Retail measurement methods

Recap: Retail

- Places where food and ingredients are sold to consumers, not to be consumed on site
- Can contain different subsectors – want to cover most of the normal sales channels in your country

- **‘Food waste’** contains **food** and **inedible parts**

- **Level 2 reporting:** total amount (fresh mass) food waste
- **Level 3 reporting:**
  - Share of food waste which was inedible parts
  - Destination of waste

Section overview

- **Measurement methods for retail**
- **Quantification ‘frameworks’ and business reporting**

How to measure retail food waste?

Sector	Methods of measurement					
Manufacturing (if included)				Mass balance		
Retail	Direct measurement (for food-only waste streams)	Waste composition analysis (for waste streams in which food is mixed with non-food)	Volumetric assessment		Counting/ scanning	Diaries (for material going down sewer, home composted or fed to animals)
Food service						
Household						

https://www.unep.org/resources/report/unep-food-waste-index-report-2021

Weighing & waste compositional analysis

- **Direct weighing of food-only waste streams possible**
  - E.g. farmers' markets?
- **Waste compositional analysis: sorting and weighing**
  - Separate food products from non-food products
  - Be mindful of packaging

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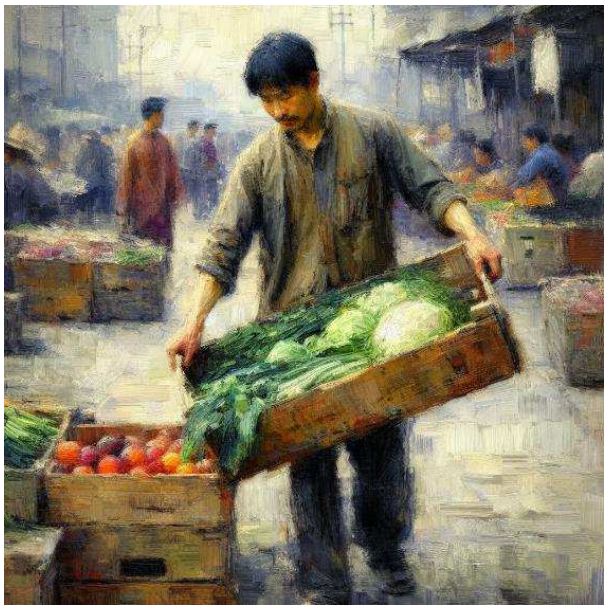
Scanning / counting

- **Scanning** relevant for packaged items (e.g., with a barcode or QR code)
  - Need to know weight of items – link to database (weight without packaging)
  - Appropriate for **discrete**, packaged items
  - Could be used by 'formal' retail businesses

Chapter 2: https://flwprotocol.org/wp-content/uploads/2016/05/FLW_Protocol_Guidance_on_FLW_Quantification_Methods.pdf

Scanning / counting

- **Counting** discrete items or quantities (e.g. boxes of items)
  - E.g. counting 20 pineapples, or 3 boxes of tomatoes
  - Need to know average weight of item or for a quantity of items (and low variation)
  - May be suitable for ‘informal’ retail businesses or those without scanning equipment



