Food Waste –
How to proof the target of the Sustainable Development Goals
The example of Austria and Japan

Marion Huber-Humer, Gudrun Obersteiner

University of Natural Resources and Life Sciences, Vienna

Institute of Waste Management

Source: https://pixabay.com/de/

"**One third or more (about 1.3 billion tons)** of all the edible food that is produced in the world ends up in the **garbage** at all the different parts of the food supply chain …"

(Gustavsson et al., 2014)

Source: https://pixabay.com/de/

"Current estimates are that nearly **690 million people** are hungry, which is **8.9** % of the world population…"

(https://www.un.org/sustainabledevelopment)

2 ZERO HUNGER

To end hunger, achieve food security and improved nutrition, and promote sustainable agriculture

SUSTAINABLE DEVELOPMENT GOALS

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Sub-Goal 12.3:

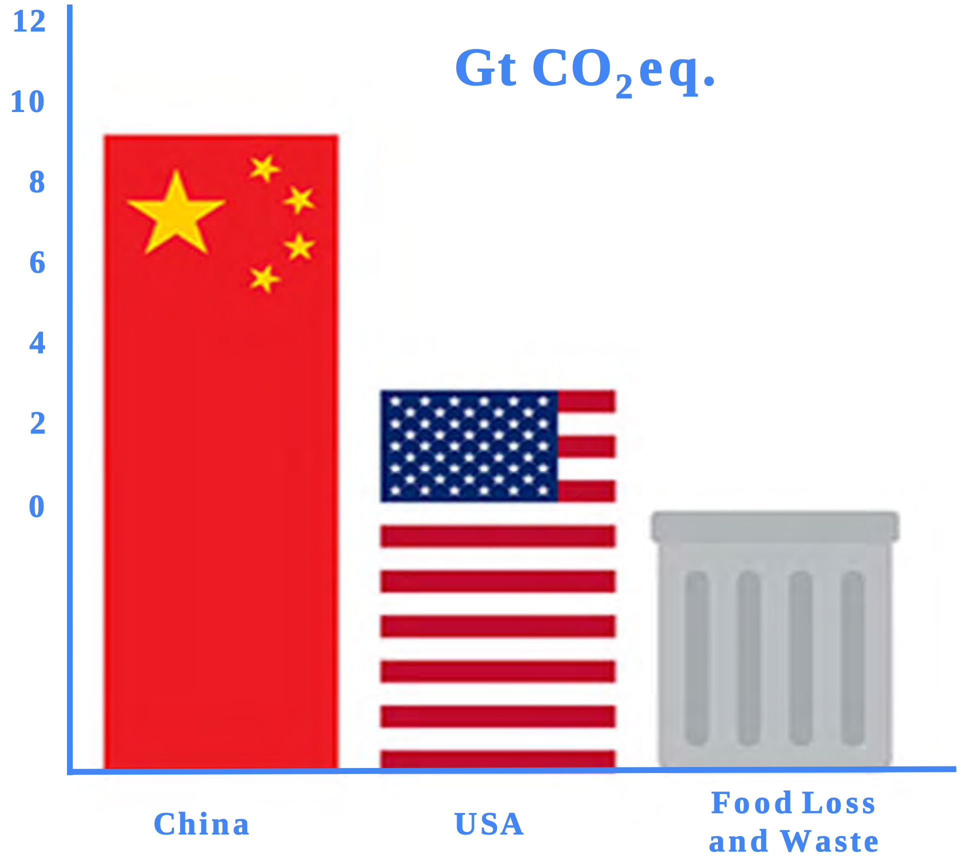
"By **2030, halve per capita global food waste** at the retail and consumer levels and reduce **food losses along the supply chains,** including post-harvest losses.“
⇒ measured by two indicators

Food Loss and Waste along the value chain

Emissions (e.g., greenhouse gases, groundwater /soil contamination)

