HANDBOOK FOR FOOD WASTE WEIGHING AND MONITORING IN SCHOOL CANTEENS

methodology applied in the "SchoolFood WasteSolutions" project

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Overview

Food waste today is one of the most significant environmental, economic and social challenges affecting resource sustainability, climate change and food security, both globally and nationally. Every year, a significant amount of food is thrown away around the world, although part of the population suffers from chronic food shortages.

The United Nations (UN) Food Waste Index report (2024) shows that in 2019, about 931 million tons of food were thrown away in the world, of which 26% came from the catering sector, including educational institutions.

According to Eurostat, in 2022, the amount of food waste in EU Member States reached an average of 132 kilograms per capita (see Fig. 1) [1].
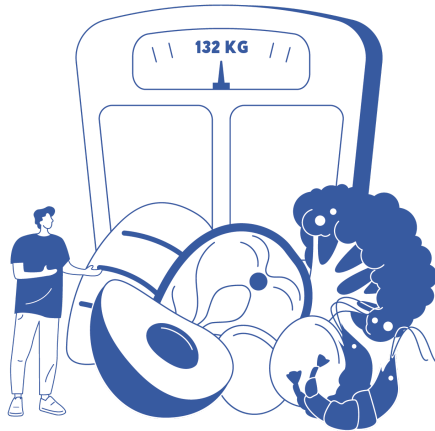
Figure 1. Average food waste per capita in the European Union, kg per inhabitant 2022 (Eurostat)

In Latvia, according to the data of the National Waste Management Plan (2021-2028), food waste accounts for a significant part of biological waste, and its reduction is one of the priorities.

Effective accounting and analysis of food waste, including systematic weighing, is an essential prerequisite for reducing waste, promoting the sustainable use of resources and educating the public on responsible consumption.

It is precisely to solve this problem that the project "SchoolFood WasteSolutions" has been developed, which aims to reduce the amount of food waste in school canteens by 30-50%, improving the quality of meals and raising awareness among students and staff about sustainable food consumption. The methodology summarized in this manual offers

practical steps for weighing and accounting for food waste in educational institutions, ensuring data accuracy and the possibility of introducing targeted improvements in catering processes.

Research insights

The sustainable food system and the reduction of food waste in educational institutions have become an important interdisciplinary area of research in recent years. Studies show that the problem of food waste in schools is multidimensional: it concerns the management of meals, the quality of children's diets, health habits and the effectiveness of an educational approach.

International research:

- **Derqui, Grimaldi and Fernandez (2020)** study *"Building and managing sustainable schools: The case of food waste"* analyses the role of school canteen management in promoting sustainable development. The authors find a contradiction between school management's subjective beliefs about the effectiveness of meals and the amount of food actually thrown away, and also point out that schools of different sustainability profiles implement different approaches to reducing food waste [2].

- **Moura etc. (2024)** study *"Assessment of Food Waste in Public Preschool and Primary Schools at the Municipality of Faro"* analyses the amounts of food waste from five preschool and primary canteens in the municipality of Faro. The results reveal that the total amount of waste amounted to an average of 40.2% of the prepared food, the share of vegetable waste was especially high. The authors also observe significant differences between urban and rural schools, emphasizing the need to adapt menus and improve staff training [3].

- **Nikravech, Fabian, Langen and Florence (2022)** study *"The Food Waste Lab: Improving food waste reduction behavior through education"* evaluates the impact of an educational program on reducing household food waste involving students in grades 9-11. The study reveals that targeted education can improve students' understanding, motivation and behavioral habits, but in the long run these benefits may diminish if active involvement is not maintained [4].

In addition to international examples, it is also important to look at the experience of Latvia and Estonia in food waste research in schools, as it provides a direct insight into the situation and possible solutions of the project partner countries.

Latvian research:

- **"Study of Food Waste at Schools in Vidzeme Region"** (Riekstiņa-Dolge, Beitāne, Iriste, Melbarde, 2019) The study was conducted in five schools, including weekly waste weighing, student surveys and interviews with canteen managers. Waste was divided into three categories: production (41%), unserved food (20%) and plate waste (39%). The amount of plate waste ranged from 2.4% to 32.3% of the prepared food, and the largest losses were caused by pre-divided portions. Suggested solutions included adjusting portions, introducing self-service with the involvement of educators, adapting the menu to student habits, and educational activities for students and parents [5].

- Research project **"Reduction of biological waste in Latvian schools"** of Ministry of Smart Administration and Regional Development stressed the importance of accurate accounting, sorting systems and classification of food categories, linking them to the preparation of the menu and portion planning [6].

Estonian research:

- **Interreg project "School Meals Program – How to Raise Awareness & Reduce Food Waste by Using Various Solutions" (2020–2023)** showed that with the introduction of digital absence notification systems ("ARNO", "Stuudium") and automatic food order prediction tools, the amount of food waste per pupil per day decreased from an average of 27 g in 2020 to 18 g in 2023 [7].