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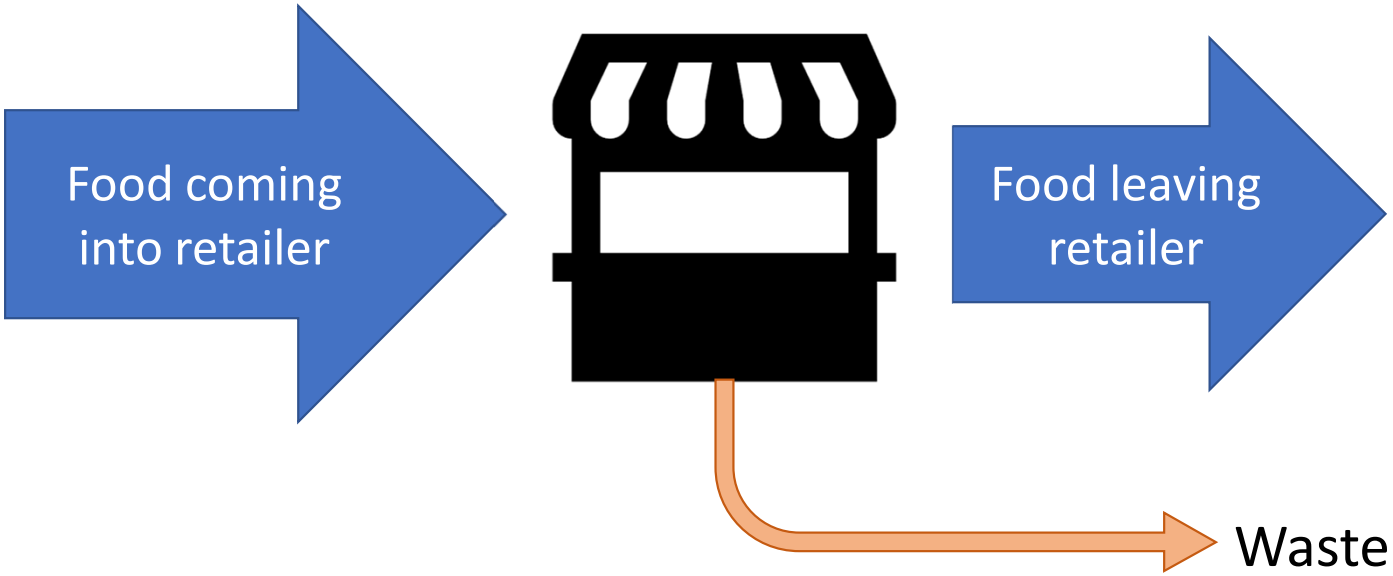
Mass balance