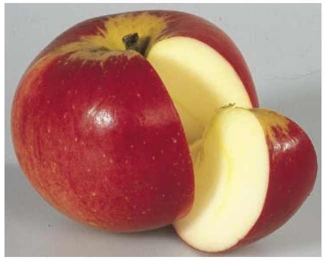
Food Loss **Food Waste**

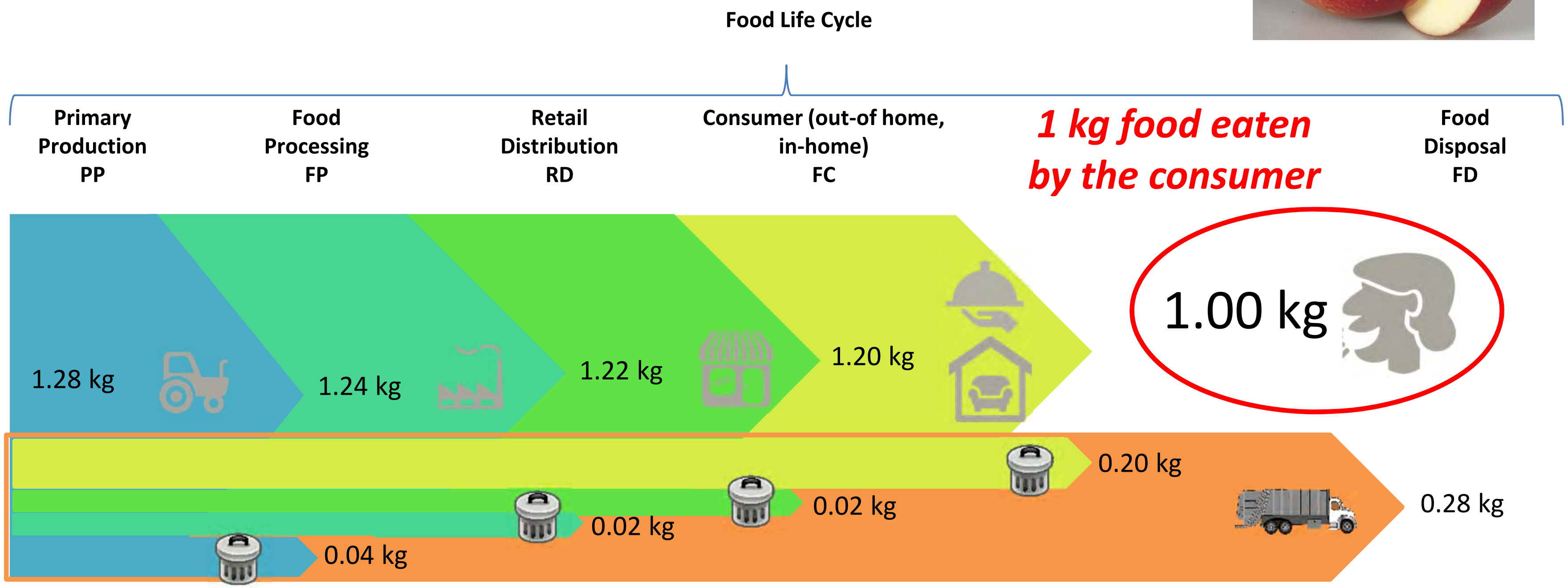
Food Loss and Waste Impacts



Sources: Stenmark *et al.*, 2016; Eurostat, 2018

Food loss and waste related impacts

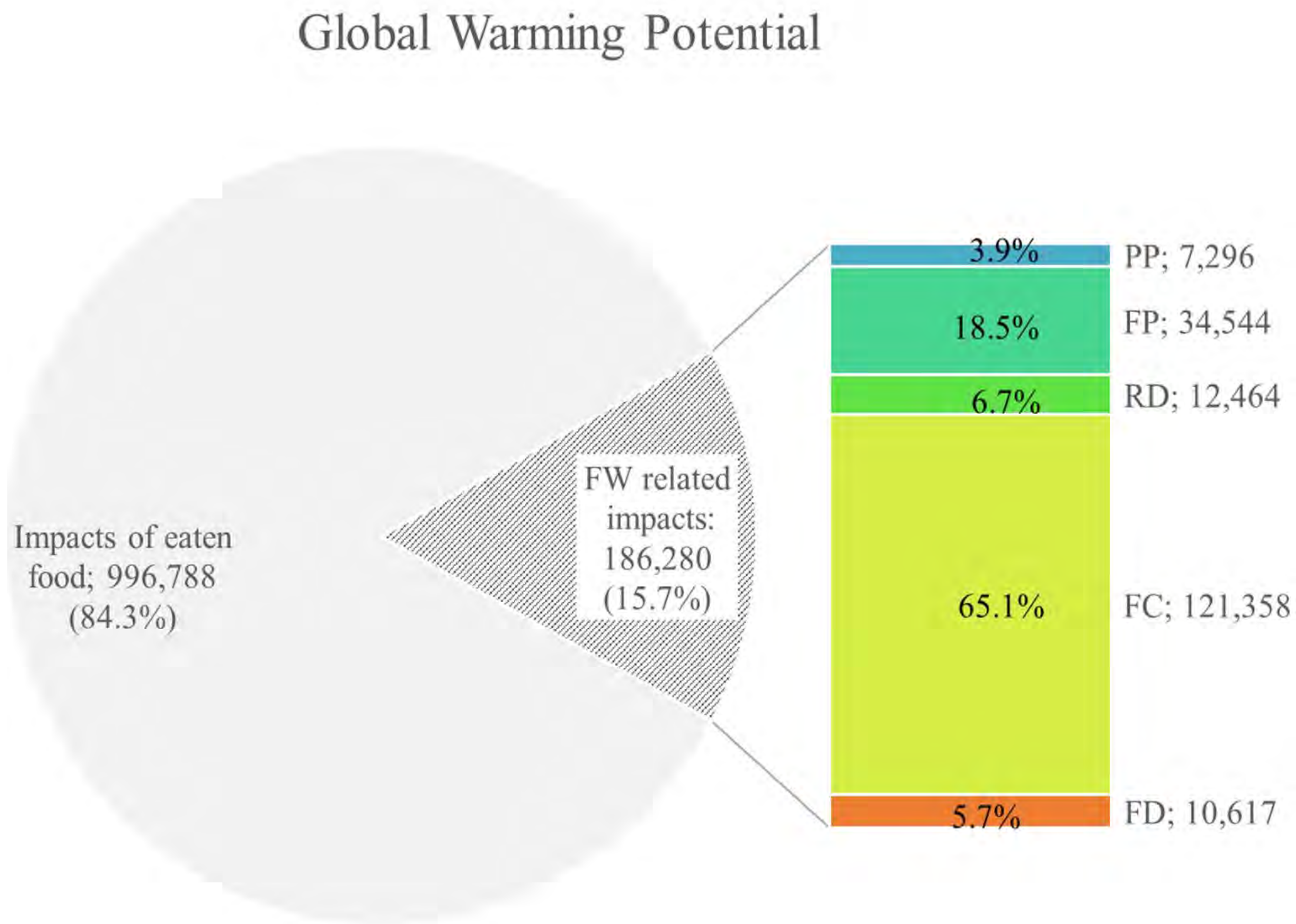




Originator perspective

Based on Scherhaufer, S. Moates, G., Hartikainen, H., Waldron, K., Obersteiner, G. (2018): Environmental