
UNEP Africa Food Waste Working Group Workshop 2: Household food waste

25th November 2021

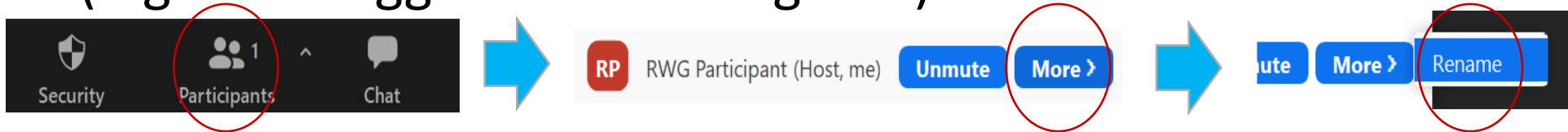
Clementine O'Connor
David Rubia
United Nations Environment Programme

Tom Quested
Hamish Forbes
WRAP

wrap

Welcome / housekeeping

Housekeeping

- Please mute microphone, except when asking question or in breakout room
- Please change your name on Zoom to include your **country** for breakout room (e.g. Joe Bloggs – United Kingdom)
- Recording 
- If you are having technical difficulties, please contact **Hannah Russell** (Project Admin)

Agenda - Household Food Waste

Agenda item	Length	Start time (GMT)
Initial welcome	5 mins	10:00
Recap	5 mins	10:05
Scope of measurement or ‘What do we need to measure?’	15 mins (+ 5 mins for Qs)	10:10
Ghana: Experience measuring household food waste	10 mins (+ 5 mins for Qs)	10:30
Interactive session 1: national waste management context	10 mins	10:45
Methods for measuring HHFW (or ‘how do we measure?’)	20 mins (+ 5 mins for Qs)	10:55
Break	5 mins	11:20
Sampling (or ‘Whose waste do we need to measure?’)	15 mins (+ 5 mins for Qs)	11:25
How to identify the right team to conduct the measurement	10 mins	11:45
Interactive session 2: First step for country plans	20 mins	11:55
NAMA Facility: New funding opportunity	10 mins	12:15
Next steps and workshop close	5 mins	12:25

**Recap: important
points from
Workshop 1**



One third of food is lost or wasted globally

- Costs the global economy nearly \$1 trillion each year
- Exacerbates poverty in households
- Reduces profits in business
- Generates 10% of global greenhouse gas emissions



FOOD WASTE INDEX
REPORT 2021

UNEP Food Waste Index Report 2021

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

Few countries measuring food waste

Income group	Number of countries with measured data		
	Household	Food service	Retail
High-income	28	18	20
Upper middle-income	12	3	2
Lower middle-income	10	2	1
Low-income	2	0	0
Total	52	23	23



Household food waste, 2019

Income group	Average, kg / capita / year
High-income	79
Upper middle-income	76
Lower middle-income	91
Low-income	Insufficient data

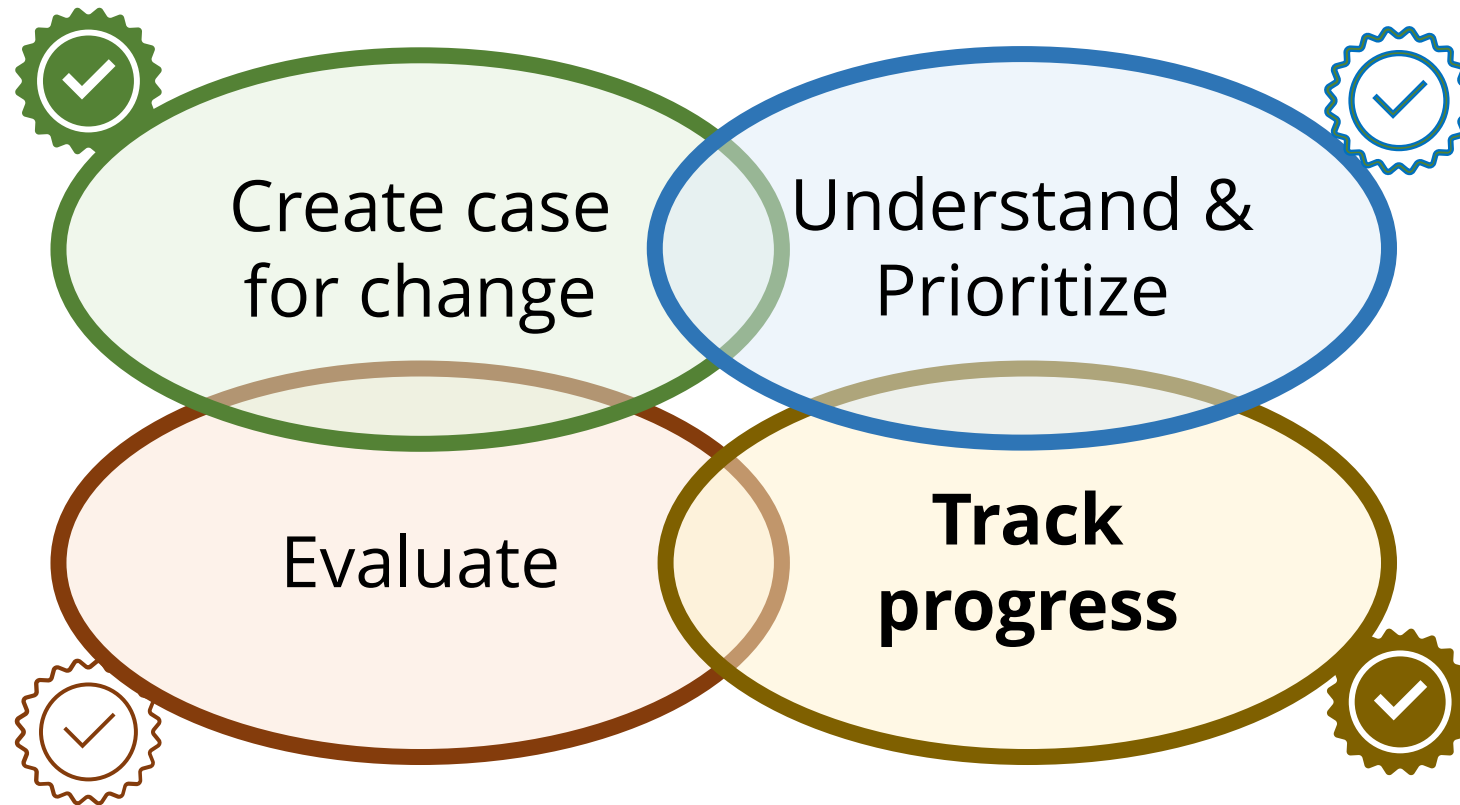


Nearly one billion tons of food waste

Sector	Global food waste, 2019	
	Average (kg / capita / year)	Total (million tons)
Household	74	569
Food service	32	244
Retail	15	118
Total	121	931



What will measuring food waste for SDG12.3 achieve?



Guidance for countries to measure food waste

Level 1

- Modelling-based
- Provides approximate scale of issue

Level 2

- **Measurement of key quantities**
- **Suitable for tracking**

Level 3

- Measurement of additional quantities
- Supports tailored food-waste strategies



Timeline

Workshop	Focus	Approximate timing
1	Introductory meeting	Mid-October 2021 
2	Household food waste – initial	Mid-November 2021
3	Household food waste – revisited	Mid-January 2022
4	Food service food waste - initial	Late January / Early February 2021
5	Food service food waste - revisited	Early March 2022
6	Retail food waste - initial	Late March / Early April 2022
7	Retail food waste - revisited	Late May 2022
8	National Food Waste Prevention Strategies	Early June 2022

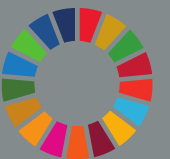
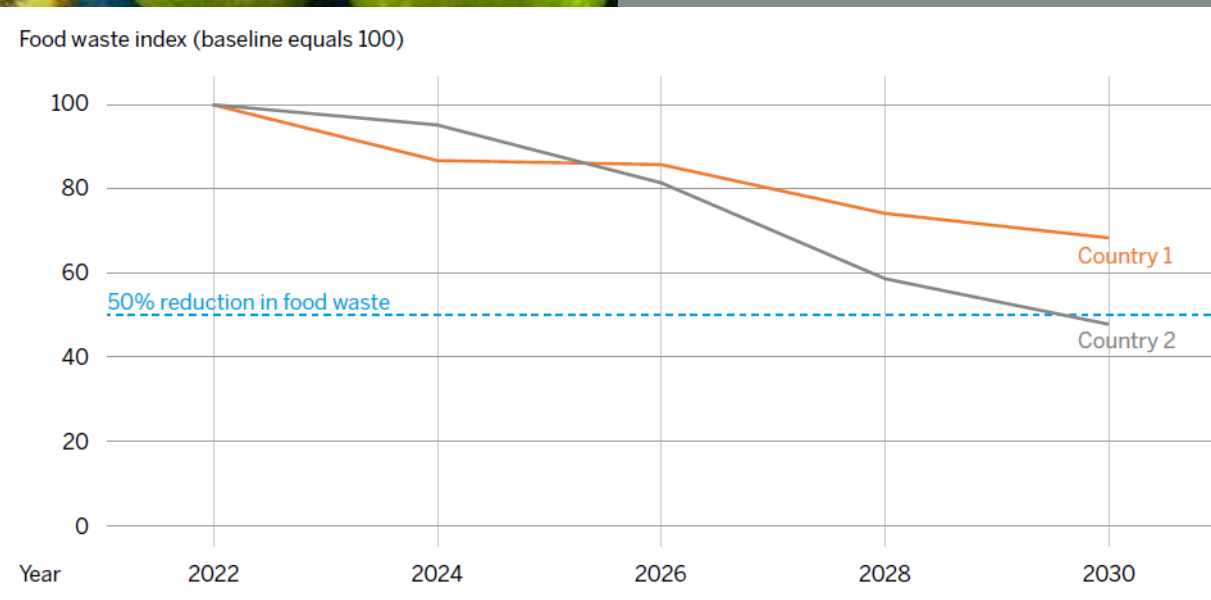


The 'What': Scope of measurement



Sustainability of measurement

- Baseline needed
- Repeat measurements over time



Defining the sector



Any type of dwelling *not* covered by other sectors

e.g. does *not* include hotels, healthcare facilities or catered student accommodation