- **SEI Tallinn and Estonian University of Life Sciences** research **"Food Waste Composition in Estonian Schools"** found that about 55% of waste is made up of plate waste, 44% is unserved food and only 1% is spoiled food, which makes it possible to determine exactly where to concentrate waste reduction efforts [8].

Research at both international and regional level highlights the need for a multidisciplinary approach to reducing food waste in schools – combining accurate accounting, optimisation of portions and menus, improvements in kitchen work planning, the introduction of digital solutions and targeted educational activities. The "**SchoolFood WasteSolutions**" project builds on these principles and provides a practical framework for

sustainable food waste management in educational institutions. This particular handbook is dedicated to one of the key elements of this system – the proper weighing and accounting of food waste in school canteens, so that the data obtained is accurate, comparable and usable for further analysis and improvements.

Useful materials

This paragraph summarizes resources that can supplement the information contained in the manual and provide both practical tools and in-depth insights into the topicality of the problem of food waste and solutions in educational institutions.

1. International guidelines and protocols

- [The Food Loss & Waste Protocol](#) – an internationally recognised framework for measuring and accounting for food losses and waste, ensuring a common approach to comparability and quality of data.

2. Practical recommendations for schools

- [Reducing consumer food waste: recommendations for schools](#) – Information material prepared by the European Commission with practical advice and examples of how educational institutions can reduce food waste by involving pupils, staff and parents.

3. Regional materials

- [Reduction of biological waste in Latvian schools](#) – Ministry of Smart Administration and Regional Development guidelines with practical recommendations for the sorting, accounting and reduction of biological waste in educational institutions.
- [Sustainable food initiatives in Estonian schools](#) – Estonian University of Life Sciences and SEI Tallinn resources on healthy and sustainable menu planning, food waste reduction strategies and public engagement.

Contents

Project SchoolFood WasteSolutions

The project **"SchoolFood WasteSolutions"** (CB0600301) was implemented within the framework of the Interreg Central Baltic Programme 2021–2027, during the period from **April 1, 2025, to March 31, 2028**. The lead partner is the **Latgale Planning Region** (Latvia).

Objective: To improve the quality of school meals and reduce food waste in school canteens by 30-50% by introducing innovative, sustainable and proven solutions.

Main activities:

- Introduction of buffet-style catering in pilot schools;
- Procurement of kitchen equipment and digital tools for food waste monitoring;
- Training programs for school cooks;
- Development of a digital education program for students;
- Creation of new recipes and menus;
- Study visits to Sweden, Finland, Latvia and Estonia for experience exchange;
- Development and public availability of a solutions handbook.

Expected results:

- 30-50% reduction in food waste in pilot schools;
- improved food quality and satisfaction with meals among students;
- enhanced municipal capacity in food waste reduction;
- sustainable knowledge and publicly available resources (a handbook and a recipe collection).

Partners:

- Latvia – Daugavpils University, The Municipality of Ludza County, Preili municipality government.
- Estonia – The Association of Municipalities of Tartu County, Peipsiääre Municipality, Kastre Municipality.

The food waste weighing and monitoring methodology described in this handbook is one of the components of the project, ensuring accurate data collection and effective implementation of solutions.

Purpose of food waste weighing

Reducing food waste in schools is an important step towards a sustainable educational environment and responsible use of resources. There are three main objectives for weighing food waste in educational institutions within the framework of the SchoolFood *WasteSolutions* project (see Fig. 2).

Figure 2. Main objectives of food waste weighing within the framework of the SchoolFood *WasteSolutions* project

1. **Data acquisition and analysis** – To determine the amount of food waste, evaluate the existing menu, and identify the dishes that students prefer as well as those that are more frequently left uneaten. Such an analysis enables evidence-based conclusions about how well the menu aligns with students' nutritional needs and taste preferences.

2. **Education and awareness-raising –** using the weighing process as a practical educational tool to help students and school staff become aware of the extent of food waste and its underlying causes. This promotes sustainable eating habits and a responsible attitude towards food.

3. **Impact assessment of project solutions –** to objectively and comparably evaluate the volume of food waste before and after the implementation of specific solutions in pilot schools (e.g., before and after the introduction of digital tools, buffet-style catering, or new menus). This methodology enables a justified and comparable assessment of the impact of each measure on reducing food waste.

Time period and duration of food waste weighing

Time period

It is **recommended to select** a period of the school year for food waste measurement when no field trips, holidays, or other activities are scheduled that could significantly affect cafeteria attendance and, consequently, the volume of collected data. Seasonal factors should also be taken into account, such as common periods of illness, which may reduce the number of students participating in school meals.

Duration of weighing

To ensure that the collected data are representative and comparable, food waste measurement should be carried out over the entire menu cycle. For example, if the menu cycle lasts two weeks, measurements should be conducted every day throughout that period. This ensures that the data reflect the full range of dishes and the regular catering routine.