- Food waste = incoming food – outgoing food

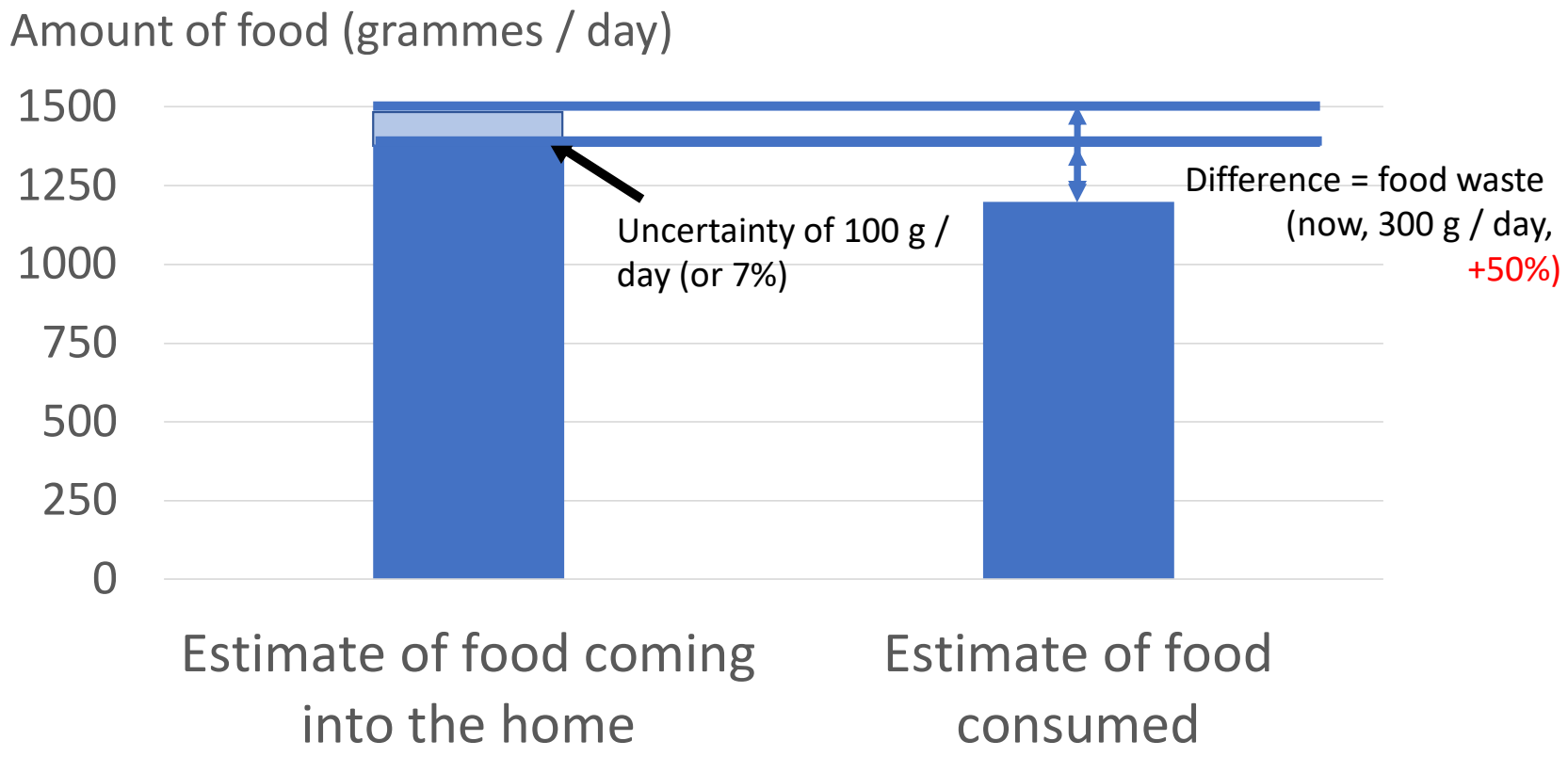
Chapter 8: https://flwprotocol.org/wp-content/uploads/2016/05/FLW_Protocol_Guidance_on_FLW_Quantification_Methods.pdf

Requirements for mass balance:

- To understand **all flows** of food for retailer (theft?)
- A common way to express all data (ideally weight)
- Food doesn't get transformed in the retailer (e.g. cooked, dry out)
- Accurate data for incoming and outgoing food, otherwise…

Chapter 8: https://flwprotocol.org/wp-content/uploads/2016/05/FLW_Protocol_Guidance_on_FLW_Quantification_Methods.pdf

… a small uncertainty becomes a big uncertainty



Note: attention to packaging!

- **Food may be disposed of in packaging: this should be removed where possible**
- **Hierarchy of options:**

1
- Remove packaging before quantification

2
- Subtract estimated packaging weight from each item

3
- Subtract estimated packaging weight from waste stream or existing data (least accurate)

Heavier packaging is a higher priority than lighter packaging…

Summary of measurement methods

	Accuracy of measurement	Coverage of all FW in sector	Detailed information possible?	Cost?
Weighing	High	Only covers segregated streams (food waste only)	No	Low
Waste compositional analysis	High	High	Yes	High
Volumetric analysis	Lower: estimating volume and bulk density – can vary substantially	Only covers segregated streams (food waste only)	No	Low
Scanning / counting	High	Only covers countable / scannable items	Yes	High
Mass balance	Usually low	High	Yes	Low

How is food bought in your country? Which approaches might work?

