Ways to monitor FLW:
Review and recommendations on data
collection and reporting for the Russian context

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Abstract

In 2015, all 193 UN member countries agreed to halve global food loss and waste by the year 2030. At national level, the first step is usually to measure the extent of the problem and set targets. Countries that initiate the inventory of their national food loss and waste (FLW), frequently find out that first, the amount of FLW is bigger than was initially anticipated, and second, that there are massive data gaps, including quality, granularity, representativeness, collaboration and prioritization etc. Russia is no exception. In this article, we will make an overview of what is already happening in Russia regarding the FLW issue and what can be learned from international examples—mainly, the Netherlands. Despite many existing methodologies and practices being limited in their scope, reach, accuracy etc., it is more important to select what is appropriate and/or feasible now than wait for an invention of a perfect quantification methodology in an unforeseeable future.

Keywords: FLW Monitoring, national statistics, measurement methodology, food loss and waste, municipal solid waste.
JEL classification: Q1.

1. Introduction

According to Food and Agriculture Organization (FAO, 2019) and United Nations Environmental Programme (UNEP, 2021), 14% of produced food is lost and 17% is wasted yearly worldwide. Overall, one third of all food produced globally by weight is lost or wasted between farm and fork, resulting in significant environmental impacts and $940 billion in economic losses annually. The issue is not only that food produced for human consumption ended up in the landfill, but also that, being

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a source of contamination and infestations, the resources used to produce it, like land, water, money and labor, were used irrationally and wasted as well.

Although the Sustainable Development Goal (SDG) 12.3 calls all countries to halve their food loss and waste (FLW) by 2030, not all of them have a proper understanding of the issue at the high level. In some cases, although the topic of FLW is gradually making its way into the political agenda, the idea of reduction or prevention of FLW is not yet here. Often not many efforts are allocated to tackle the FLW issue at a governmental level. For example, on the Russian Federal State Statistics Service (Rosstat) page dedicated to the SDGs, Goal 12.3.1 is marked as "not studied, and no national data is provided on the topic."[1]

One of the major issues associated with FLW is calculation. A satisfactory estimate of FLW in various sectors of the economy is complicated because of the lack of reliable statistical information. In Russia, balances-based calculations used by Rosstat have substantial limitations, including the scope of respondents (for example, small farms are not taken into account), and the accuracy of the provided information.

Reducing FLW in Russia requires significant investments in the improvement of production technologies, transport and logistics infrastructure and organizational measures for accounting and control of material flows. At the same time, often the economic benefit for entrepreneurs from such actions is not obvious. According to industry experts, the business strategies of companies are aimed at making quick profits, so the planning horizon in the Russian market often does not exceed 3–5 years (SKOLKOVO, 2019).

Thus, it is important to demonstrate the scope of the issue with more accurate statistics, explain how FLW reduction can contribute to resolve various economic and social issues, as well as get support from the state, as without state participation it will be difficult to improve the situation and achieve SDG 12.3.

In this article, we will provide an overview of the situation regarding FLW quantification in Russia and the Netherlands in order to select the best practices that can be used by the Russian government, academia and business for better FLW calculation, as well as outlining the ways to reduce and prevent them in the country.

2. FLW in Russia

2.1. Overview

Russia has no national strategy on food waste prevention. The major environmental project that is currently in action in Russia is the national project "Ecology"[2] under the direction of the Ministry of Natural Resources and Environment of the Russian Federation (Minprirody of Russia). The global goal of this project is to improve environmental protection across Russia by 2024. The project assumes several directions, three of which are dedicated to waste:
- Liquidation of illegal landfills;
- Waste management, including recycling and separate waste collection;
- Hazardous waste management (dealing with danger classes I (mercury-containing wastes) and II (batteries).

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[1] https://eng.rosstat.gov.ru/sdg/data/goal12
[2] https://xn--80aapampemcchfmo7a3c9ehj.xn--p1ai/projects/ekologiya

Table 1
Food loss at various stages of food supply chain (% on average, based on expert interviews).