impacts of food waste in Europe. Waste Management 77, 98-113

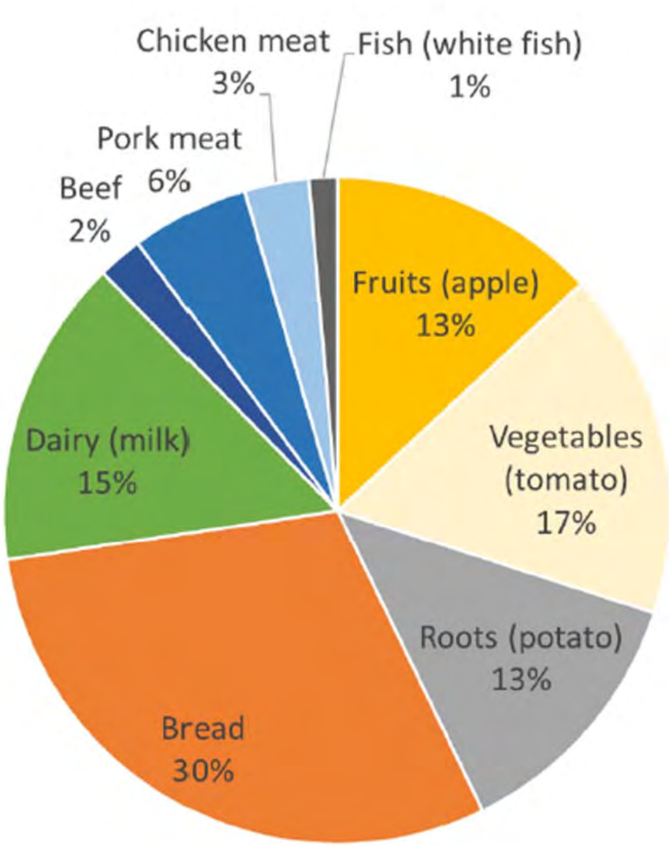
Food and food waste related impacts (kg CO_2equ)



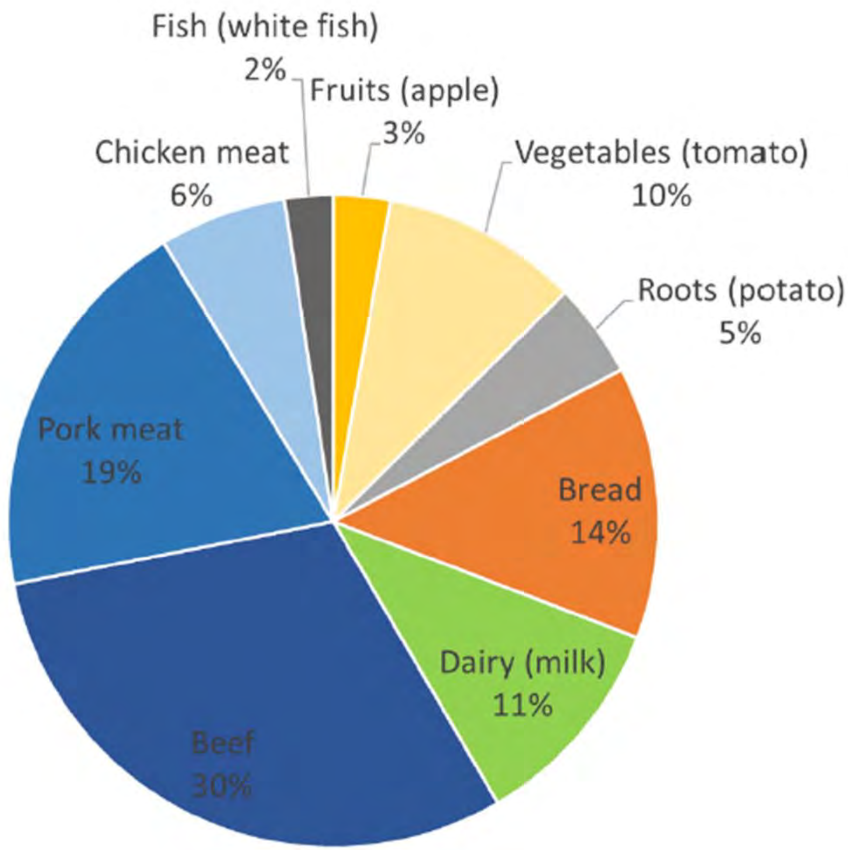
Based on Scherhaufer, S. Moates, G., Hartikainen, H., Waldron, K., Obersteiner, G. (2018) Environmental impacts of food waste in Europe. Waste Management 77, 98-113