‘Frameworks’ for quantification

Better for less consolidated sectors

Better when sector more consolidated

Ad-hoc studies

- Commissioning studies for the purposes of a baseline
- Using existing academic, government or industry studies

Business voluntary reporting

- Businesses measure their own waste
- Report on a voluntary basis, e.g. to a food waste Public Private Partnership

Business mandatory reporting

- Businesses measure their own waste
- Some/all businesses mandated to report their waste to government / agency

Different retail settings, different measurement methods

Photo by Alex Hudson on Unsplash

Photo by Franki Chamaki on Unsplash

Business reporting: need to engage those in sector

- **Useful to obtain data, and to affect change**
  - Relationships need time to establish
  - Trust, especially with commercially sensitive data
  - Agreement of common goals
  - Clear expectations of different parties

Food-Waste PPPs around the World

- Courtauld Commitment, **UK, 2006**
  - Retail, manufacturing, food service
- Pacific Coast Food Waste Commitment, **USA / Canada, 2018**
  - Retail, manufacturing
- Food Loss and Waste Agreement, **South Africa, 2020**
  - Retail, manufacturing
- Denmark against food waste, **Denmark, 2018**
  - Food producers and retailers
- Australian food pact, **Australia, 2021**
  - Retail, manufacturing
- International Food Waste Coalition, **Europe-wide**
  - Hospitality and food service

What is your retail market like? Are there existing agreements or trade associations amongst retailers?

Retail sampling and scaling

Sampling and scaling factors

Sector	Common sampling unit(s)
Household	▪ Household
Food service	▪ Kitchen ▪ Establishment

Sampling and scaling factors

Sector	Common sampling unit(s)
Household	▪ Household
Food service	▪ Kitchen / site ▪ Business
Retail	▪ Stall ▪ Market ▪ Shop / premises

Sampling and scaling factors

Sector	Common sampling unit(s)	Common scaling factor(s)
Household	▪ Household	per person per household
Food service	▪ Kitchen / site ▪ Business	% of food sold (by weight) per meal / portion per customer / pupil per employee per establishment
Retail	▪ Stall ▪ Market ▪ Shop / premises	

Photo by Martin Vonk on Unsplash

Sampling and scaling factors

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Retail	▪ Stall ▪ Market ▪ Shop / premises	% of food sold (by weight) per unit turnover per trader /employee per unit of floor space

Photo by Martin Vonk on Unsplash

Match sample to population

Sample reflects population with regard to:

- Split between supermarkets, smaller stores, markets, etc.
- Types of food sold in store / stall
- Sizes of store / market
- Locations – e.g. rural, urban, type of neighbourhood
- Other factors that could influence food waste

Photo by Martin Vonk on Unsplash

Time-related considerations

- **Consider seasonality**
  - Capture data in multiple waves, spaced through the year
- **Consider variations within the week:**
  - Ensure variations through the week are reflected in sampling

Photo by Martin Vonk on Unsplash

Sample sizes

- Data coming directly from retailers:
  - Need >50% of the sector (or sub-sector) in question & to scale for remaining share
- From a measurement study, a pilot study of **30 establishments** (for each sub-sector of interest) gives FW data and standard deviation to work out if more sample size is needed:

$$\text{Sample size} \approx \left(2 \times \frac{\text{Standard Deviation}/\text{Mean}}{\text{Desired 95\% confidence interval}/\text{Mean}}\right)^2$$

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Retail level 3

Note on edible/inedible in retail

Level 3 reporting

- In most cases, food will be disposed as whole items: i.e. a mixture of edible/inedible parts
- Retail sector least important to make distinction
- Expect the vast majority of retail waste to be ‘edible’ (c. 90%) – less accurate, less work
- If needed, edible/inedible share can be estimated using *food composition table (Appendix B, Food Loss and Waste Protocol for list of resources)* – more accurate, more work

Photo by Thomas Le on Unsplash

Note on edible/inedible in retail

Food Item (1977 of 1977)	Edible
Angler fish, fillet, simmered	100 %
Angler fish, raw	34 %
Anise seeds	100 %
Apple jam	100 %
Apple jam, with less sugar	100 %
Apple jam, without added sugar	100 %
Apple juice	100 %
Apple, Granny Smith, Golden Delicious, raw	90 %
Apple, Ingrid Marie, raw	91 %
Apple, Norwegian, raw	91 %
Apple, Rød Aroma, raw	91 %
Apple, imported, raw	90 %
Apple, unspecified, raw	90 %