Photo by [Soroush Karimi](#) on [Unsplash](#)



Defining food waste

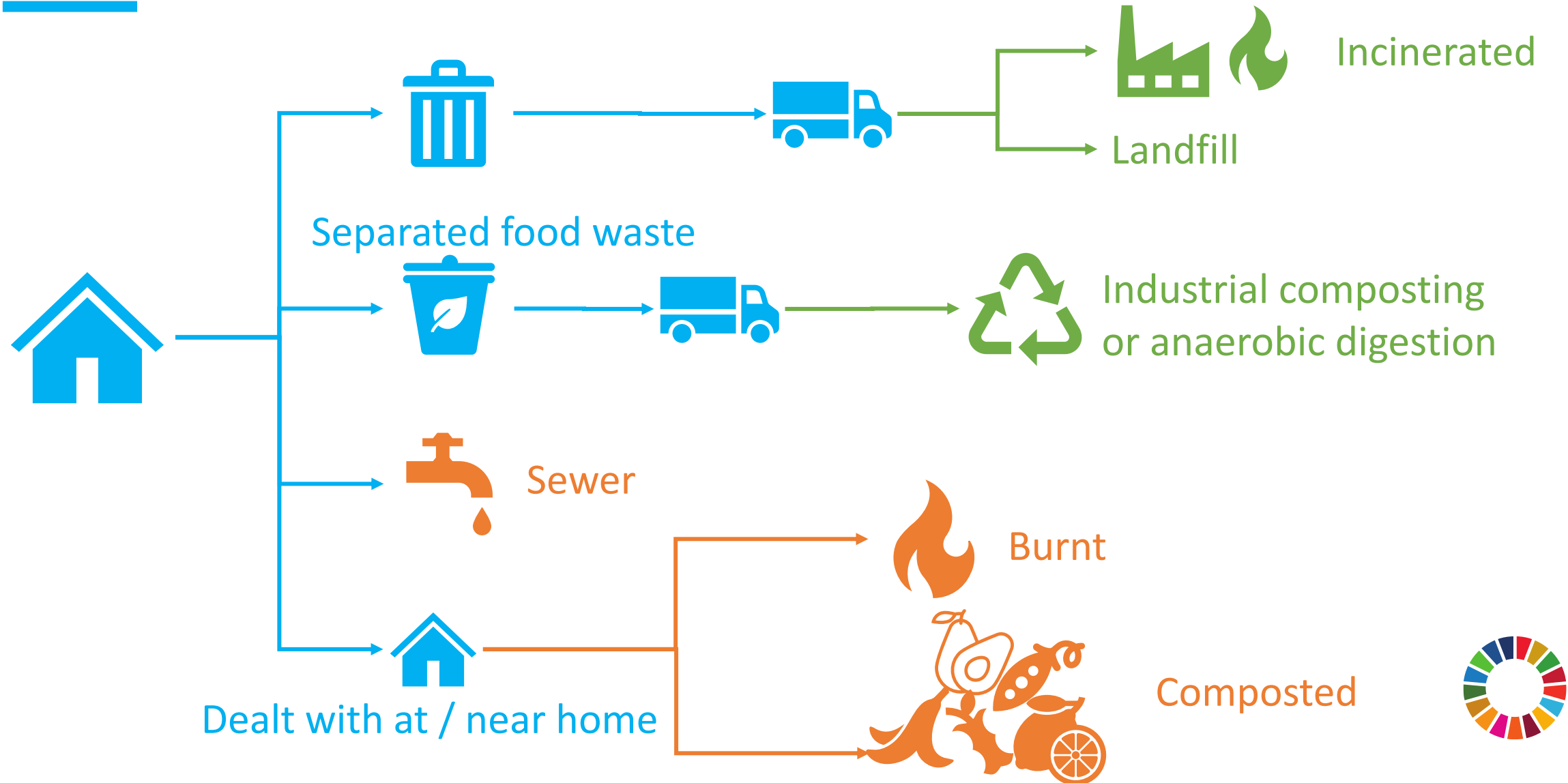
Food waste: **food and associated inedible parts removed from the human food supply chain** in Retail, Food Service and Household sector

Food: any substance – whether processed, semi-processed or raw – that is intended for human consumption. “Food” includes drink, and any substance that has been used in the manufacture, preparation or treatment of food. Includes both:

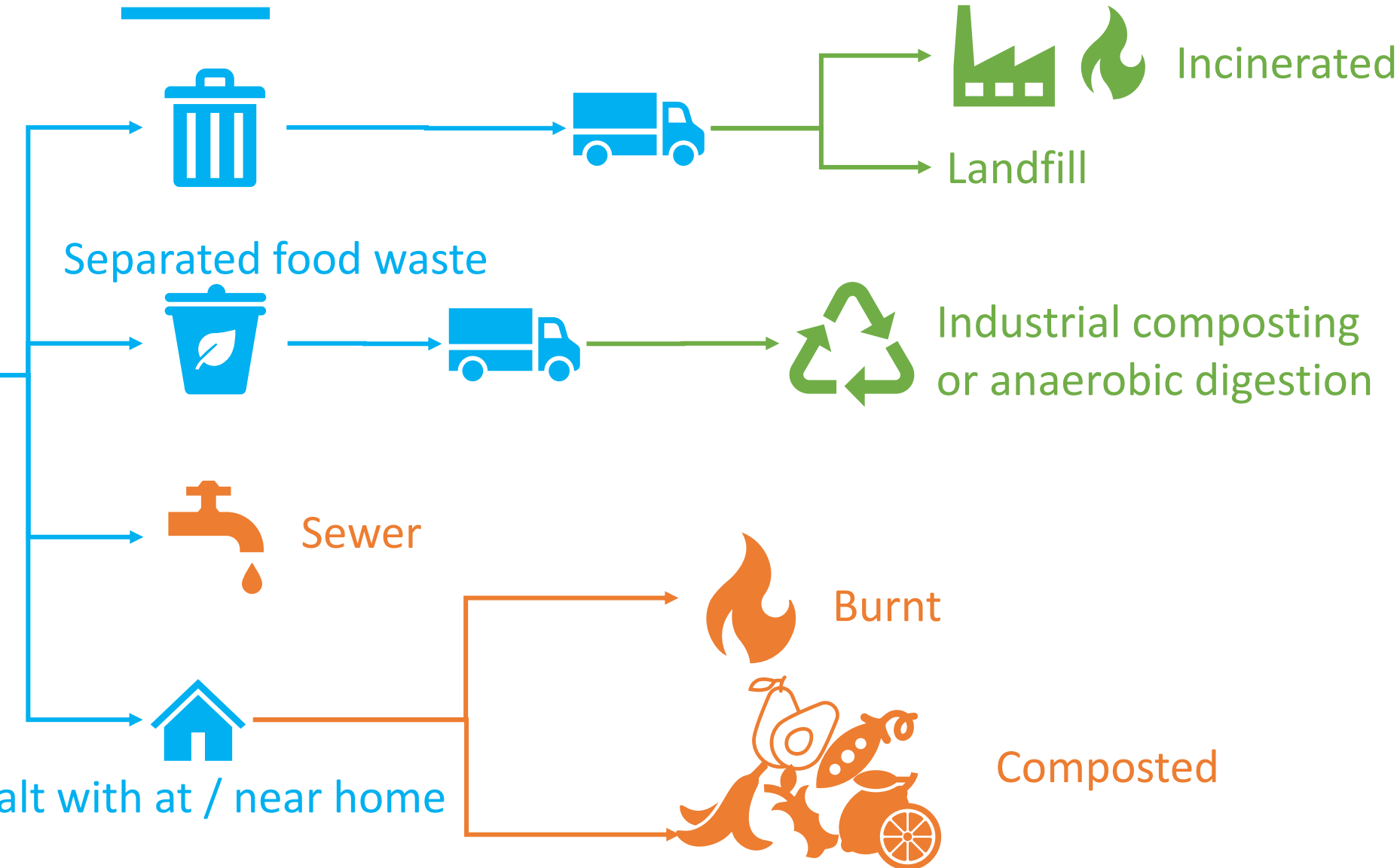
- ‘Edible parts’: i.e. parts intended for human consumption, and
- ‘Inedible parts’: components associated with a food that are not intended to be consumed by humans, e.g. bones, rinds, pits/stones