Composition of food waste and relative GWP impact

Mass flows of food waste by type



Global Warming Potential of food waste by type



Based on Scherhaufer, S. Moates, G., Hartikainen, H., Waldron, K., Obersteiner, G. (2018) Environmental impacts of food waste in Europe. Waste Management 77, 98-113

How to define and measure

Food Waste Definition (in Austria / EU)

- **Food Waste**: all food **produced for human consumption** but **not eaten** by humans.
  - includes raw and processed food as well as food that is disposed of by consumers, in agricultural production, (further) processing, distribution, wholesale and retail trade, in large-scale catering establishments and before, during and after food preparation.

- **Avoidable** Food Waste: food which
  - at the time of their disposal are still **edible** without restriction, or which
  - would have been edible if used in time,
  - but which for various reasons are not marketable (production industry, trade) or are not eaten for various reasons (gastronomy, household) and are therefore disposed of.

Definitions according to UN (for Food Waste Index)

(Waste Index Report 2021)

Food waste

Food (including drink) and associated inedible parts removed from the human food supply chain in the following sectors:
- manufacturing /grocery/retail
- food service
- households

Food Loss

Food losses occur from production/agriculture (post-harvest) up to (and not including) the retail level

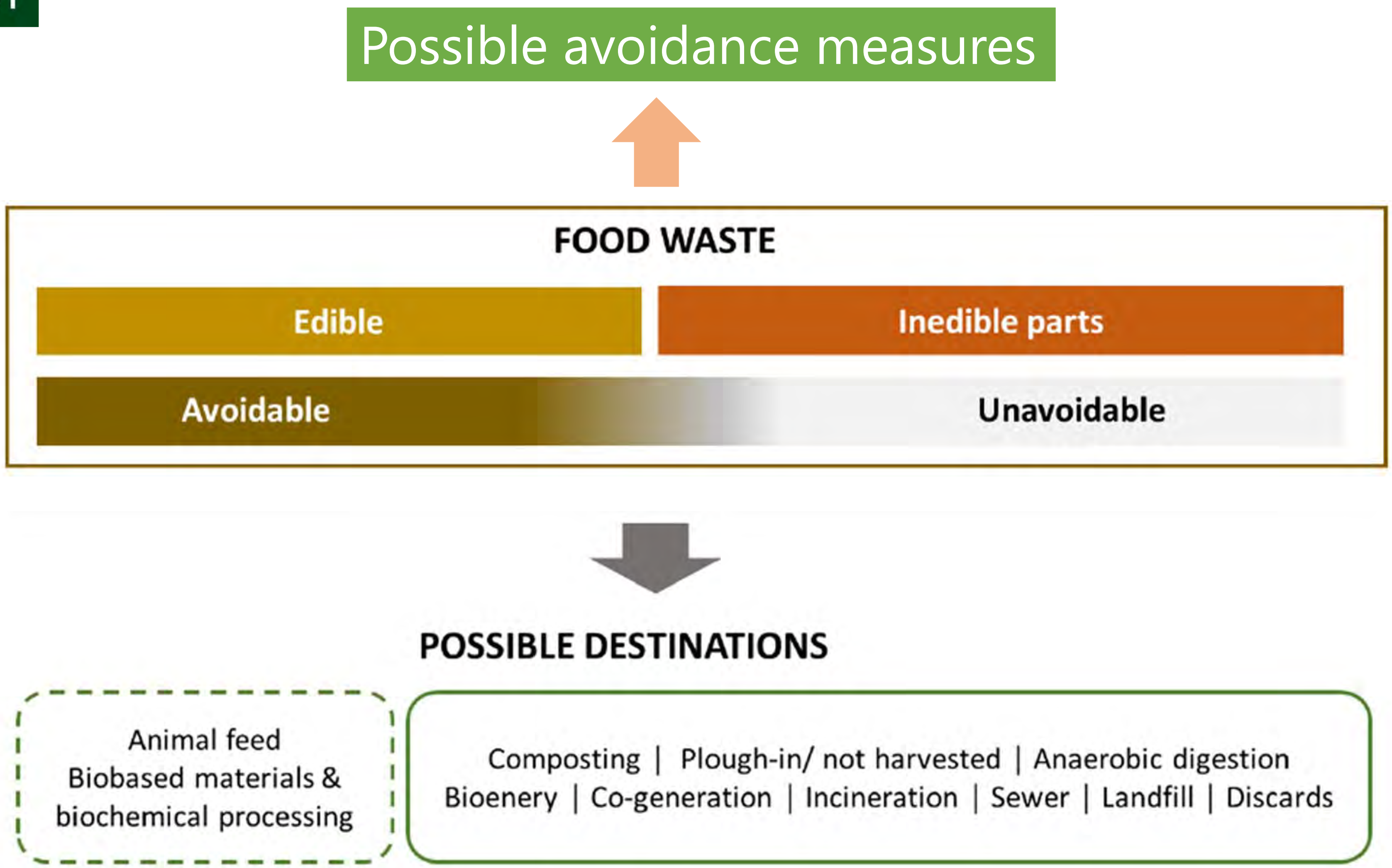
Definitions according to UN (for Waste Index)