Minimum duration

If covering the full cycle is not feasible, the minimum recommended duration for food waste measurement is five consecutive school days, encompassing as wide a variety of dishes as possible. In such cases, the data interpretation should acknowledge that the results may not include all seasonal or cyclical menu items.

Measurements to assess the impact of the solution

If the purpose of the weighing is to assess the impact of a specific solution (e.g., a digital tool, buffet-style catering, or a new menu) on reducing food waste, it is recommended to carry out measurements for at least one full menu cycle both before and after the implementation of the solution. This ensures comparable and reliable results regarding changes in the amount of waste (see Fig. 3).
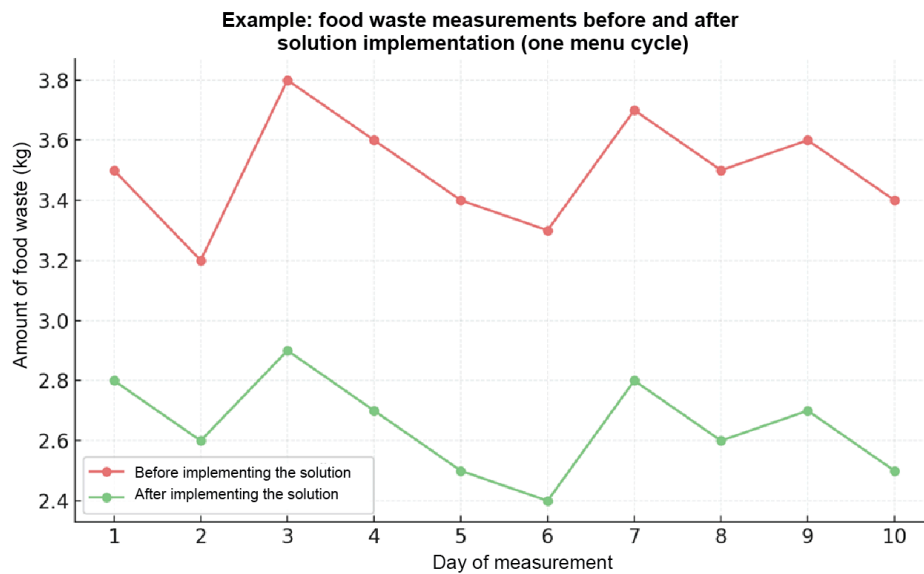
**Example: food waste measurements before and after
solution implementation (one menu cycle)**

Figure 3. Comparison of food waste amounts before and after the implementation of the
solution during one menu cycle (example; illustrative data)

*The example shows how food waste amounts are compared before and after the implementation
of a solution within one menu cycle. A similar approach to data visualization helps to visually identify
trends in changes and assess whether the specific solution has reduced the amount of waste. The data
are illustrative and do not reflect actual measurement results from any school.*

Categorization of food waste types

To ensure that food waste tracking in schools is comparable, structured, and useful for
further analysis, it is essential to divide the waste into specific categories. Such classification
helps to understand the causes of waste generation and supports targeted planning of
improvement measures. It is recommended to divide food waste into three main categories
(see Fig 4):

Figure 4. Classification of main food waste categories in schools

1. **Leftovers from students' plates –** food that was served to students but not eaten and was thrown into the bio-waste bins. Analyzing this category provides insights into students' eating habits and helps assess which meals are popular and which are often left uneaten. It also supports identifying potential improvements in menu planning and serving practices.

2. **Unserved prepared food –** food that was cooked but not served to students (e.g., leftovers in serving containers or buffet areas). Such losses typically indicate overproduction, inaccurate forecasting of student numbers, or low demand for a specific dish. By analyzing this information, it is possible to plan portion quantities more accurately and reduce unnecessary food production.

3. **Waste from food preparation and cooking processes –** waste generated during the preparation of ingredients and cooking activities, such as vegetable and fruit peels, cores, bones, fat, trimming residues, as well as unused or improperly prepared products. Since most of the waste in this category is unavoidable, its amount is not systematically weighed within the scope of the project.

Such a classification helps determine whether food losses occur during the preparation and cooking stages, during serving, or after the food has already reached the students.

Student age groups in food waste measurements

Based on the Cabinet of Ministers Regulation No. 172 *'Regulations on nutritional standards for learners in educational institutions, clients of social care and social rehabilitation institutions, and patients of medical institutions'*, Annex 2 *'Nutritional standards for learners in general basic education, general secondary education, and vocational education institutions'* [9], the division of learners is as follows (see table 1),

Table 1

Energy values and nutrient standards for set lunch menus for learners in general basic education, general secondary education institutions, social correction educational institutions, special education institutions, and vocational education institutions [9]

Learners	Energy value (kcal)	Proteins (g)	Fats (g)	Carbohydrates (g)
Learners in grades 1-4	490-750	12-28	16-29	55-113
Learners in grades 5-9	700-960	18-36	23-37	79-144
Learners in grades 10-12	800-980	20-37	27-38	90-147