Destinations of household food waste



Destinations of household food waste

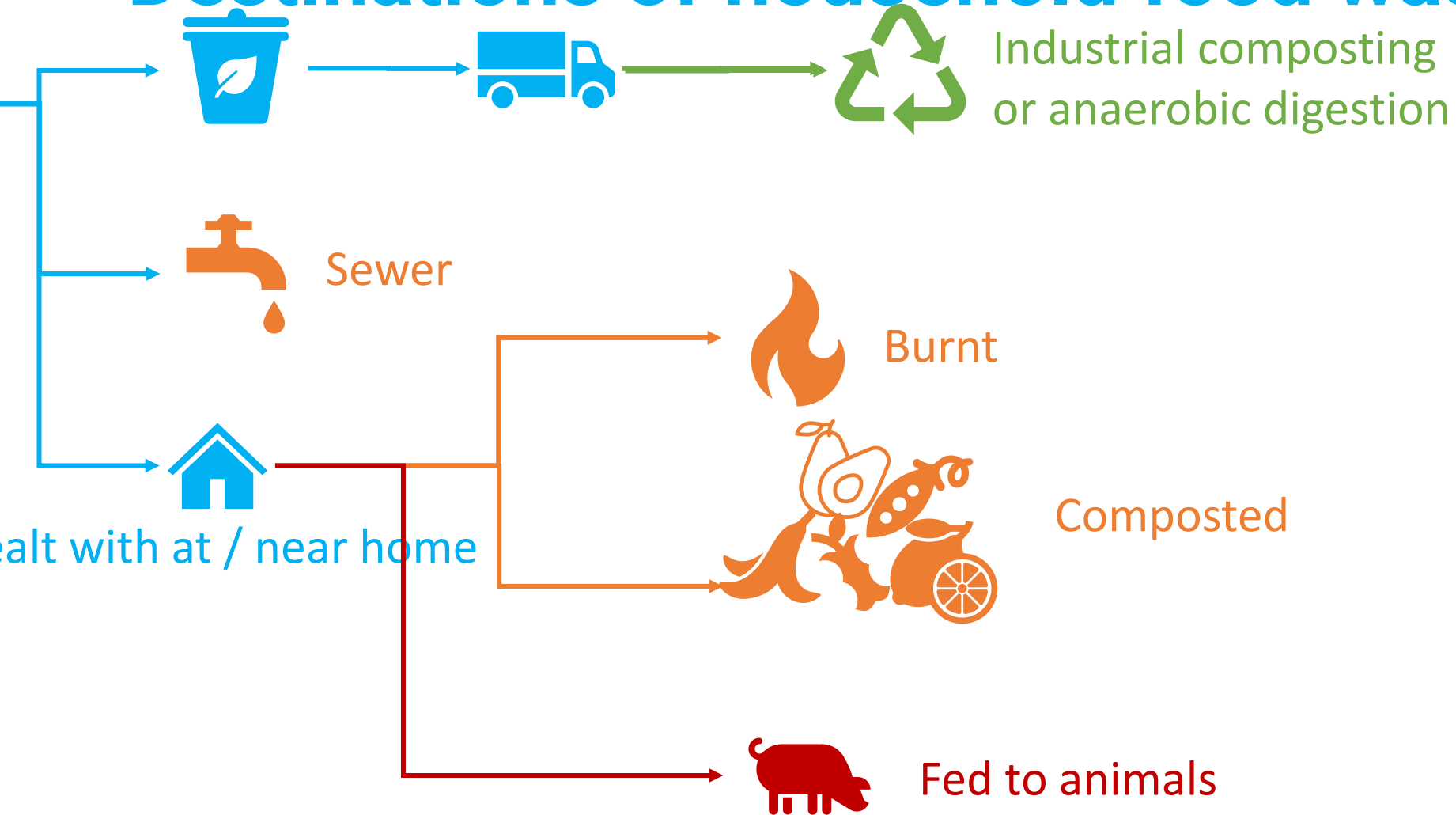


Level 2
reporting

Level 3
reporting



Destinations of household food waste



Level 2 reporting
Level 3 reporting
Not waste





Disaggregating food waste

- Edible / inedible parts
- Types of food wasted
- Stage of meal (ingredients, cooking preparations, leftovers etc.)



Disaggregating food waste

Level 3
reporting

- Edible / inedible parts
- Types of food wasted
- Stage of meal (ingredients, cooking preparations, leftovers etc.)
- Not needed for Level 2
- Highly useful for identifying problem and possible solutions!

Other breakdowns



Size and type of household

Income group

Region

Urban/rural/suburban

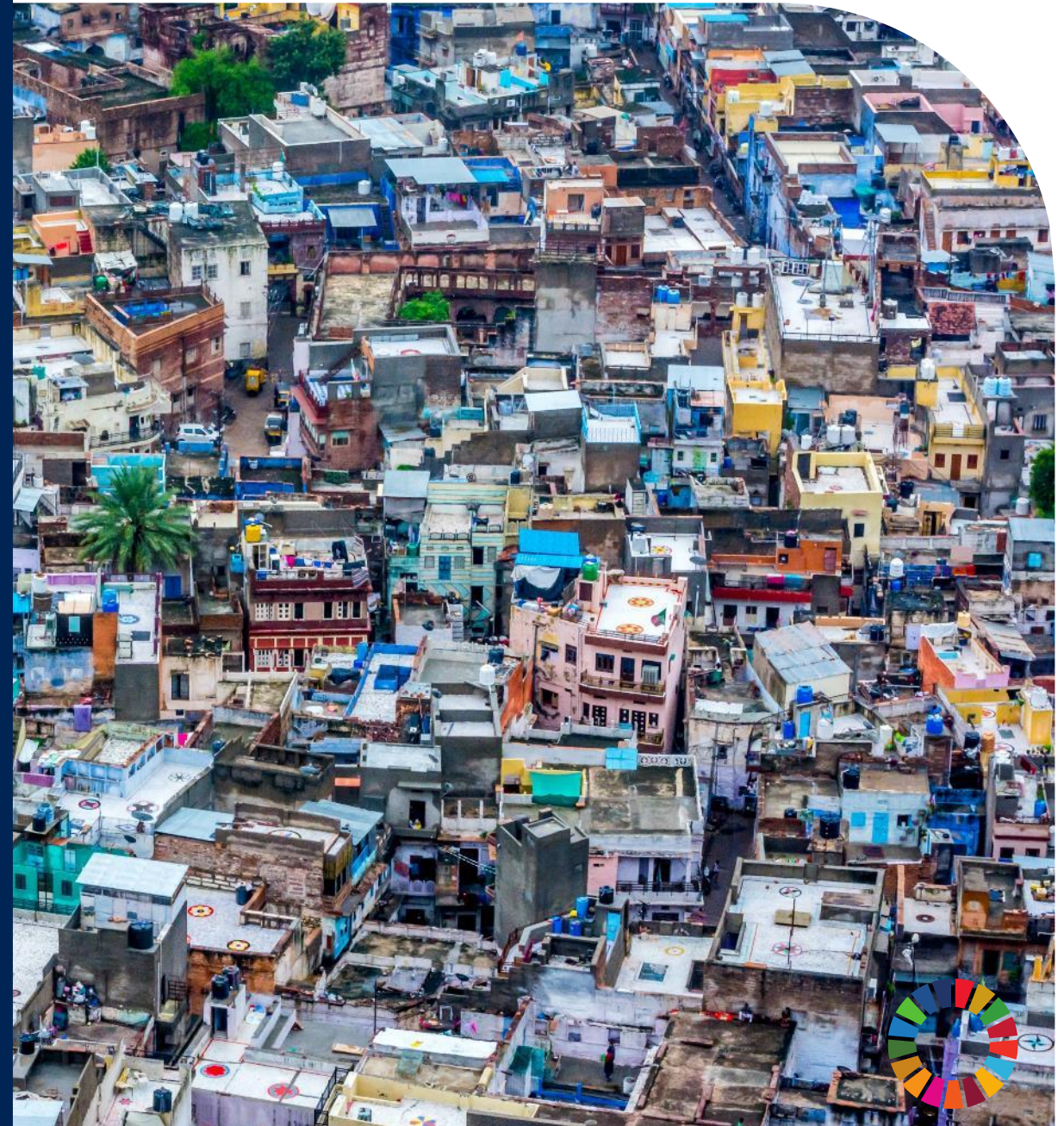


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Causes of food waste

- Causes and drivers
- Inferring causes through FW measurement
 - Edible/inedible
 - Stages/types of food wasted
- Diaries / surveys



Questions?

Guest presentation: Dr Kodwo Miezah



Interactive session: national context

- Understanding your country's waste collection
- Open [link in chat](#)
- Enter YOUR COUNTRY as your screen name
- Click on the image in a place which represents your situation



Photo by ma on Unsplash

Interactive session: national context

- Understanding your country's waste collection
- Zoom poll



The 'How': Methods for measuring household food waste



Requirements of a measurement method

- Sufficiently accurate
- Repeatable
- Good coverage of:
 - Households
 - Food-waste destinations
- Appropriate cost

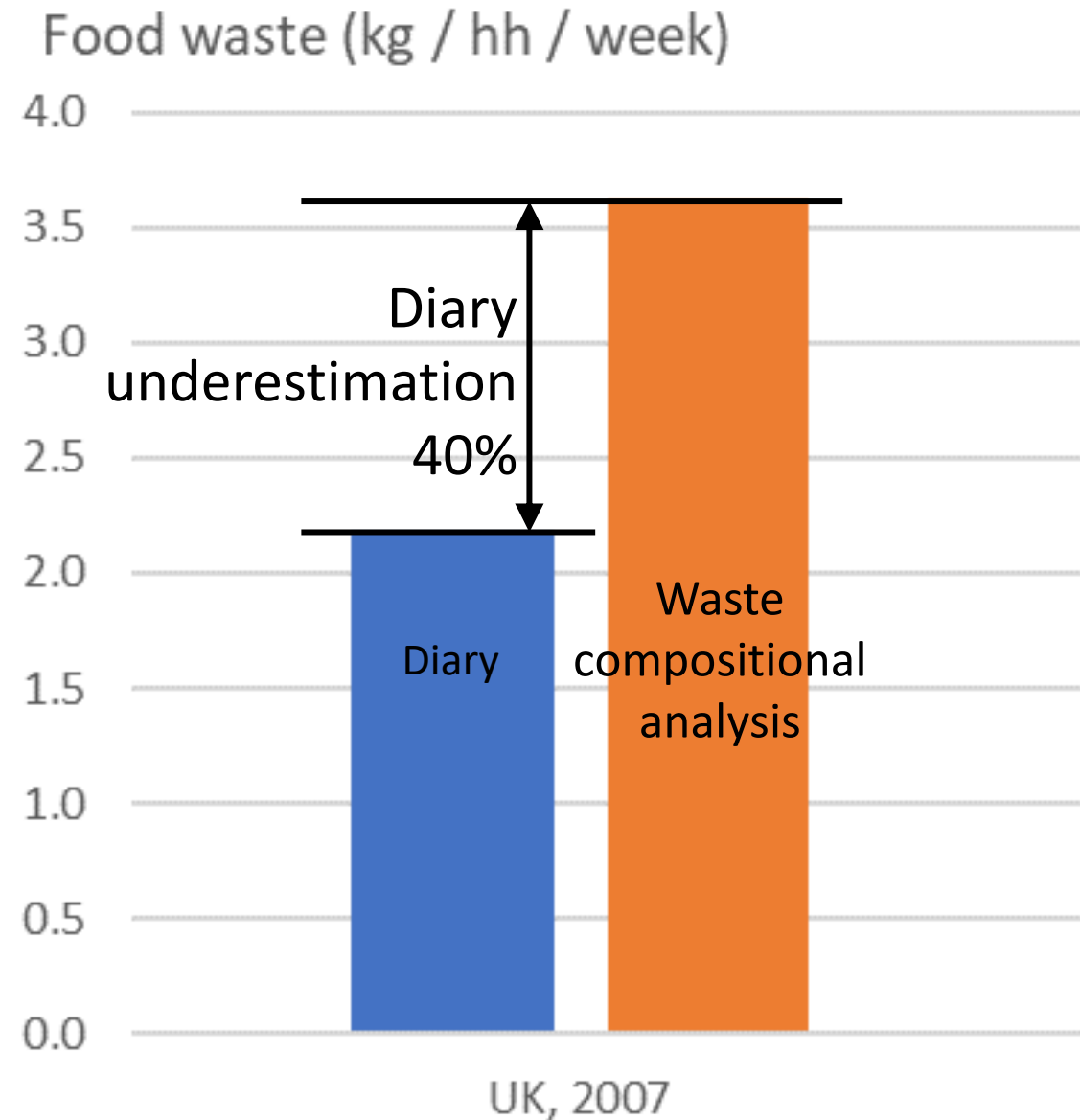
Potential measurement methods

- Food-waste diaries
- Questionnaires
- Mass balance
- Weighing
- Sorting and weighing (waste compositional analysis)