Food waste

Food Loss

Inedible parts: Components associated with a food that are not intended to be consumed by humans (e.g., bones, rinds and pits/stones), can varies among users and can change over time influenced by a range of variables, e.g., culture, socio-economic factors, availability, price, international trade, geography

Framework defining Food Waste



Sub-Indicator 12.3.1.a - Food Loss Index (FAO)

The Food Loss Index (FLI) focuses on food losses that occur from production up to (and not including) the retail level. It measures the **changes in percentage losses** for a **basket of 10 main commodities** by country in comparison with a base period. The FLI will contribute to measure progress towards SDG Target 12.3.

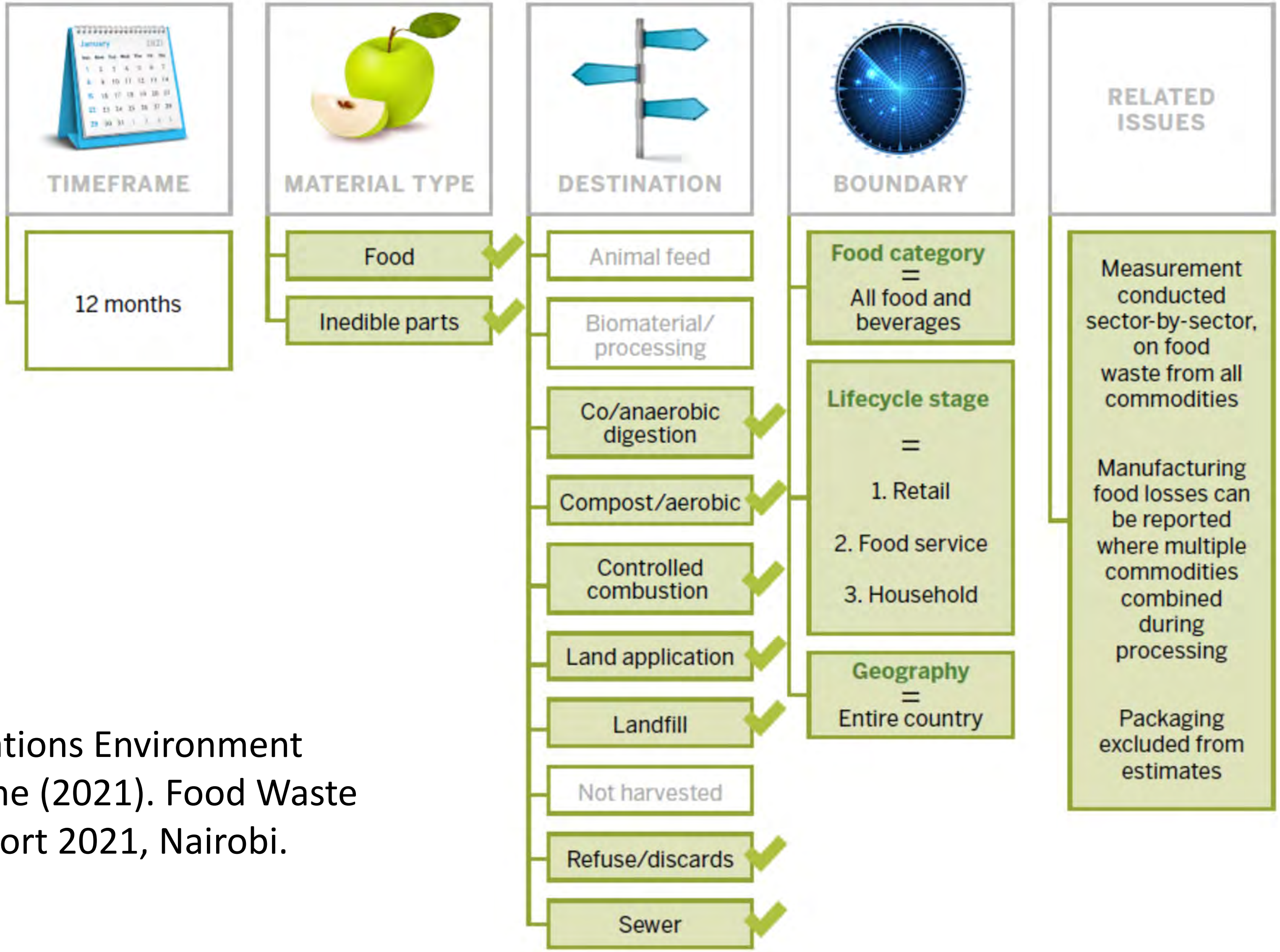
Sub-Indicator 12.3.1.b - Food Loss Index (UNEP)