It is recommended to carry out food waste measurements in schools separately for each of these age groups (see Fig. 5):

GRADES 1-4	GRADES 5-9	GRADES 10-12
• Specific dietary needs • Changing eating habits • Fluctuating appetite	• Increasing independence • Development of a personal attitude towards healthy nutrition • Habits are being reinforced	• Similar to adult eating habits • Distinct individual preferences • Clearer understanding of portion sizes

Figure 5. Age group classification of students for food waste measurement

- **Grades 1–4** – students in this age group have specific nutritional needs determined by their growth and development. Their eating habits tend to be variable, appetite fluctuates, and they often require adult assistance to choose nutritionally balanced food.
- **Grades 5–9 –** children become more independent in their food choices, but their attitude towards school meals and healthy eating is still developing. During this stage, eating habits are established that can impact health in the long term.
- **Grades 10–12 –** high school students are the most independent in their food choices, and their eating habits largely resemble those of adults. This group is characterized by stronger individual preferences and a clearer understanding of the amount and type of food.

Such a division of measurements allows for a more detailed insight into the food consumption habits and waste generation trends of students of different ages. Age influences portion size perception, food choices, preferences, and willingness to refuse certain foods.

Separately collected food waste data for each grade group is a valuable resource for meal planning. It allows tailoring the menu to the needs and habits of the specific age group, reducing the amount of waste, and improving the quality of catering.

Food waste classification by food groups

To gain a more detailed understanding of the products or food groups that most frequently end up as waste, food waste weighing data should also be classified by food type. This approach allows for better insight into students' eating habits and helps identify which dishes or products are most often left uneaten.

If a student consistently does not eat certain food groups, such as vegetables, dairy products, or whole grain products, they do not receive all the necessary nutrients for healthy growth and development. Over time, this can lead to nutrient deficiencies, affect immunity, concentration abilities, and overall well-being, which in turn can significantly impact the student's ability to learn and academic performance. Therefore, food waste analysis is important not only in the context of sustainable resource management but also as a tool to identify potential nutritional risks to ensure students' health and development. This, in turn, directly affects their ability to concentrate during lessons, actively participate in class, and achieve better academic results.

It is recommended to use the following food groups for food waste weighing (see Fig. 6):

- **Soups**
- **Side dishes** (e.g. potatoes, rice, vegetables)
- **Meat / fish**
- **Drinks**
- **Bread**
- **Fruits**
- **Dairy products** (excluding raw milk and kefir)
- **Deserts**
- **Salads**

Figure 6. Classification of food waste by food groups

Classification labels for food waste containers can be **downloaded here**.

By classifying waste according to these groups, it is possible to more accurately identify which food categories most frequently end up as waste and obtain valuable information for implementing improvements.

For example, if the data show that almost half of the students regularly leave side dishes or soup uneaten, it may indicate the need to review recipes, portion sizes, or the method of serving the food.

Such analysis helps not only to reduce food losses and optimize resource use but also to improve the quality of catering, making it more suitable for students' needs and tastes. Purposeful meal planning also promotes student satisfaction and engagement, which in the long term can positively influence their eating habits.

Important: Within the framework of the 'SchoolFood WasteSolutions' project, the classification of food groups is standardized for all participating schools in Latvia and Estonia to ensure data comparability. Users outside the project can use this classification as a basis, adapting it to the specific school's menu and types of dishes served.

Note about classification changes in the project:

In the initial phase of the 'SchoolFood WasteSolutions' project (April–May 2025), food waste measurements were conducted in pilot schools using a slightly different classification of food groups: 'Salads' were included in the 'Side Dishes' category, and the 'Dairy Products' category was labeled as 'Cottage Cheese Products.' This first round of measurements served to establish the baseline situation and create a comparable reference point. In subsequent measurements, the classification described in this handbook will be used to assess the impact of each implemented solution or their combination on the amount of food waste.

Recommendations for data usage

For the food group classification results to provide practical value and help make informed decisions, it is essential to know how often and in what way to analyze and use this data in future catering improvements.

- **Frequency of analysis:** It is recommended to analyze food group data at least once per semester, but optimally after each menu cycle, to quickly identify changes and adjust the food offerings accordingly.
- **Comparison between periods:** by comparing data before and after the implementation of specific solutions (e.g., recipe changes or portion adjustments), it is possible to evaluate their impact on reducing food waste.

- **Problem identification:** if one food group consistently constitutes the largest portion of waste, it should be prioritized for evaluation by analyzing its taste characteristics, serving method, and portion size.
- **Encouraging engagement:** it is recommended to present the results to students, teachers, and parents to raise awareness and motivate collective efforts to reduce food waste.