	Growing and harvesting	Processing	Transportation, storage	Distribution
Crops production	up to 10–30	up to 10–25	up to 15	up to 30–45
Dairy husbandry	up to 10–50	up to 10–25	up to 15–35	up to 5–10
Meat husbandry	up to 20–30	up to 1–5	up to 10–15	up to 5
Fishing	up to 20–30	up to 5–20	up to 10	up to 5–10

Source: SKOLKOVO (2019, p. 31).

Thus, this national project does not mention FLW. Moreover, FLW prevention is not even a topic in the whole strategy. One explanation is a relatively small amount of FLW, according to the official statistical data. Overall, Russia lacks reliable statistics on FLW or any extensive research on the topic. There is a problem of data discrepancy in the estimates of the total volume of FLW in the country's consumer market. According to Rosstat, food losses average 0.6% of food production. The expert community, on the contrary, considers these indicators underestimated by tens of times and claims that in Russia as a whole the situation with food losses is no better than the global average, 30–40% of the total production (SKOLKOVO, 2019, p. 7) — see Table 1.

Although government initiatives on FLW reduction are lacking, private sector and NGOs make considerable efforts, especially at the stages of retail and household. They try to raise awareness through lectures, thematic groups in social media, where they speak about food waste issues, provide recipes for leftovers, give advice about proper storage of food in households etc.

One of the key actors of this area in Russia is the Food Bank Rus. Its main task is to facilitate communication between manufacturers seeking to donate goods and recipients. According to the Food Bank, in 2020, the total volume of food donations amounted to almost 8,500 tons from 76 donor-companies.[3]

However, in Russia, tax legislation does not support food donations, making landfilling cheaper than charity because of value-added tax (VAT). On May 22, 2020, the State Duma adopted a law allowing companies to transfer goods or money to charity to the amount of no more than 1% of revenue without paying income tax. This law allows large producers and retailers to increase the volume of food products transferred to charity. Nevertheless, the topic of taxation of the transfer of goods to charity in Russia is not finally settled yet.

There are several food-sharing projects in Russia, e.g., Foodsharing.Russia,[4] We Save Food[5] that collect unsold food from food service organizations and stores, and re-distribute it. The food is re-distributed in all possible ways — given to charities or directly to homeless people, or even shared among volunteers — in order to avoid throwing it away. Eatme App[6] is a service that helps save food from restaurants with great discounts. However, the food-sharing process in Russia is

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[3] https://foodbankrus.ru/upload/iblock/d09/Foodbank_Rus_Annual_Report_2020.pdf (in Russian).
[4] http://www.foodsharingrussia.ru/about.html (in Russian).
[5] https://wesavefood.ru/en
[6] https://eatmeapp.ru/ (in Russian).

mostly a gray legal area which is open to differing interpretations. Thus, clear legislation dedicated to food donations and food-sharing is necessary.

Moreover, there are even more legal obstacles on the way to save food. For example, if a food producer or a retailer wants to transfer unsold products to animal feed, the law demands a special expertise first, which costs money. In addition, the expertise period is 30 days, while it is allowed to store discarded products for no more than 1–3 days (HSE, 2021).

Thus, there is a number of issues that clearly cannot be solved without the involvement of the government.

2.2. Russia: Solid communal waste measurement

In Russia, statistics on municipal solid waste (MSW), including FLW, are the responsibility of Minprirody of Russia and Rosstat. Russian Federal Service for Supervision of Natural Resources (Rosprirodnadzor), which is part of the system of Minprirody of Russia, collects and processes primary data and provides the aggregated statistical information to the public.

Municipal solid waste (MSW) includes waste generated in residential premises during consumption by individuals; goods that have lost their consumer properties in the process of their use by individuals in residential premises in order to meet personal and household needs; as well as waste generated by the activity of legal entities, individual entrepreneurs, similar in composition to waste generated in residential premises by individual consumption.

MSW collection in cities is carried out mainly in a mixed way: waste without preliminary sorting is collected in containers. With a mixed MSW collection system, the possibility of extracting high-quality secondary resources (textiles, paper, plastic bottles, polymer waste) for further recycling is significantly reduced, since their quality has deteriorated due to moisture and pollution. The use of a mixed MSW collection system not only reduces the possibility of extracting secondary resources, but also increases the load on landfills. In Russia, MSW is mostly buried (Minprirody of Russia and Lomonosov MSU, 2021).