Percentages provided to adjust for edible/inedible waste

Highly detailed (1977 products listed)

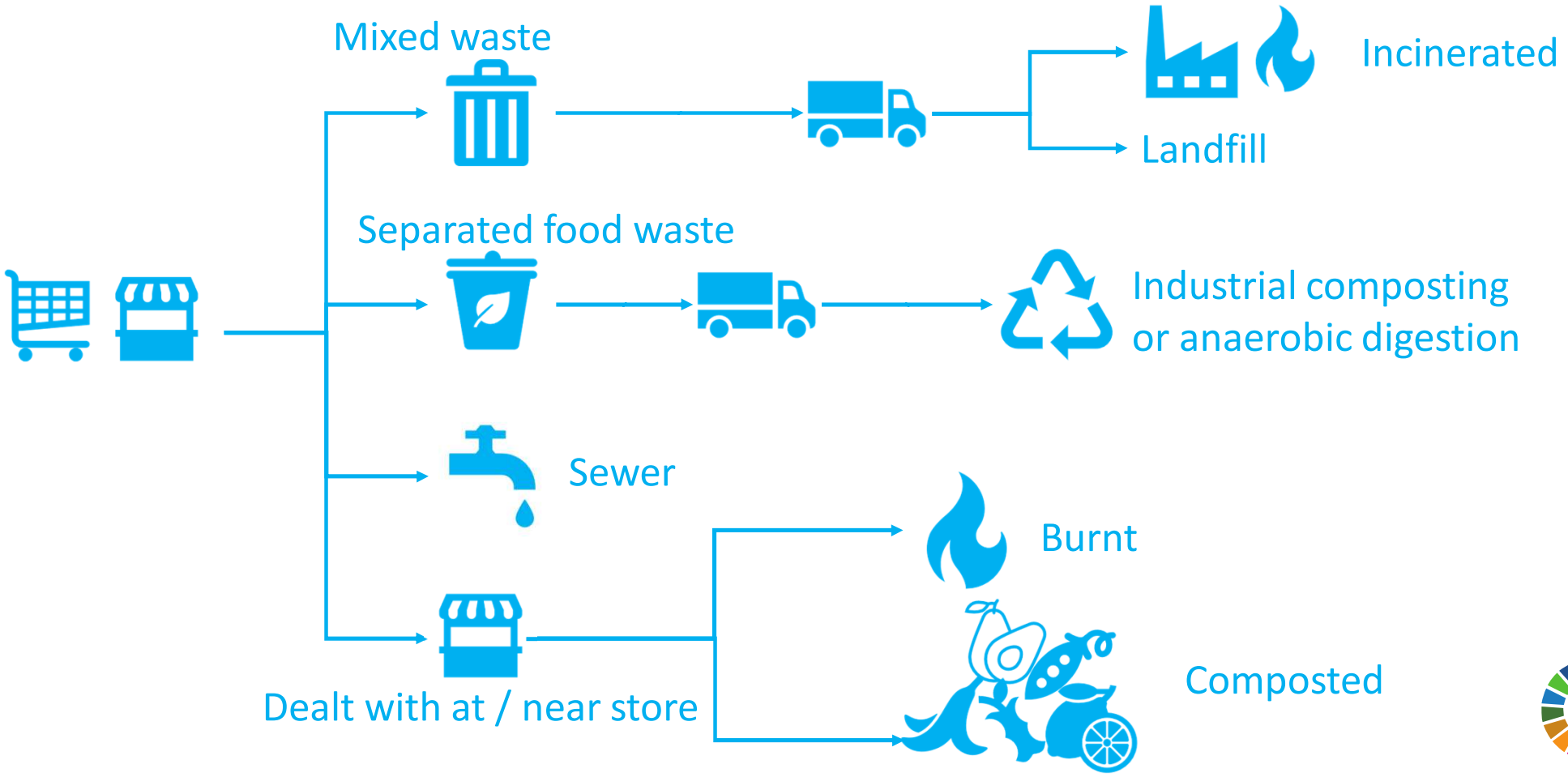
100 tonnes raw apple disposed:

- 100*90% = 90 tonnes *edible* waste
- 100*10% = 10 tonnes *inedible* waste

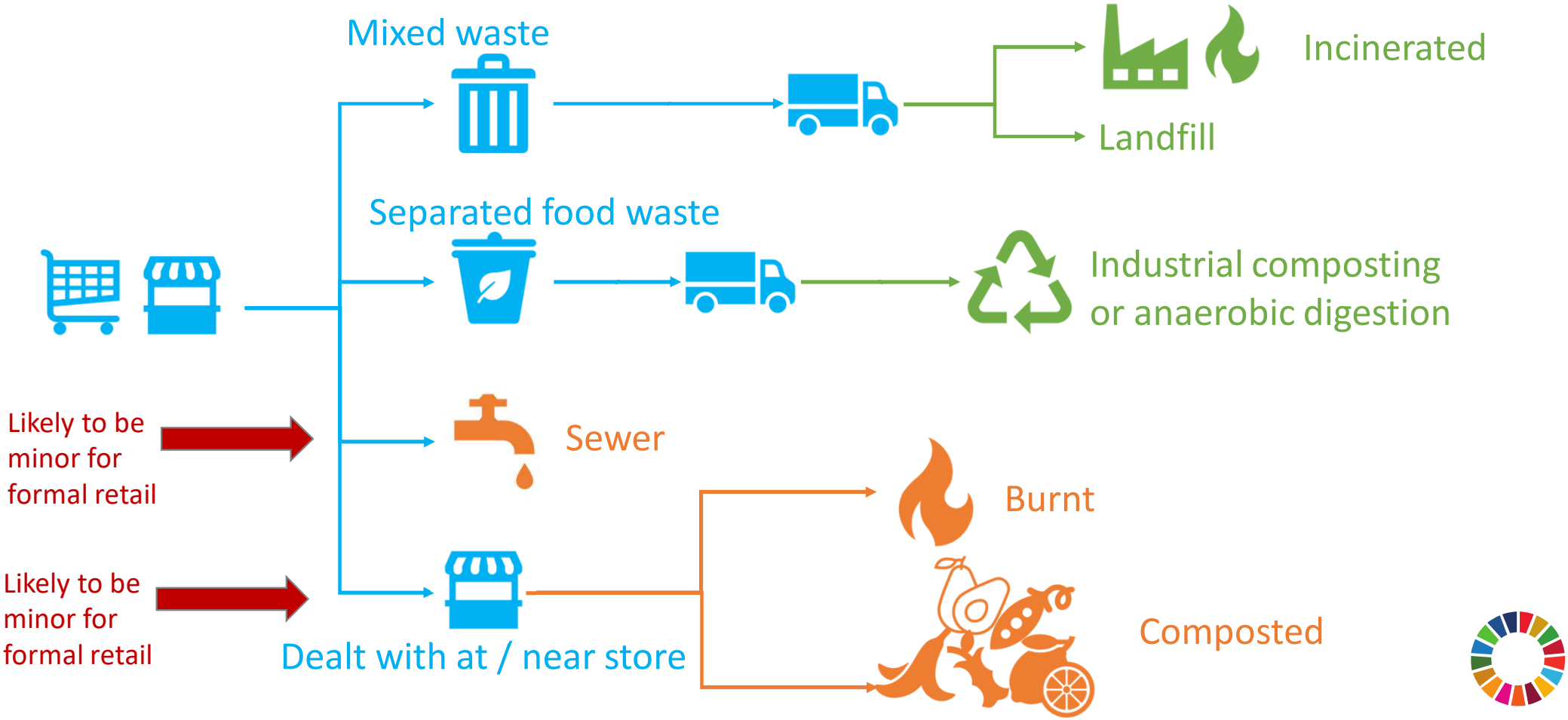
Example table used by Norwegian Food Safety Authority