Diaries

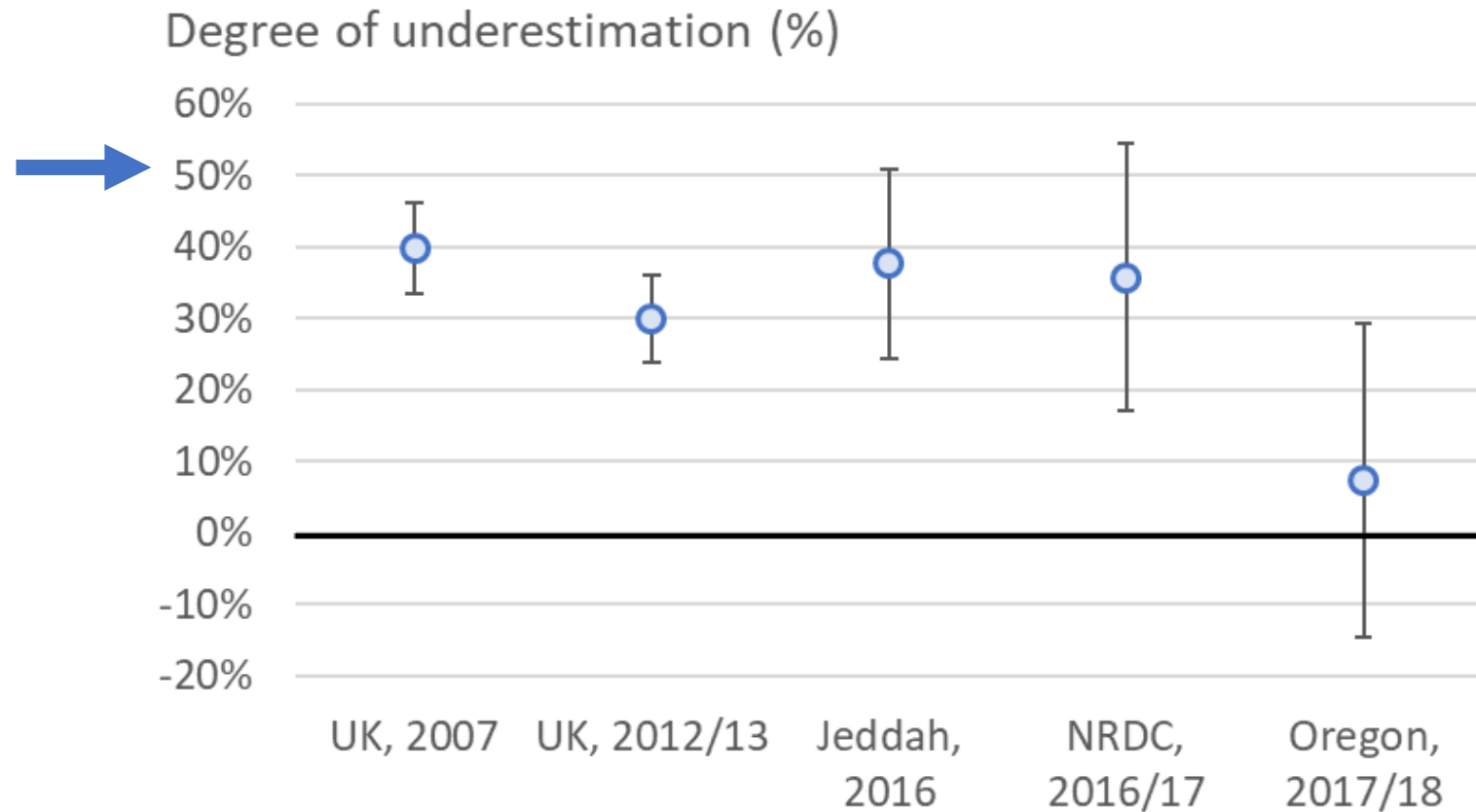
Comparing food waste in waste streams collected by the municipalities from households →



From: Comparing diaries and waste compositional analysis for measuring food waste in the home,
<https://doi.org/10.1016/j.jclepro.2020.121263>

Different diaries: different levels of underestimation

Five different
comparisons



From: Comparing diaries and waste compositional analysis for measuring food waste in the home,
<https://doi.org/10.1016/j.jclepro.2020.121263>



Potential reasons diaries underestimate

- Households change behaviour during diary period
- Household don't report all food waste
- Households measure food waste incorrectly
- People completing diaries not representative of whole population

Potential measurement methods

- ~~Food waste diaries~~
- Questionnaires
- Mass balance
- Weighing
- Sorting and weighing (waste compositional analysis)



Questionnaires underestimate more than diaries

Amount of food waste recorded (grammes / week)





Potential reasons questionnaires underestimate

- Relies on memory: people forget
- Hard for people to estimate amounts of food waste
- Hard to develop questions that obtain relevant information

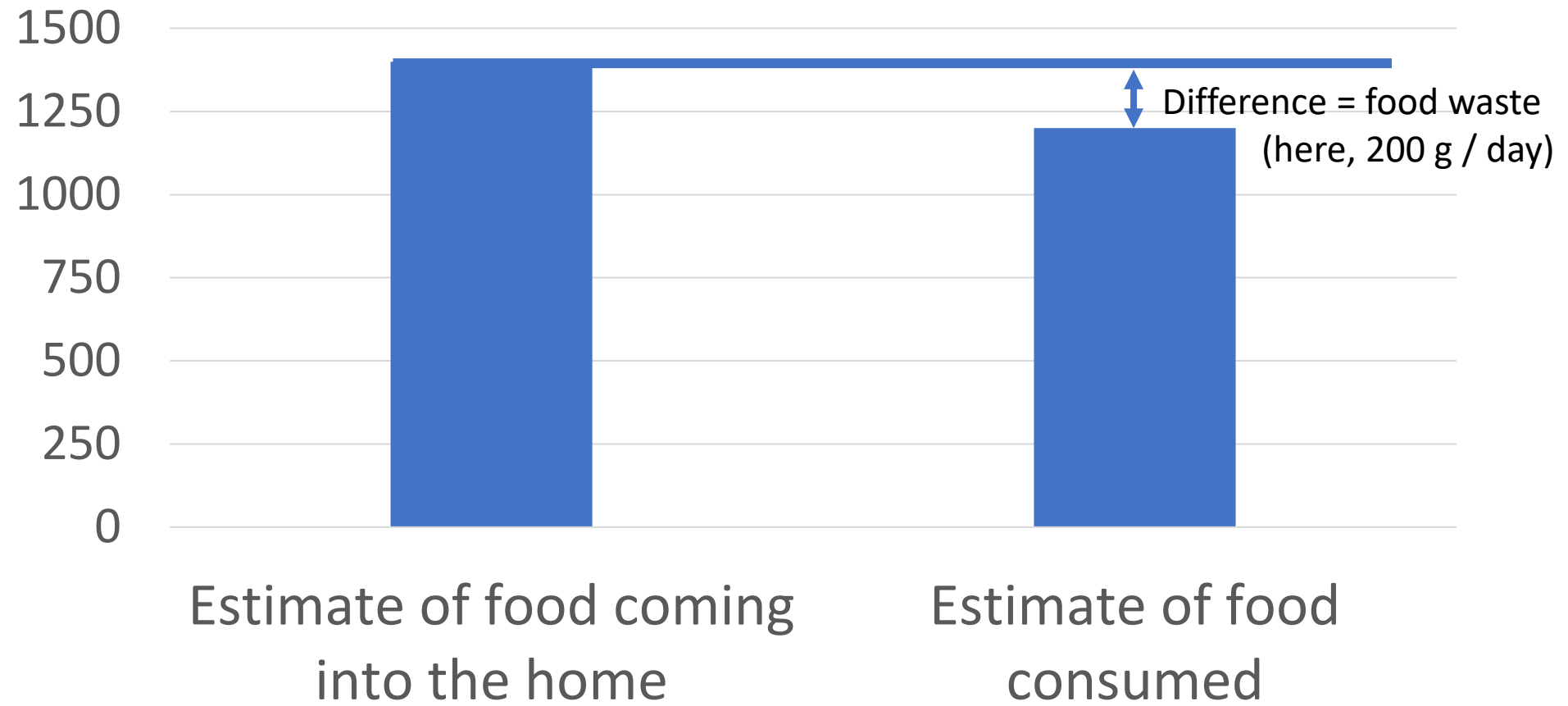
Potential measurement methods

- ~~Food waste diaries~~
- ~~Questionnaires~~
- Mass balance
- Weighing
- Sorting and weighing (waste compositional analysis)