Measures food waste at **retail and consumer level** (households and food service). In contrast to the FLI, the Food Waste Index **measures total food waste.**

It also allows to measure and report on food loss generated in manufacturing processes, which would not be captured under key commodity losses by the FLI.

Scope of the Food Waste Index

(Food Loss and Waste Accounting and Reporting Standard)



Source:
United Nations Environment Programme (2021). Food Waste Index Report 2021, Nairobi.

Food Waste Index Measurement Approach

Insight into **scale of problem** to make a case for **first action**

primary data that fulfils the tracking at national level in line with SDG 12.3

policy/ reduction actions!

Source: United Nations Environment Programme (2021). Food Waste Index Report 2021, Nairobi.

Food Waste Quantification Methods

Direct methods

Indirect methods

Waste composition analysis

Weighting

Surveys

Counting

Diaries

Records

Assessing volume

Observation

Modelling

Mass balance

Use of proxy data

Use of literature dara

Recommended/appropriate methods for different sectors

<table>
<tr><th>Sector</th><th colspan="6">Methods of measurement</th></tr>
<tr><td>Manufacturing (if included)</td><td rowspan="4">Direct measurement (for food-only waste streams)</td><td rowspan="4">Waste composition analysis (for waste streams in which food is mixed with non-food)</td><td rowspan="4">Volumetric assessment</td><td rowspan="2">Mass balance</td><td></td><td rowspan="2"></td></tr>
<tr><td>Retail</td><td rowspan="2">Counting/ scanning</td></tr>
<tr><td>Food service</td><td rowspan="2"></td><td rowspan="2">Diaries (for material going down sewer, home composted or fed to animals)</td></tr>
<tr><td>Household</td><td></td></tr>
</table>

Source:
United Nations Environment Programme (2021). Food Waste Index Report 2021, Nairobi.