Container labeling for food waste weighing

To ensure transparency, accurate recording, and facilitate the compilation of food waste data, each waste container should be labeled before weighing. It is recommended that the labeling includes three main identifiers:

1. **Food group –** for example, soup, bread, fruits, side dishes, etc.
2. **Age group / grade –** indication of which grade group the specific meal was intended for (e.g., grades 1–4, grades 5–9, grades 10–12).
3. **Weight of the specific container (in grams) –** indication of the container's weight to facilitate the calculation of food waste.

Such labeling allows:

- accurately compare the amount of waste between different age groups;
- identify which dishes most frequently end up as waste within a specific age group;
- ensure data consistency throughout the entire measurement process.

It is recommended to use waterproof labels or color codes for labeling that are clearly legible and durable throughout the entire measurement period (see Fig. 7 - Illustrative example of container labeling).

Figure 7. Illustrative example of food waste container labeling

Necessary equipment for food waste weighing

To successfully carry out food waste weighing and obtain reliable data, the school must provide appropriate equipment and clear procedures for waste sorting.

Necessary equipment:

- **Electronic or mechanical scales -** suitable for measuring larger weights, with sufficient accuracy for food waste recording.
- **Clearly labeled containers -** for sorting waste by food groups and age groups; these containers are initially used to collect food waste for weighing and data recording.
- **Biodegradable waste bins -** for final collection of food waste after weighing and data registration, in accordance with the country's regulations on biodegradable waste management.
- **Additional container for non-food waste -** for example, napkins, packaging, plastic bags, etc., to prevent mixing with food waste and ensure measurement accuracy.

Properly labeled containers and additional bins significantly facilitate the weighing process and reduce the possibility of errors, while high-quality scales ensure comparable results across different schools and measurement periods. Within the framework of the 'SchoolFood WasteSolutions' project, a standardized approach to equipment and labeling in all schools ensures that the collected data are comparable between different educational institutions and measurement periods. Users outside the project can use this approach as a basis, adapting it to their own needs.

Data entry (registration) in food waste accounting

For food waste measurements to provide practical value and be usable in analysis, it is essential to record them in a standardized and structured format. Within the framework of the 'SchoolFood WasteSolutions' project, a standardized data entry form (an Excel spreadsheet '**Food Waste Tracking Template'**) is used to ensure comparability between different schools and measurement periods.

Mandatory data to be recorded:

- **Date -** the day the measurement was taken.
- **Age group -** indicates the children's age category (e.g., grades 1–4, grades 5–9, grades 10–12). This helps identify which age groups tend to have issues with certain dishes and allows for menu or approach adjustments.
- **Food group -** classifies which food groups are most frequently wasted (e.g., soups, side dishes, meat/fish, fruits, bread, dairy products, salads, desserts, drinks). This helps identify potential nutritional risks and improve catering quality.
- **Type of waste -** plate or kitchen. Indicates whether the food was wasted from the plate (uneaten) or from the kitchen (leftovers). This helps understand if the issue is portion size, food quality, or overproduction.
- **Waste weight -** after subtracting the container's weight (tare). Shows the actual food loss in kilograms or grams (grams are recommended within the project). Accurate measurements allow tracking changes and evaluating the effectiveness of improvements.
- **Number of portions served -** necessary to calculate the waste proportion per portion.
- **Portion weight -** indicated in grams.
- **Comments -** additional information about special circumstances (e.g., fewer students due to illness, special menu offerings).

Recommendations for data entry:

- Enter data **immediately after weighing it** to reduce the risk of errors and forgotten records.
- Always use the same measurement units (within the project — grams).

- Ensure that the names of food and age groups are **entered consistently in all records** (do not use inconsistent abbreviations).
- If in doubt about the data entry procedure, use the sample data entry form included in the appendix of this manual or consult the project manager.

See the example data registration table below (see table 2).

Table 2

Example of data registration in the food waste tracking form (illustrative)

Date	Age group (1.-4., 5.-9., 10.-12.)	Food group	Waste type (plate/kitchen)	Weight (kg)	Number of Portions Served	Portion weight (g)	Comments
09.05.25.	Grades 1-4	soup	plate	3,694	128	210	
			kitchen	12,246			
		bread	plate	0,044	128	20	
			kitchen	0,784			
10.05.25.	Grades 5-9	meat (chicken cutlets)	plate	0,458	184	200	not all children came to lunch (reduced hours)
			kitchen	6			
		side dishes (mashed potatoes)	plate	5,466	184	200	
			kitchen	14,296			

The data entry form (Excel spreadsheet 'Food Waste Tracking Template') can be **downloaded here**.

Comments section

Please pay special attention to entering comments, as they are essential for interpreting the collected data in the correct context. Even significant amounts of food waste are not always directly related to the quality of the menu — they may result from special circumstances.

Common examples of comments:

- Some students were absent (due to illness, excursions, or other reasons);
- Kitchen staff were not informed in time about changes in the number of students;
- The menu included a new or less popular dish;
- Last-minute changes were made to the menu;
- Food overproduction occurred due to technical reasons;
- The served food was not liked by the students.