The federal project "Integrated system of solid municipal waste management" is being implemented as part of the national project "Ecology" in order to create an effective system for managing production and consumption waste (Minprirody of Russia and Lomonosov MSU, 2021).

The order of Rosstat of 2020 introduced a new version of the statistical form No. 2-TP (waste) "Information on the formation, processing, disposal, neutralization, disposal of production and consumption waste."[7] This form is filled out by:

- Legal entities and individuals engaged in entrepreneurial activity… who carry out activities in the field of waste management of production and consumption;
- Regional solid waste management operators;
- Solid waste management operators.

Reporting on the form is annual and obligatory.

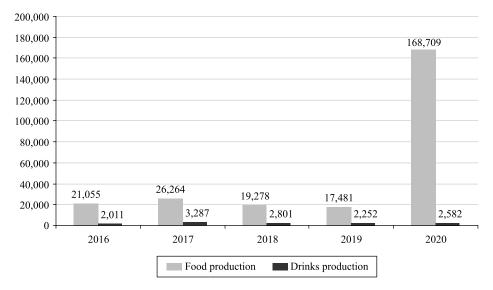[7] https://rpn.gov.ru/activity/reports-receiving/waste/ (in Russian).

Fig. 1. Volume of production and consumption wastes generation in Russia by types of economic activity in 2016–2020 (thousand tons).

Source: Minprirody of Russia and Lomonosov MSU (2021, p. 261).

Waste mass is calculated in tons by the standard waste mass balance formula:[8]

Waste residue at the end of the year =

= Waste available at the beginning of the year +

+ Waste mass generated/received – Distributed waste mass,

whereby Waste mass generated/received is formed by:
- Primarily formed MSW
- Waste generated after treatment
- MSW received from other entities

Distributed waste mass is formed by:
- Disposed MSW
- Processed MSW
- Neutralized MSW
- Buried MSW
- Transferred MSW

Order of Rosprirodnadzor "On approval of the Federal Classification Catalog of Waste"[9] amended in 2021 introduces the full new classification of *Food, drinks and tobacco waste*. Although all food products there are considered as "lost consumer properties," it is a huge step forward that will allow to trace specific food categories. Possibly, this change allowed for a drastic surge in statistical data in Russia in 2020 (Fig. 1).[10]

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[8] https://rpn.gov.ru/upload/iblock/beb/pamyatka_2tp_othody.pdf (in Russian).
[9] http://www.consultant.ru/document/cons_doc_LAW_218071/1e357d8fa15c76e50c00c46123570a7808b8648c/ (in Russian).
[10] https://rosstat.gov.ru/folder/11194 (in Russian).

Table 2
Rosstat monitoring of food losses by stage of the food supply chain.

Type of food loss	Monitoring status
1. Loss of crop crops in the case of livestock (by main types of crops and agricultural animals)	Is monitored
2. Uncultivated crop areas	Monitored by agricultural organizations, farm households and individual entrepreneurs
3. Loss at harvesting	Not monitored
4. Losses in transportation and storage by producers	Monitored in agricultural organizations
5. Refraction factor	Monitored (for grain, sunflower, sugar beets)
6. Quality loss	Not monitored
7. Product losses during transportation, storage by procurement, processing organizations and in wholesale	Monitored in procurement and processing organizations (grain)
8. Retail waste	Not monitored, data from the 1980s is used
9. Household waste	Not monitored (assessment based on comparison of various studies, household budget and diet studies is possible)

Source: Laikam (2018, slide 8).

Still, FLW are not monitored in relation to a specific stage of food supply chain (Table 2).

To conclude, the following major issues can be mentioned:

- In Russia, FLW is regarded and calculated as a part of MSW, thus many actors in the food supply chain are not in the overall state statistics, like small farmers, households, etc.
- There is no single definition of FLW. Although the definition of FAO is used by the government, the issue is not sufficiently studied from the SDGs point of view. Retailers use their own definition that may include expenditure rates, defects and theft (Kim et al., 2020).
- There is no concept of FLW prevention/reduction.
- Connecting FLW to different supply chain stages is a general issue, and Russia is no exception.
- The existing legislation does not facilitate the efforts of FLW reduction, and often may be an obstacle. However, it will not be amended unless the FLW prevention/reduction issue enters the political agenda.