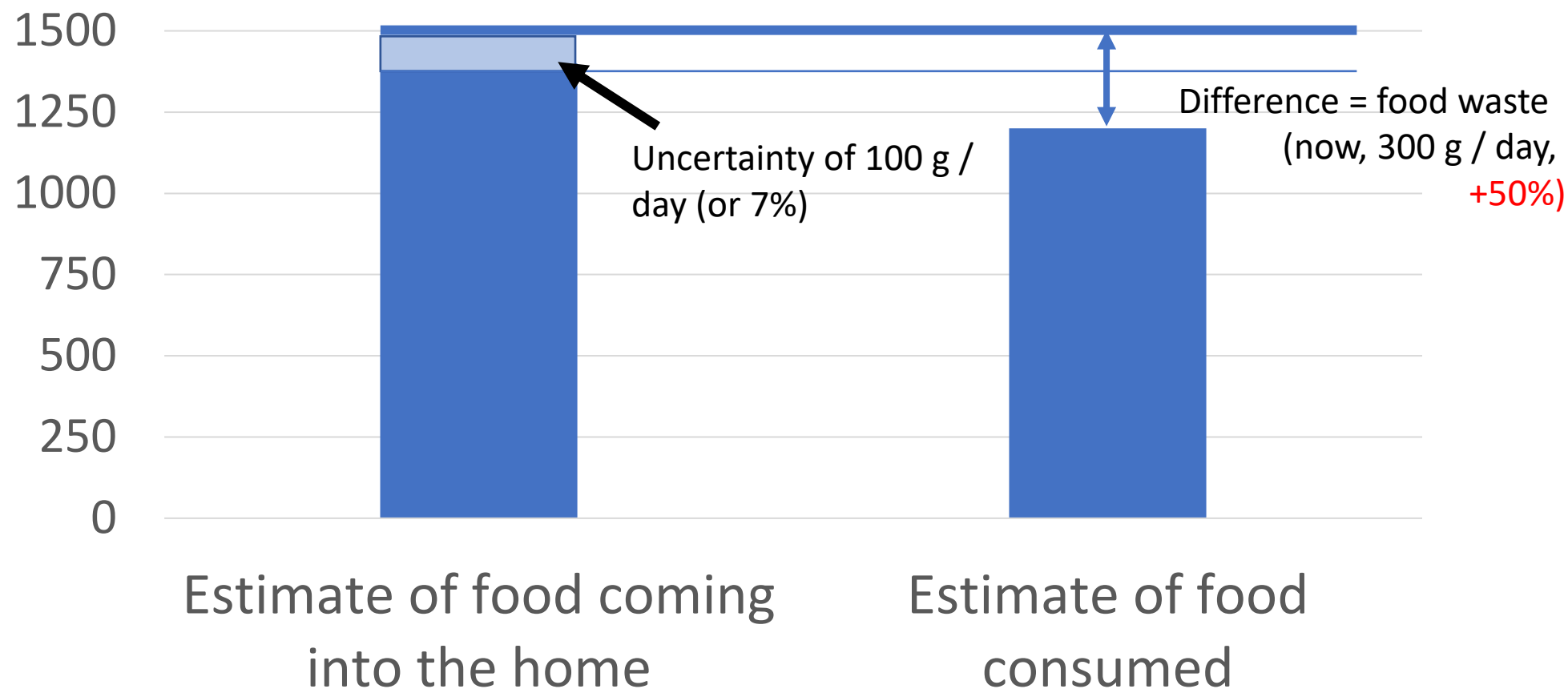
Mass balance

Amount of food (grammes / day)



A small uncertainty becomes a big uncertainty

Amount of food (grammes / day)





Inaccuracies in mass balance

- Need to have very accurate measures of:
 - Amount of food going into people's homes
 - Amount of food eaten
- No information on where food waste ends up

Potential measurement methods

- ~~Food waste diaries~~
- ~~Questionnaires~~
- ~~Mass balance~~
- Weighing
- Sorting and weighing (waste compositional analysis)

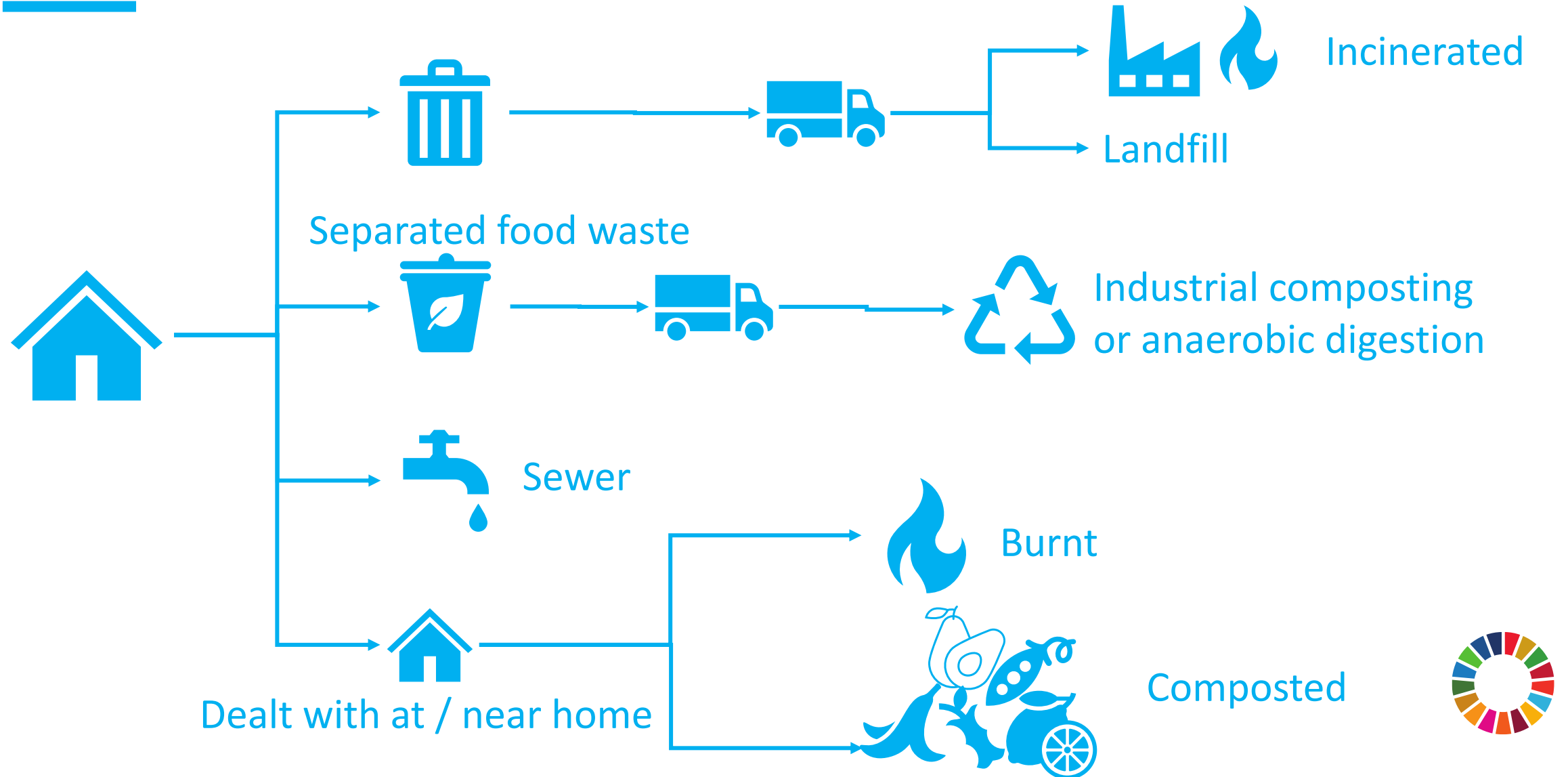


Waste compositional analysis

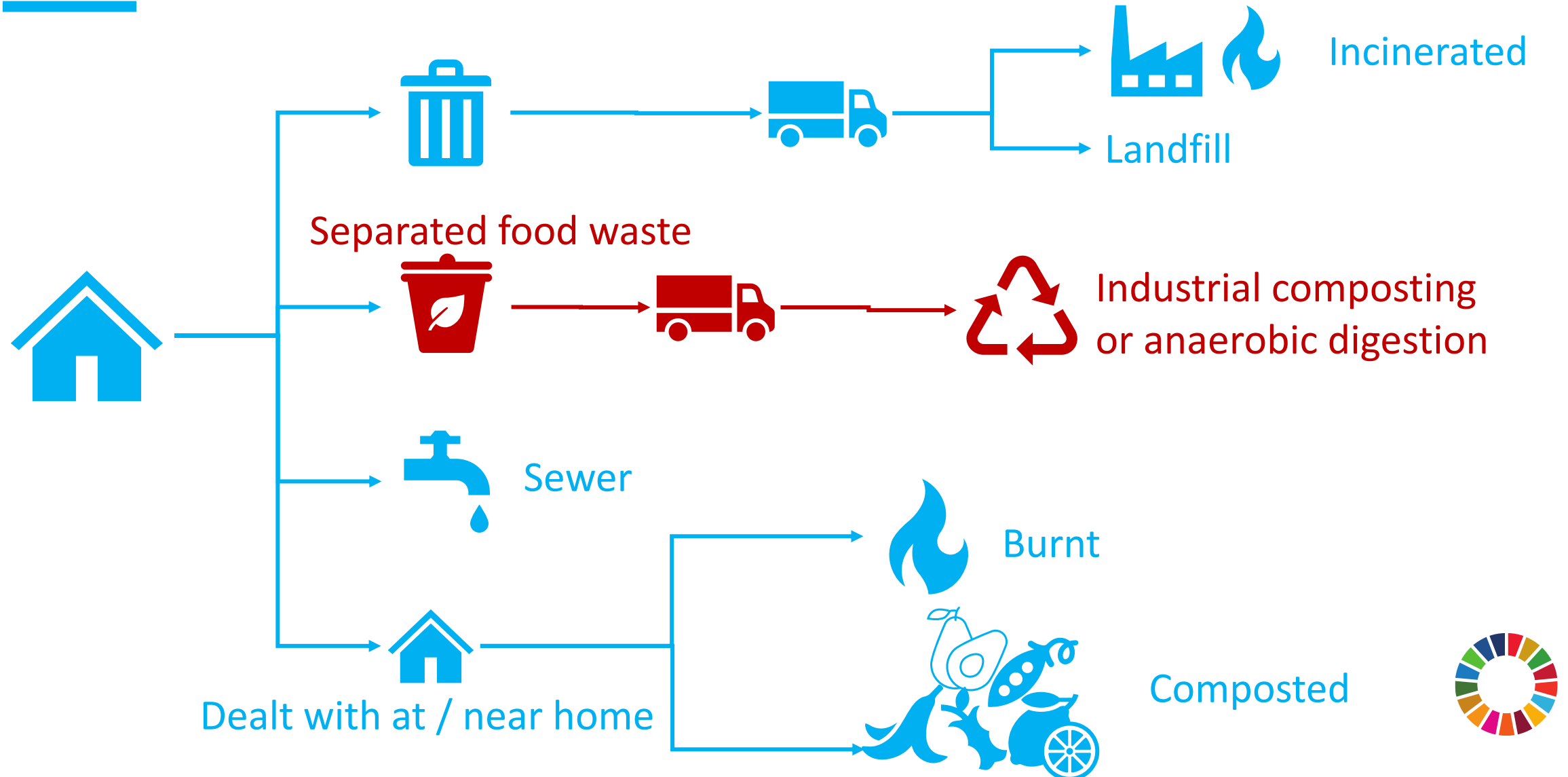
- Collecting, sorting and weighing of waste
- Many variations of this method
- General guidance in Chapter 4 in [Food Loss and Waste Standard's Guidance](#)
- Your country may have specific guidance or specifications:
 - These may need adapting to separate and weigh food waste specifically
 - Useful to find the people who develop and use the guidance in your country
- Other resources: [Waste Wise Cities Tool](#)