Photo by Thomas Le on Unsplash

Destinations of retail food waste



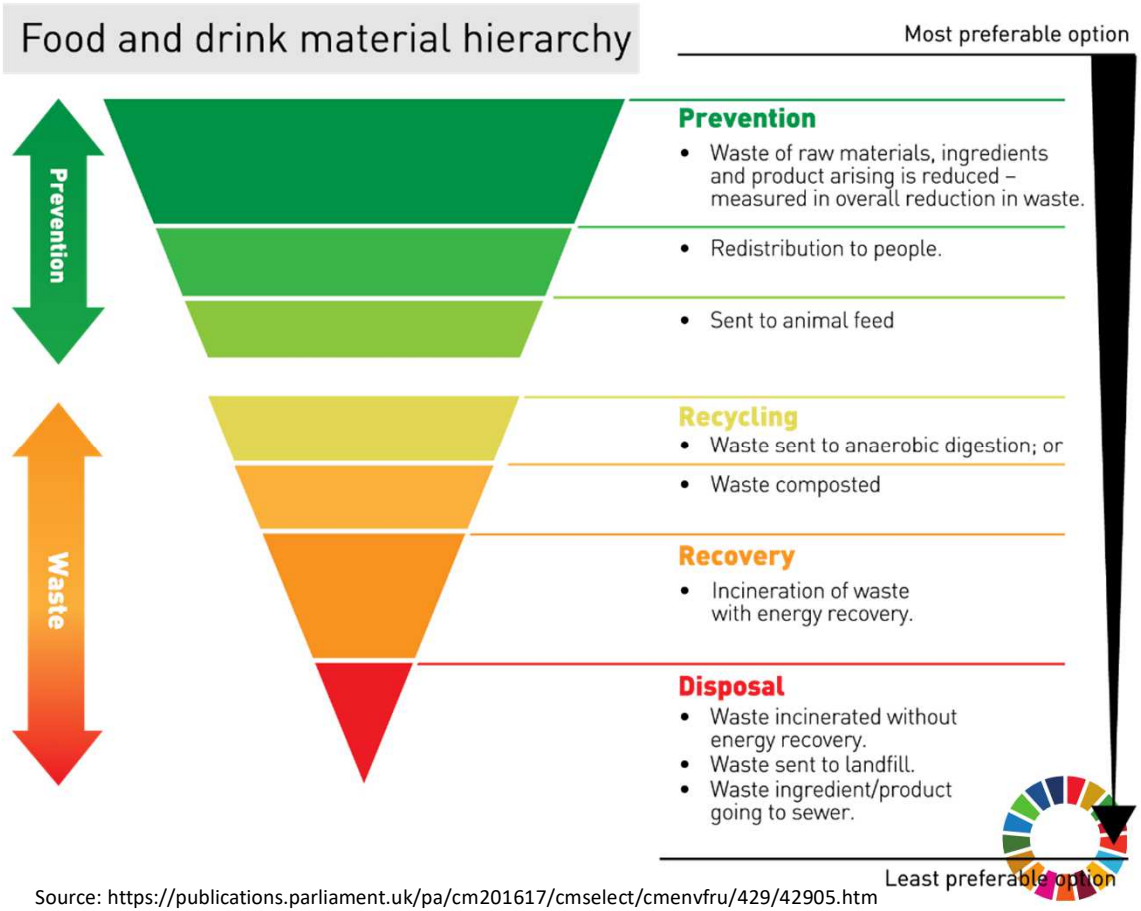
Destinations of retail food waste



Destinations of retail food waste

Retail food surplus

- **Formal retail** may be effective at diverting food waste to more productive destinations
- **Measuring surplus** may still be desirable: food waste *prevention* is always the preferred option



Source: https://publications.parliament.uk/pa/cm201617/cmselect/cmenvfru/429/42905.htm