3. FLW quantification methodologies in the EU

3.1. Short history of developments since 2010

In the EU the development of the FLW agenda started in 2010 with a landmark "Preparatory study on food waste across EU 27" (Monier et al., 2010), which calculated that around 90 million tons of food waste were generated in the EU each year and provided recommendations on food waste reduction. Multiple important studies dedicated to FLW in the EU and at the global level followed.

In 2011, FAO launched a FLW footprint study during the world's first conference of Save Food Waste in Düsseldorf, Germany; the data from the report has since become the reference on global food waste data (FAO, 2011).

In 2012, the European Commission Framework Programme 7 funded the project to investigate the development of a harmonized approach on FLW quantification, FUSIONS,[11] which was against the backdrop of EU policy to reduce FW by 50% by 2025 (resource efficiency flagship).

The year 2013 brought an update to the FAO study of 2011. The new report (FAO, 2013) provided a worldwide account of the environmental footprint of food waste along the food supply chain, and focused on impacts on climate, water, land and biodiversity, as well as economic quantification based on producer prices.

In 2015, the EU launched its Circular Economy Action Package, including FW reduction target — to reduce food waste 30% by 2025. That year seventeen SDGs were launched, including SDG 12.3 on halving FLW by 2030. The World Resource Institute, UNEP and FAO started to work on quantification methodologies to track progress against SDG 12.3. In the result, in 2016 a FLW protocol was created as global accounting and reporting standard enabling a wide range of entities — countries, companies and other organizations — to credibly, practically and consistently report how much FLW is created and identify where it occurs.

In 2018, EU's newly revised Waste Framework Directive came into effect, establishing food waste definition and reporting requirements from 2020 onwards. Next year, the EU launched its updated Green Deal (–55% CO_2 by 2030 compared to 1990, and the first climate neutral continent by 2050).

According to the FAO 2019 Food Loss Index, 14% of food produced for human consumption is lost on the global level (FAO, 2019).

The same year, the European Commission (EC) published the Delegated Decision establishing a common EU methodology to measure food waste, laying down a format and quality check report for reporting the data on the levels of food waste generated in member states. Eurostat published a Questionnaire and Guidance document to help member states' experts with their food waste measurement activities.

In 2020, the EU launched Farm to Fork Strategy[12] for a fair, healthy and environmentally friendly food system. In 2021, the EC published Inception Impact Assessment on setting legally binding EU-level targets for food waste reduction. The proposal to set targets at the EU level is part of the Farm to Fork Strategy, and it presents the policy context, objectives and policy options, as well as a preliminary assessment of its expected impacts.

In 2021, UNEP calculated Food Waste Index. 17% of food produced for human consumption is wasted on the global level (UNEP, 2021).

3.2. The European Commission methodology

Directive 2008/98/EC[13] lays down an obligation for member states to include food waste prevention in their waste prevention programmes and to monitor and assess the implementation of their food waste prevention measures by measuring the levels of food waste on the basis of a common methodology.

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[11] http://www.eu-fusions.org/index.php/about-fusions
[12] https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en
[13] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN

The food supply chain under the Directive looks as following: (a) primary production; (b) processing and manufacturing; (c) retail and other distribution of food; (d) restaurants and food services; (e) households.

The methods it recommends for FLW calculation include direct measurement (weighing or volumetric assessment); scanning/counting; waste composition analysis; diaries. When there is no direct access to food waste or when direct measurement is not feasible, mass balance and coefficients are used.[14]

3.3. Dutch FLW Monitor

Commissioned by the Dutch Ministry of Economic affairs and Climate, the Dutch FLW Monitor is executed by Wageningen Food & Biobased Research annually since 2009. The goal of the annual update of the Dutch FLW Monitor is to provide a reliable result on the amount of food that is wasted in the Netherlands (van Dooren, 2019). Based on the results, the Ministry adjusts its policies to reach its goal of reducing food waste. The results are a quantification of the total amount wasted and are based on data gathered from public sources.

