared to children less educated and with money difficulties and, surprise, the former (category) are likely to generate more food waste than the latter [79,88]. Here, too, trends were not clearly outlined, as the past seems to shape the present in the studies so far, but the future influences the present of our societies as much as the past [89,90].

### 3.3. Impact of COVID-19 on Agri-Food Systems and the Rise of Interventionist Policies

The COVID-19 pandemic exacerbated the FLW phenomenon because of panic-induced irrational behaviour among the population. During the COVID-19 pandemic and the disruption of supply chains, the waste of first necessity products increased even more because of human stockpiling, on the one hand; on the other, the preservation standards and procedures suffered a change in the application, because products that needed to be stored in cool conditions (such as meat or eggs) were bought in larger quantities and had to be stored for months by consumers. Therefore, sustainable and resilient approaches in the agri-food system became imperative as early as 2021, when large parts of Europe started to experience lockdowns [91,92] and the uncertain future of the linear economy in agri-food brought into discussion the necessary transition to a circular economy. To ensure future food security and food provision, governmental assistance to producers became a must,



with a direct or indirect impact on consumers. In Western Europe, this has taken the form of an interventionist policy to prevent national producers from being excluded by external competitors and to ensure appropriate management of agri-related resources [93,94].

Governmental assistance measures implemented successfully in Western countries need to also be applied in Eastern Europe, such as the depreciation of the national currency (higher price competitiveness increases the level of exports and decreases imports, thus favouring local producers); support addressing producers of premium goods and luxury exports; integration of local trade rules (such as eat local, buy local); setting alternative transportation routes (cheaper and faster, with preferential customs tariffs to speed up the farm to fork process); reduction in the price of healthy food and taxation of unhealthy products (effective strategies to encourage people to eat better [91,92]); and favourable tax treatment for economic operators (who install planned measures such as monitoring the expiry date of products, reducing the selling price before expiry, and sending unsellable food for use in compost or biogas [95,96]). Food security (or safety) implies both health (hygiene) as well as the sufficiency of food, and in the supply chain, stakeholders are becoming more and more aware that each one plays an important role for the benefit of all, especially during stressful times.

#### 4. Conclusions

The identified reports outline that interest in the food waste phenomenon in Eastern European regions at the household level exists, but the results regarding estimations of trends are not satisfactory enough because comparisons between the west and east are limited to past habits with no future outlook in mind (obligatory to set macro-trends). Collection of data at the household level has a social (psychological) limitation too, because active participants in interviews or surveys most probably provided answers according to their need to show themselves in a good light without understanding the need for evolution, and therefore, further considerations and new methods could be useful to overcome those barrier factors.

One such different approach is the political anticipation method. If applied for further FLW studies, it could be a valuable tool to strengthen statements and give way to macro-trends based on horizontal and vertical triggers. Until the middle of the 20th century, humanity determined present actions according to habits, traditions, and past experiences (a genuine imitation game): whatever parents did, children did too; whatever tools they used, children used too, because that was the way it had always been for generations and because past always shaped present. However, nowadays, the future influences the present as much as the past. Technology has changed lifestyles: the parents' tools (phones, computers, and cars) have become obsolete and inadequate for their children's world. The requirements in terms of standards, climate change, and the need to be constantly up to date are some of the determiners of the people's decisions. By questioning certainties, checking the compass, not only the map, seeing the trend breaks, and thinking about the unthinkable (the change no one believes will happen), research studies applying the anticipation method would be able to project new forecasts and help actors of the food production and consumption chain adapt their work and actions accordingly.

As part of the anti-FLW campaign, Eastern European policymakers are invited to design regulations aiming to promote anti-waste practices, such as rewarding companies which incorporate socio-ethical programmes in their social-responsibility research work and education curricula for minorities or disadvantaged groups in their training sessions. When designing such policies, particularly when combining emergent technologies and agri-food systems, the balance of short-term financial growth goals with long-term development ones should be kept in mind. Furthermore, anticipatory scenario-based exercises organised in cooperation with NGOs, food producers, distributors, and consumers may significantly improve the level of resilience of all stakeholders of the agri-food industry.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

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