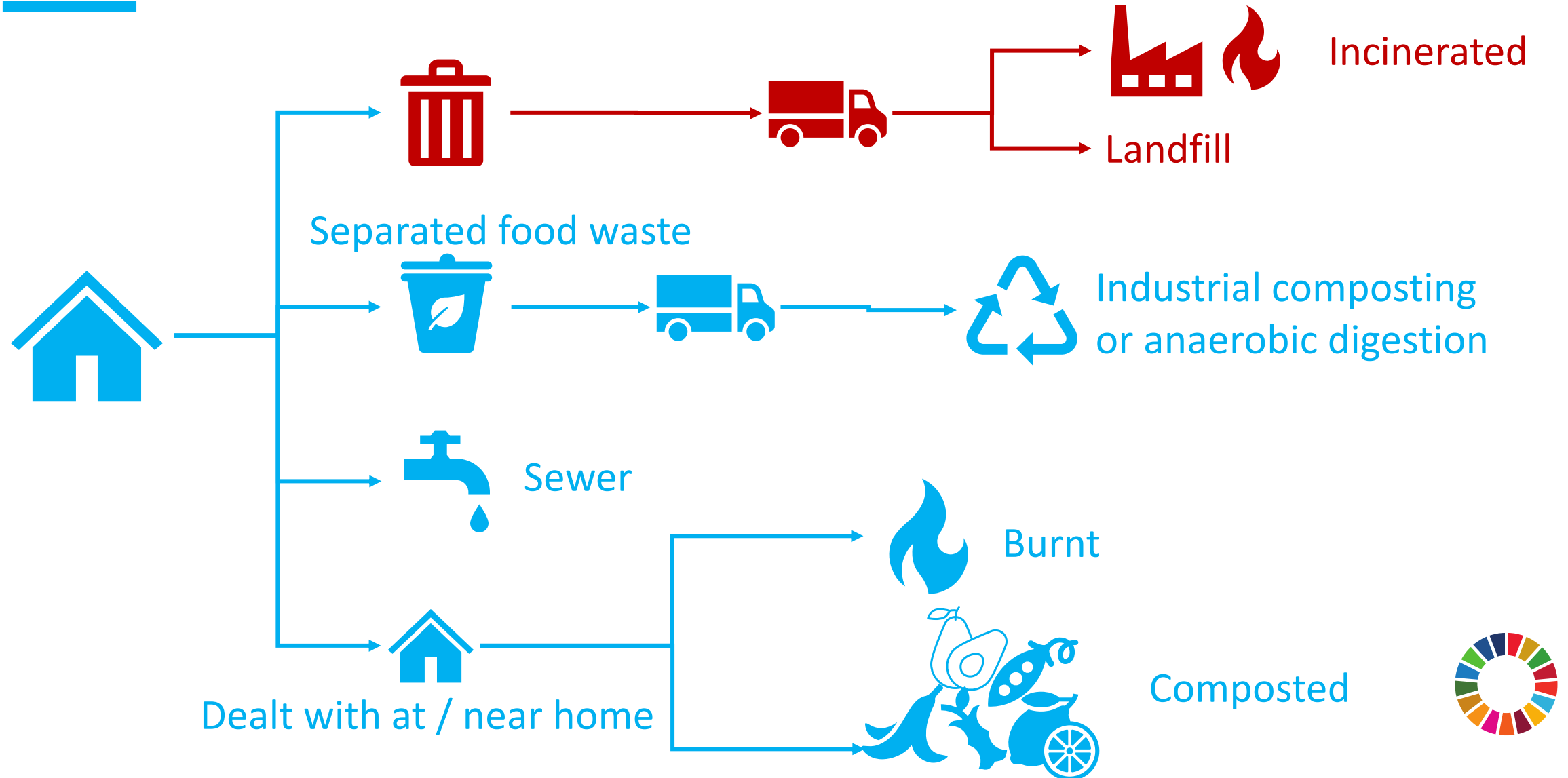
Variations on weighing (and sorting)



Separated food waste = sorting not necessary



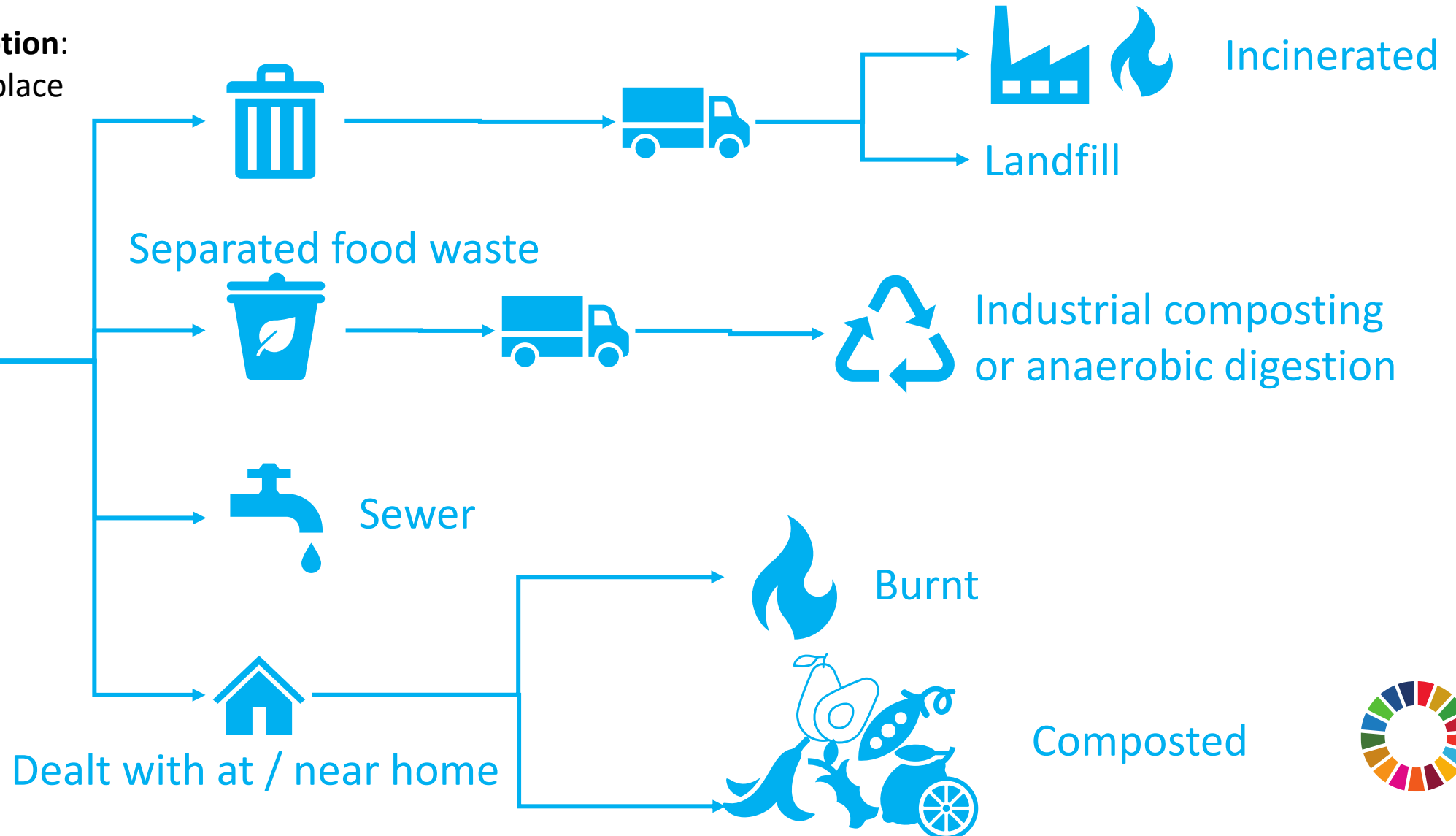
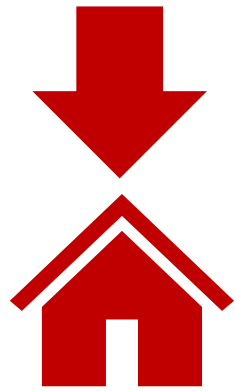
Mixed waste = sorting necessary



Where and how to intercept?