Secondary data is collected for the complete post-harvest supply chain, from agricultural producer to (and including) consumers. In the result, all waste is divided into streams by the type of waste. The types of waste included in the Monitor are avoidable, potentially avoidable, unavoidable and by-products. Destinations included in the Dutch FLW Monitor are food banks, converted into human consumption, animal feed, digestion, composting, burning and landfill.

The definition of food waste used in the Monitor is: "Food intended for human consumption that is not used for human consumption." Food not intended for human consumption is not part of the definition and is not included in the quantification. The destinations are based on Moerman's Ladder (Fig. 2). Only avoidable and potential avoidable side streams, with the destination animal feed, digestion, composting, burning and landfill, are included in the final quantification (Table 3).

Avoidable — products that could be used for human consumption and are not potentially avoidable, unavoidable or by-products, like products that go past the best-before-date, leftovers or food that is kept out of cooling too long.

Potentially avoidable — When products are no by-products and can be used for human consumption, but due to economic, technical, legal or quality reasons not kept in the regular supply chain, like fruit and vegetables with small spots or different shapes.
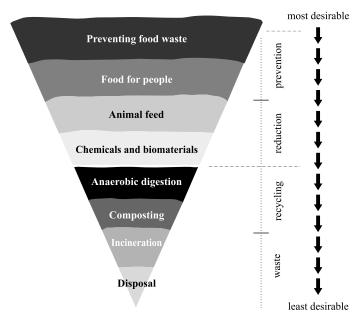
Unavoidable — products that are not consumed by humans, for example, in the Netherlands those are seeds, bones, peels and lungs. This category often depends on the country/culture.
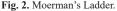
By-products — side streams due to processing of food, which cannot be used as food, like beet pulp when retrieving sugar (Soethoudt and Timmermans, 2013).

Data is gathered depending on the food waste destination. For example, the AgenschapNL[15] annually provides statistical information for the category *landfill, burning, composting* and *digesting*. The waste statistics include waste in

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[14] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN
[15] AgenschapNL is an agency of the Ministry of Economic Affairs of the Netherlands. It carries out various assignments for the Ministry of Economic Affairs, Agriculture and Innovation and for various other ministries.

Fig. 2. Moerman's Ladder.

Source: Timmermans (2021, slide 9).

Table 3

Food waste destinations covered by Dutch FLW Monitor.

	Avoidable	Potentially avoidable	Unavoidable	By-products
Food bank				
Converted for human consumption				
Animal feed				
Digestion				
Composting				
Burning				
Landfill				

Note: This table shows what areas are covered in the Dutch FLW Monitor — from animal feed to landfill and only avoidable and potentially avoidable waste.

Source: Soethoudt and Timmermans (2013, p. 5).

general, with, for example, paper, iron, organic etc. Based on additional information gathered from other public sources and studies on food waste, the food waste data is extracted.

For the destination *animal feed*, statistics are gathered from two types of feed producing organizations, the moisture-rich feed producers are organized in the OPNV (Consultation Group Wet Feed Producers) and compound feed producers are organized in PDV (Product board animal feed) — although there are still data gaps. For the destination *food bank* and *converted for human consumption*, no structural data is provided. The data is gathered from other public sources and studies. For example, data from the *food bank* is collected from the website and presentations given by the Foodbank Netherlands, while the destinations *converted for human consumption* is even more difficult since this is often done internally in companies or by public initiatives.

Speaking about limitations, Dutch FLW Monitor is not able to connect the waste data to the different supply chain stages and to provide a total overview. The reason is that the data comes from consolidated streams, which are not traceable to the source. The only exception is the consumers' stage — a study of the waste streams from consumers is conducted every three years.

Another challenge is that instead of one number a spectrum per destination and type of waste is provided. Reasons are the insecurity about some of the public data available. Sometimes it is unknown to what type of waste stream the data is directed. For example, composting has a spectrum since it is unknown why a waste stream occurs at farmer level — economic situation or bad weather. Biobased products (non-food applications) are not yet considered in the Monitor.