Food Waste Index Report 2021 – Confidence of estimates

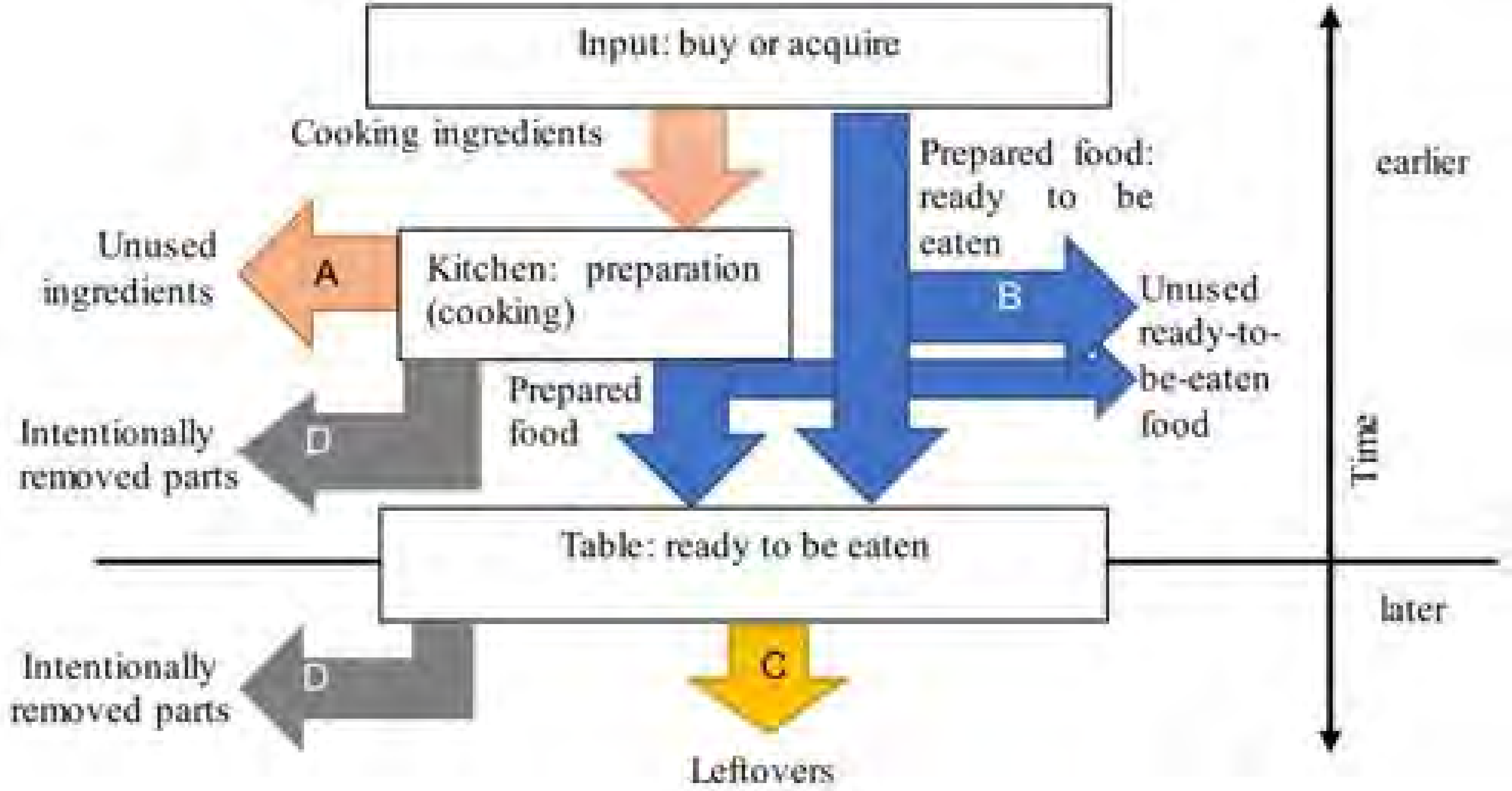
Region **Eastern Asia**

M49 code[1]	Country	Household food waste estimate (kg/capita/year)	Household food waste estimate (tonnes/year)	Confidence in estimate
156	China	64	91 646 213	Medium confidence
344	China, Hong Kong SAR	71	531 023	Very low confidence
446	China, Macao SAR	71	45 731	Very low confidence
408	Dem. People's Rep. Korea	81	2 070 528	Very low confidence
392	Japan	64	8 159 891	Medium confidence
496	Mongolia	78	250 173	Very low confidence
410	Republic of Korea	71	3 658 024	Very low confidence

Region **Western Europe**

M49 code[1]	Country	Household food waste estimate (kg/capita/year)	Household food waste estimate (tonnes/year)	Confidence in estimate
40	Austria	39	349 249	High confidence
56	Belgium	50	576 036	Medium confidence
250	France	85	5 522 358	Medium confidence
276	Germany	75	6 263 775	High confidence
438	Liechtenstein	72	2 725	Low confidence
442	Luxembourg	90	55 126	Medium confidence
492	Monaco	72	2 796	Low confidence
528	Netherlands	50	854 855	High confidence
756	Switzerland	72	616 037	Low confidence

Household Food Waste Classification in Japan



Avoidable food waste = A + B + C

Okayama, T.;Watanabe, K.; Yamakawa, H. (2021). Sorting Analysis of Household Food Waste— Development of a Methodology Compatible with the Aims of SDG12.3., Sustainability 2021, 13, 8576. https://doi.org/10.3390/su13158576

Household Food Waste Classification in Austria

Category	Sub-category	Description
Organic waste	Kitchen waste incl. Preparation residues	Fruit and vegetable peels, radish leaves, coffee brew incl. filter, tea bags, eggshells, bones
Food packed	Food originally packed	whole pasta bag, unopened dairy products, unopened Canned food - contents only
	Food opened in original packaging	half-full packages (or more than 10% product residue) – contents only
Food unpacked, without packaging	Food complete unpacked	whole roll, whole apple - without original packaging
	Food opened unpacked including leftovers	cooked leftovers, bitten/cut fruits and vegetables, loose pasta
	Liqids	Beverages (leftovers) - contents only

Some numbers…

Global Food Waste by sector (2019)

	Global average food waste (kg/capita/year)*	2019 total (million tonnes)
Household	74	569
Food service	32	244
Retail	15	118
Total	121	931

Source: United Nations Environmental Programme (2021): Food waste index report 2021, Nairobi

Global Food Waste by sector and Income group (2019)

(according to World Bank income classification)

Income group	Average food waste (kg/capita/year)		
	Household	Food service	Retail
High-income countries	79	26	13
Upper middle-income countries	76	Insufficient data	
Lower middle-income countries	91	Insufficient data	
Low-income countries	Insufficient data		

Source: United Nations Environmental Programme (2021): Food waste index report 2021, Nairobi