Example of a comment:

"1st–4th grade was on an excursion. Meals were prepared but not eaten."

Please fill in the comments section as accurately and specifically as possible. This information helps to correctly interpret the measurement results, distinguish regular issues from one-time cases, and make informed decisions for improving catering services.

Recommendations for writing comments:

- State the cause, not just the result (e.g., 'the food was not eaten because it was too spicy');
- Use **specific data** if known (e.g., 15 students were absent due to illness');
- Avoid vague statements such as 'It just happened' or 'The food wasn't good'.

Food waste weighing procedure

Summarizing the above preparation and data recording requirements, the following unified food waste weighing procedure is described. Adhering to this procedure ensures that all data is collected consistently, accurately, and is comparable both within and beyond the "SchoolFood WasteSolutions" project. A standardized approach is a prerequisite for high-quality analysis and reliable conclusions regarding the effectiveness of food waste reduction measures. It is applicable both for regular food waste monitoring and for evaluating the impact of specific actions and solutions.

Steps of the Procedure:

1. **Prepare the workspace and all necessary equipment.** Ensure that all required containers, scales, and data recording forms are available at the weighing station. This will ensure the process runs smoothly and does not disrupt food service operations.
2. **Ensure that all containers are properly labeled.** Containers must be marked with the food group and age group so that measurement results can be compared across different schools and class groups.
3. **Empty the food waste into the appropriate container.** Sort the waste directly according to the food groups and age groups to ensure data accuracy and prevent mixing.

4. **Weigh each container, subtracting the weight of the empty container (tare).** The tare must be deducted so that the measurements reflect only the weight of the food waste.

5. **Record the measurement results in the data entry form.** Please enter the data, including notes about special circumstances, immediately after weighing to prevent errors and data loss.

6. **Empty the contents of the containers into the final bio-waste bins.** Handle the waste in accordance with the country's applicable bio-waste management regulations.

7. **Clean and prepare the equipment for the next measurement day.** Clean and ready equipment facilitates the work and helps prevent contamination or odors.

For a visual representation of Food waste weighing procedure see Figure below (see Fig. 8).
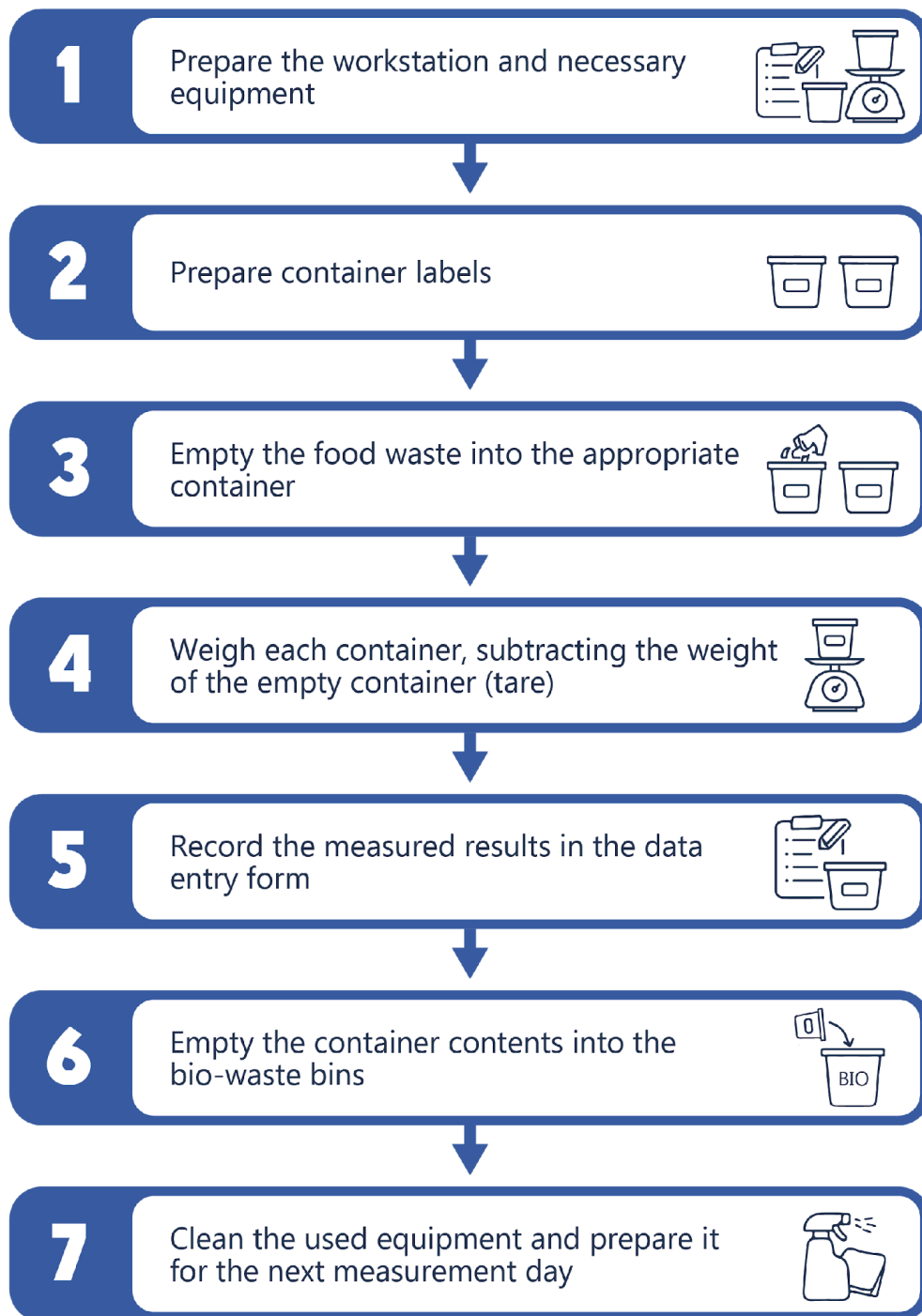
PROCEDURE FOR WEIGHING FOOD WASTE