3.4. The latest developments in the FLW Monitoring in the Netherlands

In 2018, the foundation United against Food Waste (STV) was established. It is a collaboration between government, businesses and NGOs based on four actions pillars: 1) monitoring progress and impact, 2) joining forces to combat food waste across the food supply chain, 3) joining forces to combat food waste at the consumption level, and 4) changing the legislation.

In collaboration with the STV foundation, Wageningen University and Research (WUR) provides an in-depth method to quantify FLW following the EU definition, with (sub)sector specific data, as provided in the Waste Framework Directive and the Delegated Decision on FLW reporting. The goal is to provide a quantification method and sector benchmark per supply chain link with use of primary data collected.

The methodology is sector specific. Data is shared confidentially with the use of a contract that ensures confidentiality. Experts from WUR provide support and guidance on data gathering, definitions and FLW classification. Furthermore, they assist in prioritizing reduction efforts on product groups or impact in CO_2 equivalents.

Currently, the work is still in process for most supply chain stages, however, the benchmark for the retail sector and consumers is already available.

3.5. Dutch self-reporting companies

In collaboration with the Dutch Food Retail Association, WUR and the Ministry of Agriculture, Nature & Food Quality, STV, and retail performed a self-monitor assessment to create a benchmark for the retail sector regarding quantification of waste streams. Five Dutch supermarket chains participated in the research. Together they make up around 77.5% of the Dutch market. The supermarket chains voluntarily reported on their unsold food products, and provided this data confidentially to WUR, which then performed the data analysis and extrapolation for the Dutch market as a whole. The results give insights on the amount and type of food wasted, split per destination in 2019. In total, 1.7 percent of food does not reach the consumer. This 1.7% of food waste in retail consists of five product categories: fresh bread, part-baked bread, and pastry (31.5%); fresh meat and fish (7.5%); potatoes, vegetables, and fruit (34.5%); dairy, eggs, and chilled convenience products (13.3%); and other fresh and shelf-stable products (13.2%)
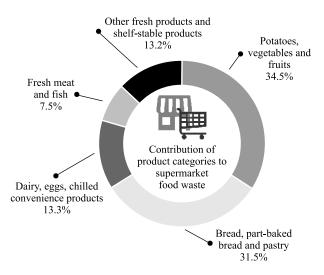
Fig. 3. Dutch retail benchmark.

(Fig. 3). However, waste per category relative to total stock is 7.7% for fresh bread, part-baked bread and pastry; 2.9% for fresh meat and fish; 2.7% for potatoes, vegetables and fruit; and 1.4% for dairy, eggs and chilled convenience products (WUR, 2020).

3.6. Examples of Dutch initiatives to prevent, reduce and valorise FLW streams

3.6.1. Research on FLW inducing regulations

In collaboration with STV and resources from the Ministry of Agriculture, Nature and Food Quality, Wageningen Food and Biobased Research published a report on the impact and feasibility of policy and regulatory measures on the prevention and reduction of food waste in 2020. The goal of the report was to identify, advise on, and actively advocate for the removal of obstacles, barriers, and obstructions at selected hotspots in legislation, regulations, and trading practices (Bos-Brouwers et al., 2020).

On April 2015, guidelines were developed for charities and food banks in collaboration with the Dutch Safety Authority and the Dutch Ministry of Health. The guidelines are in line with the Dutch regulations and include information on expiration dates, storage temperatures, labelling, freezing of products, traceability and working environment.[16]

3.6.2. Measures in private sector

A typical example of valorisation of FLW streams in the Netherlands is the Verspillings Fabriek (Waste Factory).[17] Here products are processed into

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[16] https://voedselbankkennederland.nl/wp-content/uploads/2016/12/april2015-informatieblad-76-charitatieve-instelling-april-2015.pdf

[17] https://deverspillingsfabriek.nl/

soups and sauces. The products in question are, for example, the leftovers from cut tomatoes from catering facilities, or vegetables and fruits that are too small or have a different shape. These products are cooked and sold to consumers via retail channels, catering companies etc.