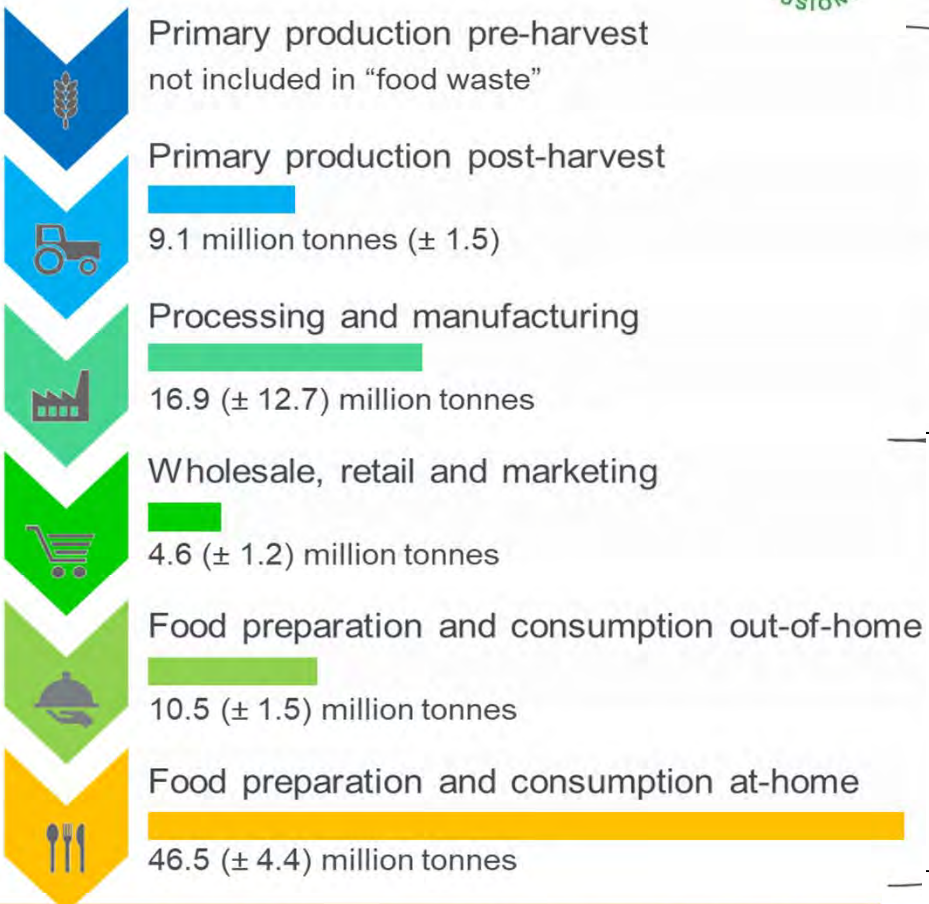
FOOD WASTE IN EUROPE

SUSTAINABLE DEVELOPMENT GOALS

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

EU Estimates on food waste:

(Data from Stenmarck et al., 2016)



Sustainable Development Goals 12.3:

(https://sustainabledevelopment.un.org/)

“Reduce food losses along production and supply chains, including post-harvest losses”

„By 2030, halve per capita global food waste at the retail and consumer levels“

88 Mio t in EU_{28} (=173 kg/EW a)

→ a reduction of approx. 31 million t

Status of Food Waste/Loss in Japan (2015)

Raw material provided for food and processed food **82.91 mil. tons**

Utilisation

Food industries

Households

Food wastes/losses and by-products

28.42 mil. tons

(20.10 mil. tons)

(8.32 mil. tons)

“Food Losses” **(edible parts)**

6.46 mil. tons

irregular, returned goods, unsold goods, leftovers

(3.57 mil. tons)

leftovers, unused foods, excessive removals

(2.89 mil. tons)

Source: Kohei Watanabe (2018/2019) and http://www.caa.go.jp/policies/policy/consumer_policy/information/food_loss/efforts/efforts_180628_0001.pdf

Food Losses and Waste in Austria

	Agriculture	Processing	Wholesale Retail	Catering	Consumption
Data summary	**167.000 t/y*** (77.300 t vegetables 76.500 t potatoes 13.200 t fruits) Including losses before harvest	**121.800 t/y** including 35.000 t bread – returned goods from retail	**89.500 t/y** 79.200 t retail, (including donation: 12.250 t; feed: 10.000 t) 10.300 t wholesale	**175.000 t/y** 61.000 t canteen kitchen, 45.000 t restaurant 50.000 t hotel, 19.000 t/a others	**521.000 t/y** (municipal residual waste: 157.650 t; estimation other disposal paths
Source	Hrad et al., 2016 (Interview of farmers) *Note: International losses before harvest are often not taken into account	HIETLER und PLADERER 2017 (qual. und quant. analysis at 10 types of food business)	BMNT, 2018 (participating retailer cover 83% of market share) HIETLER und PLADERER, 2019 (extrapolation of 15 wholesale enterprises)	HRAD et al. 2016, www.united-against-waste.at (Berechnungsbasis 49 Betriebe)	SCHNEIDER et al. 2012 Reliable data on food waste in residual waste; Disposal methods such as canal, home composting, estimation via survey results.

Medium data availability	Sufficient data availability

"Take home message"

regarding challenges related to Food Waste

AWARENESS & INFORMATION	**Ethical, food security, climate, resource and environmental issues!!**
DEFINITIONS	**no unit definitions => low comparability of studies/data**
METHODOLOGY	**No harmonised method so far => data reliability and comparability low**
POLICY INTERVENTION	**Need a reliable data basis (on level 3!) to find targeted solutions and actions**

Do not waste food – buy consciously and eat it!

Thank you for your attention!

Marion.huber-humer@boku.ac.at
Institute of Waste Management,
BOKU - Vienna