1. In-home interception:

Ask households to place waste in bags



In-home interception



- Determine sample of households (covered later in this workshop)
- Recruit households & determine demographics
- Distribute bags to households
- For 8 days, households put all their waste in bags: one bag for each day
- Researchers pick up bags periodically through week, take to sorting site
- Researchers weigh total waste for each household
- Researchers sort waste into different materials and weigh each material for each collection area
- Divide food waste by number of people to get 'per capita' figure



In-home interception



Advantages:

- Covers all food waste from household
- Good in areas with little formal collections
- Good in areas where it is difficult to identify waste from specific households once set-out

Disadvantages:

- Asking households to do something differently, could lead to underestimation
- Can't determine end destination of food waste



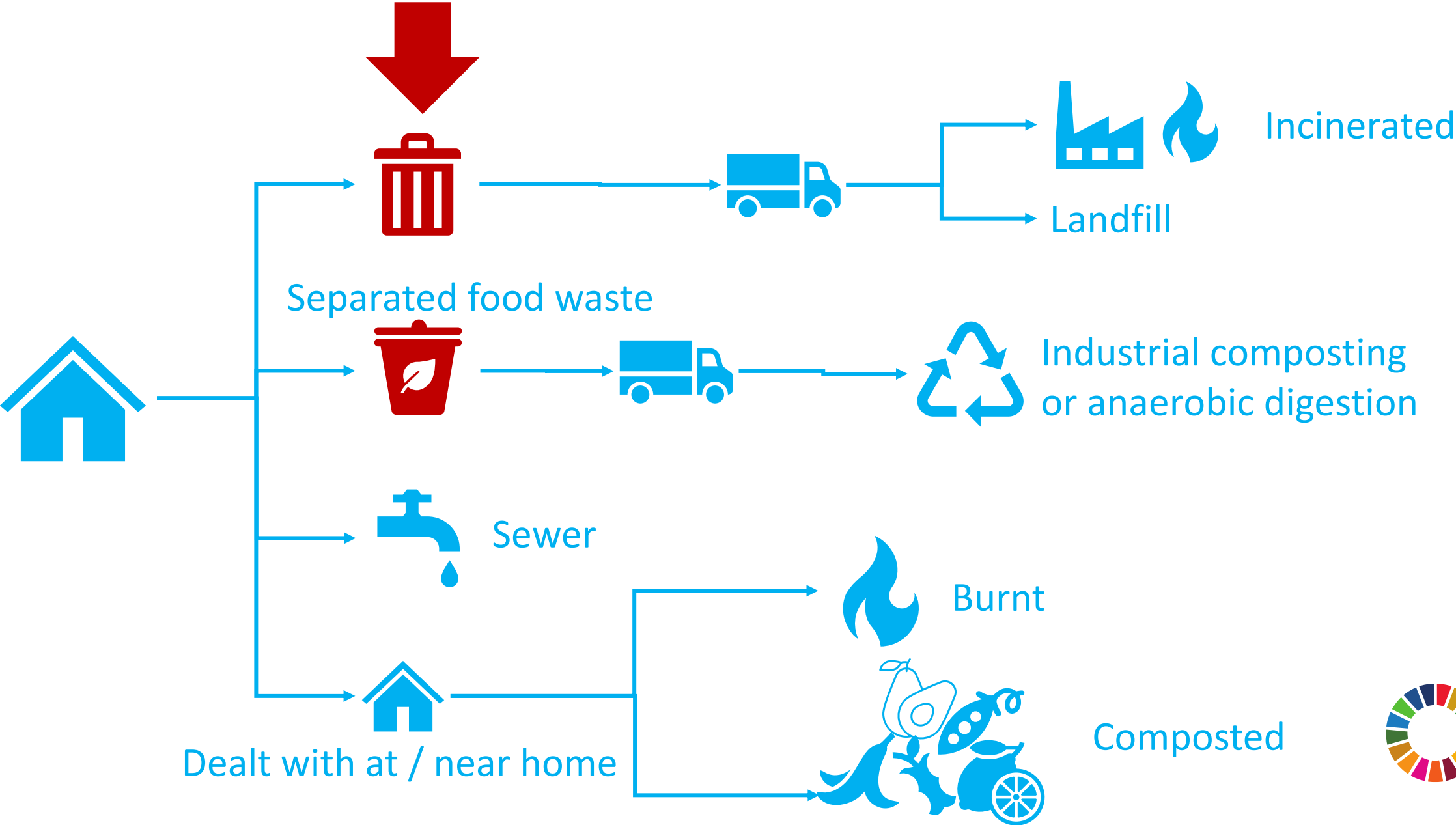
In-home interception



- Considerable overlap between this method and [Waste Wise Cities \(WWC\) Tool](#)
- By adapting WWC approach, can measure for SDG12.3 and SDG11.6 together
- Key adaptation:
 - WWC Tool is for cities; for SDG12.3, need to extend to whole country
 - Minimum sample size for SDG12.3 = 400 households (90 for WWC Tool)



2. **Intercept bins:** intercept waste from formal collections ahead of usual collection



Bin interception



- Determine sample of households
- Recruit households & determine demographics
- Arrange with usual waste collectors for researchers to pick up waste from the bins, rather than the waste collectors
- Researchers intercept waste from waste bins on chosen date, keeping waste from different households separate
- Researchers weigh total waste, sort waste into different materials and weigh each material
- Divide food waste by number of people to get 'per capita' figure



Bin interception



Advantages:

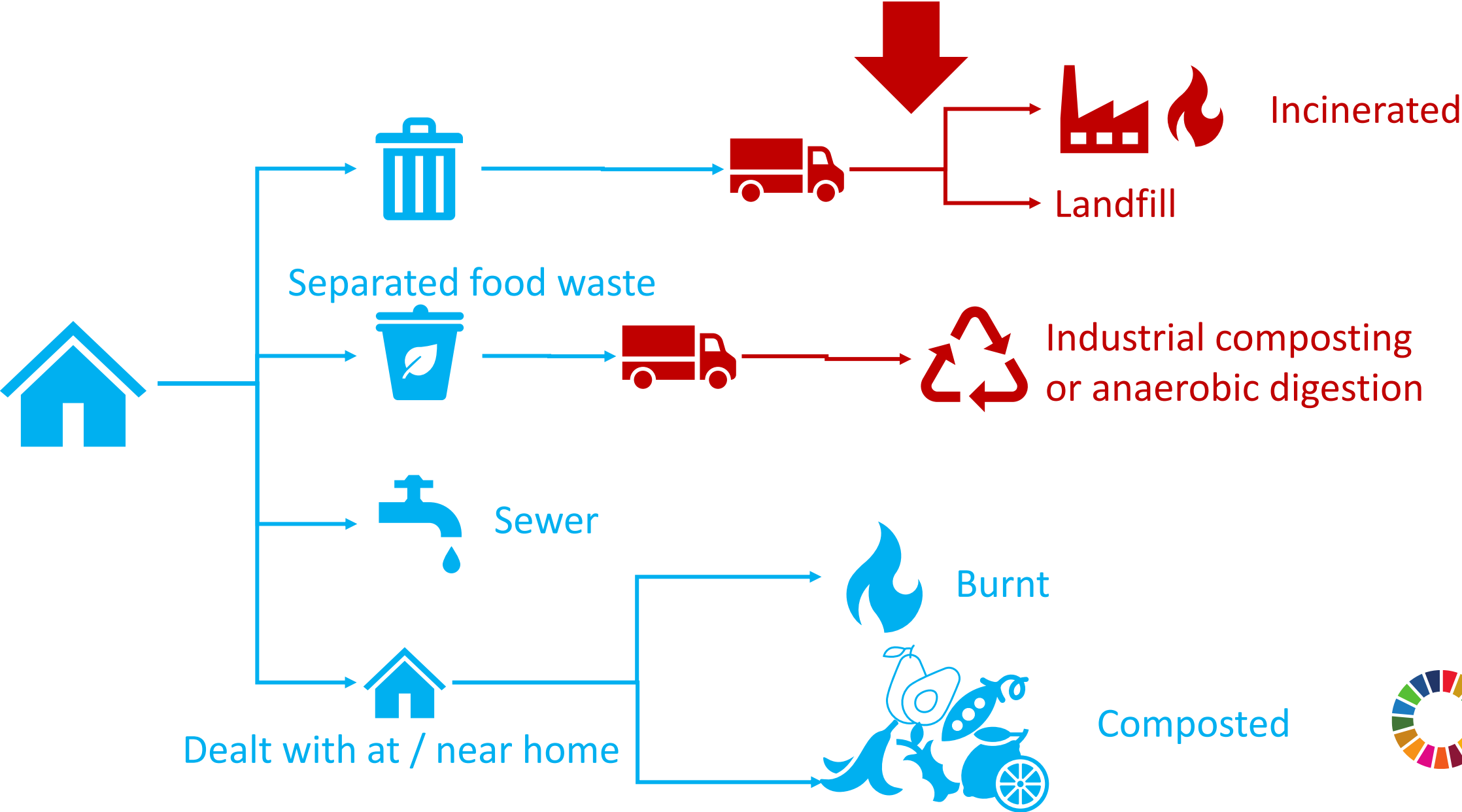
- Low level of interaction with households; less likely to underestimate food waste
- Can link data to specific households => which households waste more

Disadvantages:

- Only works well for formal, regular collections
- Waste from specific households needs to be identifiable: shared waste receptacles are problematic for this method
- Doesn't cover some routes / destinations

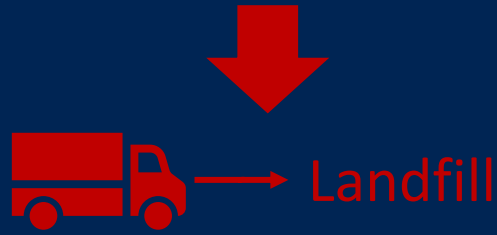


3. Bulk sampling: Sample from trucks at waste transfer station or disposal / treatment site



Bulk

Sampling

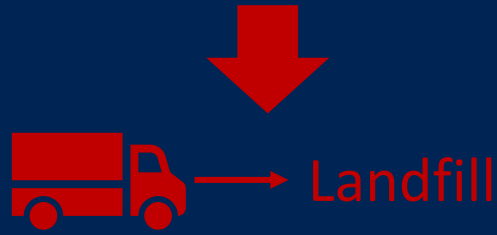


- Determine waste sites and collection routes to sample from
- Arrange with site staff to intercept specific loads of waste
- Researchers intercept waste from trucks on chosen date
- Researchers weigh total waste, sort waste into different materials and weigh each material
- To calculate 'per capita' food waste, need to apply % food waste from above to data on total amount of waste in that waste stream for the country



Bulk

Sampling



Advantages:

- Usually the cheapest method
- Less travel required to collect waste

Disadvantages:

- Can't link data to households => can only tell differences by waste round
- Food waste gets broken up / squashed: harder to sort accurately
- Requires additional data on total waste in country



Summary: where to intercept?

	In-home interception	Bin interception	Bulk sampling
Interception	Before waste leaves home	From waste bins / bags set out for collection	From waste vehicles
Can work in absence of formal waste system?	✓	✗	✗
Can work if waste from households gets mixed	✓	✗	✓
Asking households to do something different?	Yes – could lead to underestimate	No	No
Need other waste data	No	No	Yes – total household waste in country
Relative cost	High	High	Low



Summary

- Methods for *tracking* food waste involve weighing waste
- Food mixed with other materials first needs sorting
- There are different ways of intercepting waste for a study
- Finding the right method(s) for your country is the focus of the 'homework' assignment



Questions?