Plenty of small start-ups started in the last couple of years to prevent, reduce or valorise FLW streams. For example, *WasteWatchers*[18] that focus on monitoring and reduction of FLW streams, and the local start-up *De tweede jeugd*[19] which collects day-old bread and processes it, for example, into grilled cheese sandwiches, garlic bread and croutons.

3.6.3. Consumer campaigns

As a result of the consumer sector monitoring that is conducted every three years, several research, pilot projects and consumer awareness campaigns started. For example, a consumer campaign focusing on positive social norms and practical tips, and providing more information on labelling.

4. Conclusion

Although the situation with FLW calculation in the Netherlands is not perfect, there are some achievements that Russia can use to reach SDG 12.3 and halve (or at least reduce) its FLW by 2030 and beyond.

It is important to understand that there is no ideal or flawless methodology. However, it should not discourage. On the contrary, finding ways to involve more actors and get more data on how much food is lost and wasted along various stages of food supply chains will help to expand and hone the existing methodologies. For example, getting information by waste stream, like in the Dutch FLW Monitor, may be a good addition to 2-TP forms (Table 4).

Overall, waste management operators and waste plants are widely involved as information sources in the EU member-states, as they have first-hand data on the amount of waste, and it may be very useful for Russia to include them as well.

Secondary data should also not be overlooked. For example, it is possible to calculate organic fractions along food supply chain from MSW.

Another important thing is to create incentives for businesses to disclose their data on food waste without fear of being fined by the government or having reputational damage. It is crucial to raise awareness that FLW is a global issue and is often a result of structural inefficiencies that can be overcome by cooperation of all actors, and especially the government. Political measures that will facilitate FLW prevention and reduction are necessary. As many experts highlight, retail chains are interested in reducing food waste, so it is important to create incentives and even a more favorable environment to do so in practice (HSE, 2021).

To conclude, it is important to remember FLW statistics is not a goal in itself as its purpose is to identify focal points along the food supply chain, develop measures to reduce FLW, and monitor progress.

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[18] https://wastewatchers.eu/en/
[19] http://www.detweedejeugd.nl/

Table 4
Suggestions for data sources by FLW destinations.

Destination	Possible sources	
	The Netherlands	Russia
Donation	• Website/year reports food bank Netherlands; • Website/year reports local food banks.	• Website/year reports Food Bank Rus; • Retail chains that have data but usually do not publish it; • Involve food-sharing organizations.
Converted for human consumption	• Online available websites/ presentations.	• Food Bank Rus; • Food-sharing organizations.
Animal feed	• Annual statistical data available; • For moisture-rich feed: OPNV (Consultation Group Wet Feed Producers); • For compound feed: PDV (product board animal feed); • Data From 2011 PA (product board arable farming).	• Food producer organizations; • Food processing organizations; • Retail; • Hotels/Restaurants/Catering;
Anaerobic digestion	• Annual report and statistics available; • For anaerobic digestion: AgentschapNL, report "Afvalverwerking in Nederland" [Waste processing in the Netherlands]; • For co-digestion: National Dutch statistics CBS (Central Bureau for Statistics on co-digestion of manure, stopped in 2011).	• National statistics; • Waste management operators; • Agricultural producers.
Composting	• Annual report available; • For composting companies: AgentschapNL, report "Afvalverwerking in Nederland;" • For agriculture: – National Dutch statistics CBS on agricultural statistics, CEFS sugar statistics; – PA (Product board arable farming); – Use of fixed percentages.	• National statistics; • Waste management operators; • Waste recycling plants; • Agricultural producers.
Incineration	• Annual report available; • AgentschapNL, report "Afvalverwerking in Nederland;" • Use of target audience monitoring, conducted by AgentschapNL; • Use of fixed percentages.	• National statistics; • Waste management operators; • Waste incineration plants.
Landfill	• Annual report available; • AgentschapNL, report "Afvalverwerking in Nederland."	• National statistics; • Waste management operators.

Note: Fixed percentages are percentages collected from a document or a study and are assumed to be fixed over the years. These percentages are not determined annually.
Source: Compiled by the authors.

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