1 Prepare the workstation and necessary equipment

2 Prepare container labels

3 Empty the food waste into the appropriate container

4 Weigh each container, subtracting the weight of the empty container (tare)

5 Record the measured results in the data entry form

6 Empty the container contents into the bio-waste bins

7 Clean the used equipment and prepare it for the next measurement day

Figure 8. Food Waste Weighing Procedure

From measurements to improvements: results and their application

This section summarizes information on how data collected during food waste weighing is analyzed and used to implement practical improvements in schools. Data interpretation and application are essential for making evidence-based decisions and achieving long-term improvements in catering quality and resource use efficiency.

Information provided by the results

Food waste weighing enables:

- to assess students' eating habits and the acceptability of the served food;
- to compare waste volumes across different age groups;
- to identify food categories with the highest waste proportions;
- to determine opportunities for improvements in portion planning, menu structure, and serving methods.

Practical benefits:

- reduced food waste and costs;
- improved food quality and student satisfaction;
- positive impact on the environment by reducing resource consumption and greenhouse gas emissions;
- increased awareness among students and staff about the value of food and responsible consumption.

Long-term significance:

Regular food waste analysis serves as a basis for improving food policy and developing educational activities to create a sustainable food culture in schools. Within the framework of the project "SchoolFood WasteSolutions", this method is also a tool to compare the initial situation with the results after the implementation of different solutions and to assess their impact.

Goals and standards for food waste reduction in educational institutions

Based on the **Latvian National Waste Management Plan 2021–2028** [10] and the **United Nations Sustainable Development Goal 12.3**, which states: "by 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" [11],

Educational institutions should aim to reduce food waste by at least **40–50% compared to the current levels.**

Such a reduction is essential to implement the principles of sustainable waste management and to ensure progress towards the overarching goal – to halve per capita food waste at the retail and consumer levels by 2030.

According to UN data, approximately **931 million tonnes of food** were wasted globally in 2019, with **26%** originating from the food service sector, including educational institutions [12]. The need to promote a sustainable approach to food systems is also emphasized in the **development and food strategies of the Tartu region** [13], [14].

Taking into account these documents and strategic settings, a **40–50%** reduction in food waste is not only recommended, but also a realistically achievable and necessary goal for building a sustainable school feeding system.

Within the framework of the project "**SchoolFood WasteSolutions**", these goals are implemented by regularly measuring food waste before and after the implementation of solutions, analyzing the data obtained and, based on them, implementing targeted improvements in portion planning, menu development, serving and self-service systems, education of students and staff, as well as introducing innovative solutions, such as digital tools for reducing food waste.

Such an approach ensures that food waste weighing becomes not only a monitoring tool, but also the basis for evidence-based action that improves the quality of catering, reduces resource consumption and helps achieve national and international sustainability goals.

Food waste monitoring in schools

For the food waste weighing method to be effective and provide comparable results, it is important to use it **systematically and repeatedly**. This is especially important when changes are made to the food system, such as:

- new recipes are introduced, or the menu structure is changed;
- portion sizes are reviewed;
- new catering approaches are tried (e.g. buffet system or digital tools).

Repeated weighing allows you to assess **whether and how these changes affect the amount of food waste**, identify positive trends and spot problems early. Regular data

collection at different times provides the basis for **targeted decisions and evidence-based improvements**.

Thus, food waste weighing is not a one-time event, but a **dynamic monitoring and development tool** that must be adapted to the specific situation and used repeatedly so that the data obtained are comparable and serve as a basis for continuous improvement of the quality of school meals.

The SchoolFood WasteSolutions project uses this approach to measure food waste before and after implementing different solutions in pilot schools. This allows us to assess the impact of each solution (or combination of solutions) on reducing food waste and provides evidence for the future implementation of sustainable solutions in other schools.