5 minute break

'Who' and 'When': Sampling

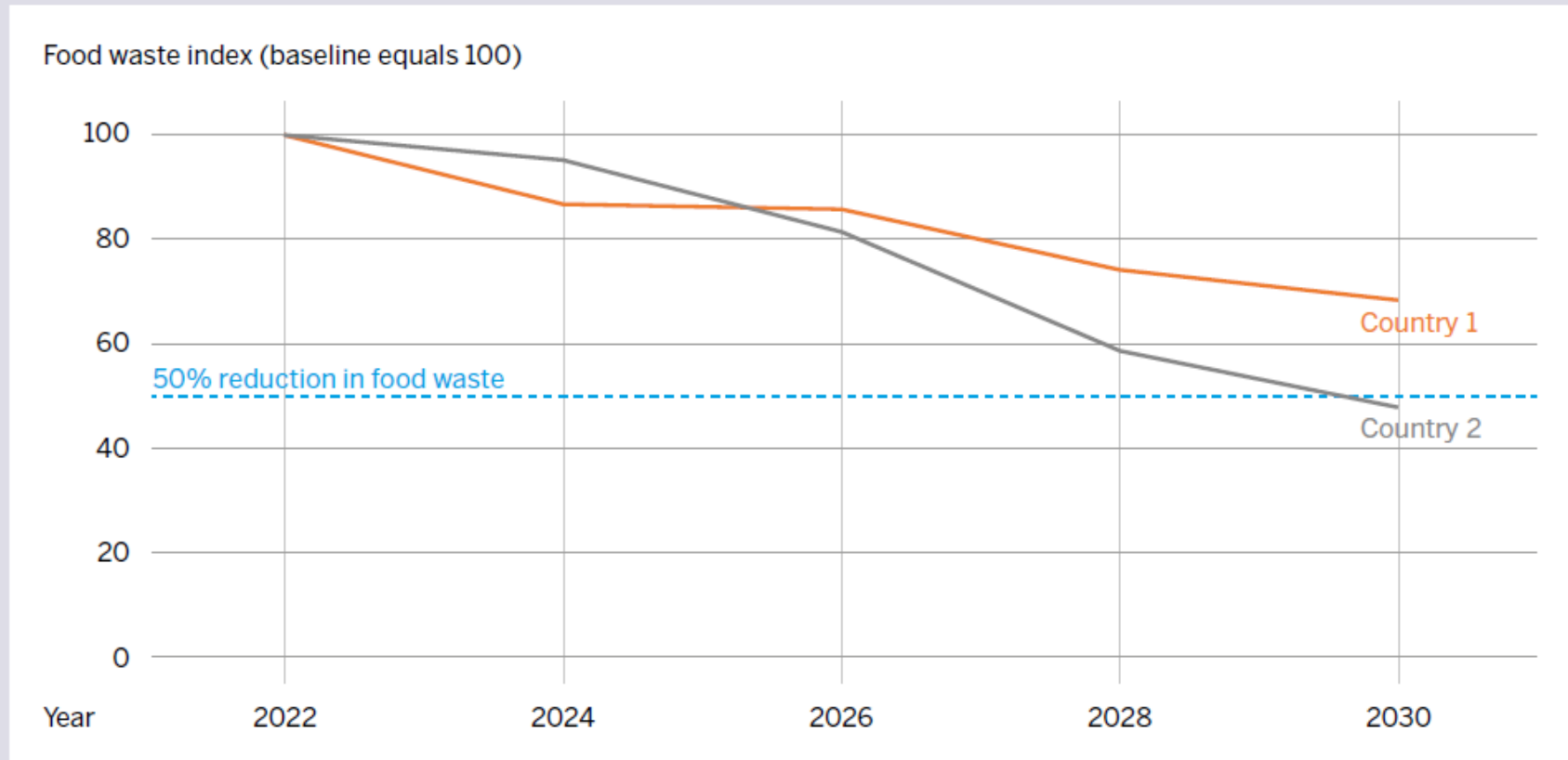
Considerations

- How many households to sample?
- Which households to sample?
- When to sample within a year?

How many households to sample?

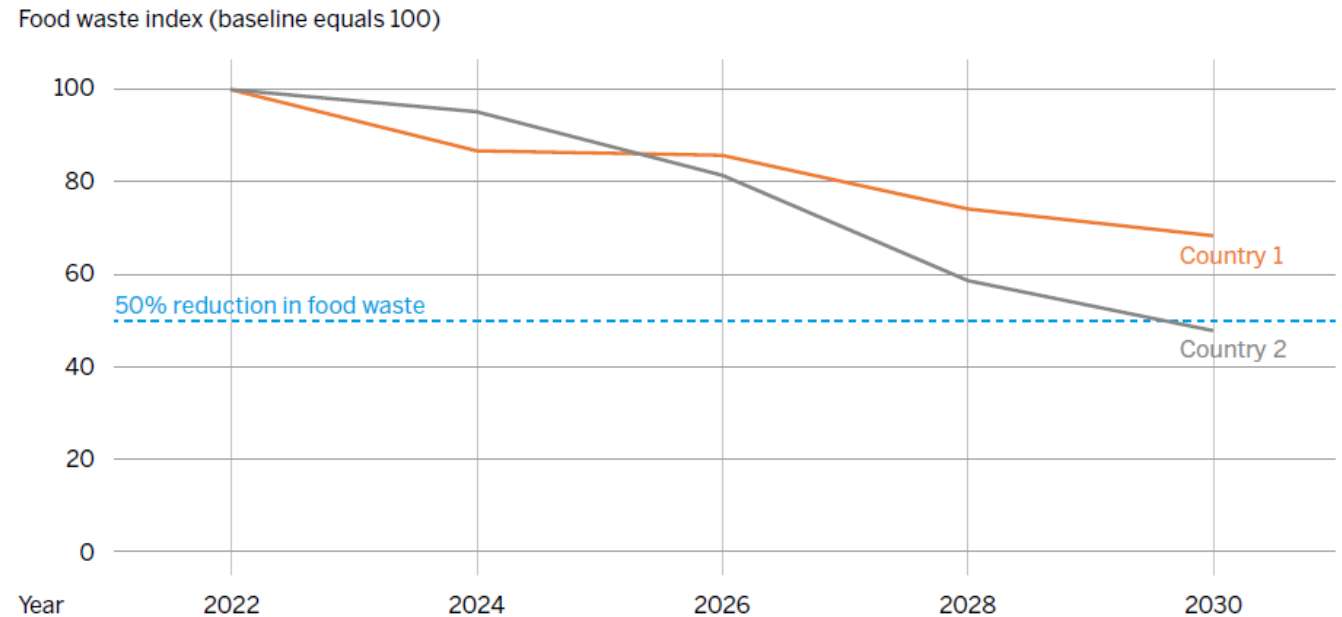
First, we need to know how accurate the results need to be

Figure 5: Food Waste Indices for two hypothetical countries



How many households to sample?

- Minimum accuracy: 95% confidence interval = 10% of estimate
- For example, household food waste = 80 ± 8 kg / person / year
- Allows evaluation of target in 2030 and where substantial progress is being made



How many households to sample?

More variation in food waste
between households => larger
sample size required

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

More accuracy (smaller
confidence interval) => larger
sample size

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

Standard deviation / mean ≈ 1

Desired 95% CI / mean $\approx 10\%$

$$\text{Sample size} \approx \left(2 \times \frac{1}{0.1} \right)^2 \approx 20^2 \approx 400 \text{ households}$$

How many households to sample?

- **Minimum sample size**
households = 400 households
- Accurate enough for tracking nationally ($\pm 10\%$) – Level 2
- For Level 3, more households required to generate useful information, e.g.,:
 - Differences between types of households / areas
 - More info on types of food

Which households to sample?

- **Ensure sample households reflect your nation**
- Sample should reflect country for important parameters, e.g.,:
 - Level of income
 - Urban / rural
 - Type of waste collection
 - Others relevant to your country
- Within these constraints, pick areas & households randomly where possible
- [Waste Wise Cities \(WWC\) Tool](#)

Building sample from sub-samples

Sorting and weighing waste usually geographically clustered. Multiple levels needed to create sample:

- Select **cities / provinces / areas / municipalities**
- Select **collection rounds / neighbourhoods**
- Select **households**



Image from: [Waste Wise Cities \(WWC\) Tool](#)

Example sampling

Budget available for sampling 500 households in 50 clusters. Income level and urban / rural important.

Share of population:

	Urban	Rural
Low income	16%	35%
Middle income	19%	9%
High income	14%	7%

Number of clusters:

	Urban	Rural
Low income	8	17
Middle income	9	5
High income	7	4

To select location of clusters, 1) list all low-income, urban areas in country, 2) select 8 at random for sampling. Then select 10 households within that area.

When to sample?

- **Food-waste measurement should reflect variation within a year**
- As a minimum, sample in two distinct phases, for example:
 - 200 households in dry season
 - 200 households in wet season
- Ideally, spread the measurements through the year

Summary: who and when

- 400 household minimum sample size
- Ensure sample reflects your nation (income, urban / rural, etc.)
- Sample throughout the year (minimum of two distinct phases)



Questions?

**Identifying the team
for measurement**

Creating a strong team

Getting the right team together is important for success. Need people with the following skills / knowledge:

- Sampling and statistics, scaling waste data up to a country level
- Collecting and sorting of waste (logistics, health and safety, waste handling)
- Knowledge of food waste 'flows' in the country: where it goes, how it gets there, details of the 'waste' operations
- How to recruit households for research
- Problem solvers



How would you identify your team?

Interactive session: country planning

- In groups by country
- Think about:
 - What other organisations need to be involved in measuring household food waste?
 - Are you in a position to start developing a plan to measure household food waste in your country?
 - If so: What are the next steps, who should do them?
 - If not: what are the barriers stopping progress?
 - What do you need from the working group?
- (Optional): Document your responses [on a form](#) (you can download a PDF of your responses)



Photo by ja ma on Unsplash

Your next mission: You are on the Selection Committee in a Call for Proposals

- ✓ You receive three proposals for a national household food waste study
 - ✓ Evaluate the proposals using the selection criteria
 - ✓ And select the winning proposal based on which would work best in your country
- The Selection Committee will meet at the beginning of Workshop 3 (**during January 2022**) - be ready to debate with your fellow panelists!



Next workshop

- Follow-up workshop on household food waste measurement
- Proposed date: 11th January 2022
 - 10am GMT / Midday East Africa Time