Challenges in implementing food waste monitoring and possible solutions

Monitoring food waste in schools is an effective tool, but its implementation can be affected by various practical obstacles. These challenges can reduce the quality of the data or create additional burden for the parties involved. Below are a summary of the most common challenges and possible solutions.

1. Employee motivation and engagement

Challenge: Weighing can be perceived as an additional burden on daily work, especially if employees do not understand its significance. This can lead to sloppy or incomplete data entry.

Solutions:
- organize short training sessions explaining the objectives and benefits of monitoring to students, the kitchen and the municipality;
- involve kitchen and school staff in planning, listening to their suggestions for simplifying the process;
- recognize contributions, for example, with public thanks, symbolic awards or recognition of the staff involved at school level.

2. Lack of time and daily intensity in the kitchen

Challenge: During meal times, the staff is very busy and there is not enough time for careful weighing of waste.

Solutions:

- prepare containers and a weighing location in advance;
- appoint a specific person responsible for data registration and determine the most convenient weighing time (e.g., after lunch, not during it);
- attract additional human resources (interns, volunteers, municipal employees) if necessary.

3. Container labeling and organization

Challenge: If containers are not clearly labeled by food and age group, the data becomes unclear and difficult to analyze.

Solutions:
- use a uniform marking system across all participating schools;
- use reusable labels, color codes or pictograms for easier orientation;
- regularly check that the markings are legible and understandable to all involved.

4. Student behavior and emergencies

Challenge: Excursions, sports competitions, holidays or unusual foods can significantly affect students' attendance or eating habits on a given day.

Solutions:
- Indicate relevant circumstances in the comments section for the data (e.g., "5th–9th grade on an excursion");
- Plan measurements during periods when the learning process is ongoing without significant interruptions;
- Perform weighing in at least two menu cycles to smooth out fluctuations.

5. Equipment availability

Challenge: Scales may be under-capacity or unavailable at the time needed.

Solutions:
- timely check available scales and ensure appropriate ones (with sufficient capacity and accuracy);
- create a clear place for weighing;
- use alternatives (measuring containers, volume calculations) if necessary, but record this method for assessing the reliability of the data.

6. Data entry and digitization

Challenge: Manual data registration increases the risk of errors and is time-consuming.

Solutions:

- use a centralized digital form or application;
- provide clear instructions on how to enter data;
- combine digital tools with automated data analysis to facilitate interpretation.

7. Communication with students and parents

Challenge: Students may not understand the importance of monitoring or perceive it as control, while parents may be skeptical about "weighing food."

Solutions:
- explain to students the purpose of monitoring as part of responsible food consumption education;
- incorporate the topic of food waste into school activities or curriculum;
- inform parents about the goals and benefits to build trust.

Summary:

Identifying challenges and implementing timely solutions allows for the creation of a realistic and effective food waste monitoring system in schools. The key is to ensure flexibility while maintaining data quality and the basic principles of the methodology.

For a visual representation of Challenges and solutions in implementing food waste monitoring see Figure below (see Fig. 9).

CHALLENGES AND SOLUTIONS IN IMPLEMENTING FOOD WASTE MONITORING

CHALLENGE	SOLUTIONS
Employee motivation and engagement	• Organize educational training sessions • Involve kitchen and school staff in food waste monitoring planning • Acknowledge staff contributions
Lack of time and daily intensity in the kitchen	• Prepare containers and the weighing area in advance • Appoint a specific person responsible and determine the most convenient weighing time • Engage additional human resources
Container labeling and organization	• Use a consistent labeling system • Use reusable labels, color codes, or pictograms • Regularly check whether the labels are clear and understandable
Student behavior and emergencies	• Indicate conditions alongside the data • Schedule measurements when the educational process proceeds without interruptions • Conduct weighing during at least two menu cycles
Equipment availability	• Check available equipment in advance and ensure it is suitable • Establish a designated area for weighing • Use alternative equipment
Data entry and digitization	• Use a centralized data entry system • Provide clear instructions • Combine digital tools with automatic data analysis
Communication with students and parents	• Explain and inform students and parents about the purpose and benefits of the monitoring • Incorporate topic of food waste into school events or the curriculum

Figure 9. Challenges and solutions in implementing food waste monitoring

Concluding insights and further application

The food waste weighing and counting methodology is a practical tool that helps schools and municipalities not only identify food losses, but also find effective solutions to reduce them. Regular data collection, analysis and evidence-based decision-making contribute to improving the quality of catering, more rational use of resources and a sustainable approach to everyday school life.

This methodology is based on the experience and goals of the **SchoolFood WasteSolutions project**, but its practical solutions can also be applied outside the project — in any school or municipality that wants to implement thoughtful and systematic food waste monitoring.

A sustainable food system starts with awareness and action. Properly conducted food waste monitoring provides not only data, but also the opportunity to change habits, strengthen the knowledge of students and employees, as well as move towards the common goal of reducing food waste and promoting responsible use of resources.

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