WASTE DATA BASICS

Opening questions for the reader before reading:

- How would you define/describe waste data?
- What could be the most important data about waste?
- What data would you need to know in order to give good zero waste advice?
- From where to get the best data?
- How can we know if the data is reliable and of good quality?

PURPOSE OF COLLECTING WASTE DATA – WHY COLLECT DATA?

The more we know about our waste, the better we can manage it. Data is essential in setting recycling and recovery targets, calculating current waste treatment trends and identifying potential problem areas. In general, good data helps saving money. Accurate waste data provides a foundation for implementing effective waste management.

Consider this exercise:

Imagine you wanted to reduce the amount of food waste in your city. It's relatively easy to come up with preventive measures, but how would you know you are on track? Where and how would you get the data to verify the impact and even to be sure action needs to be taken in the first place?

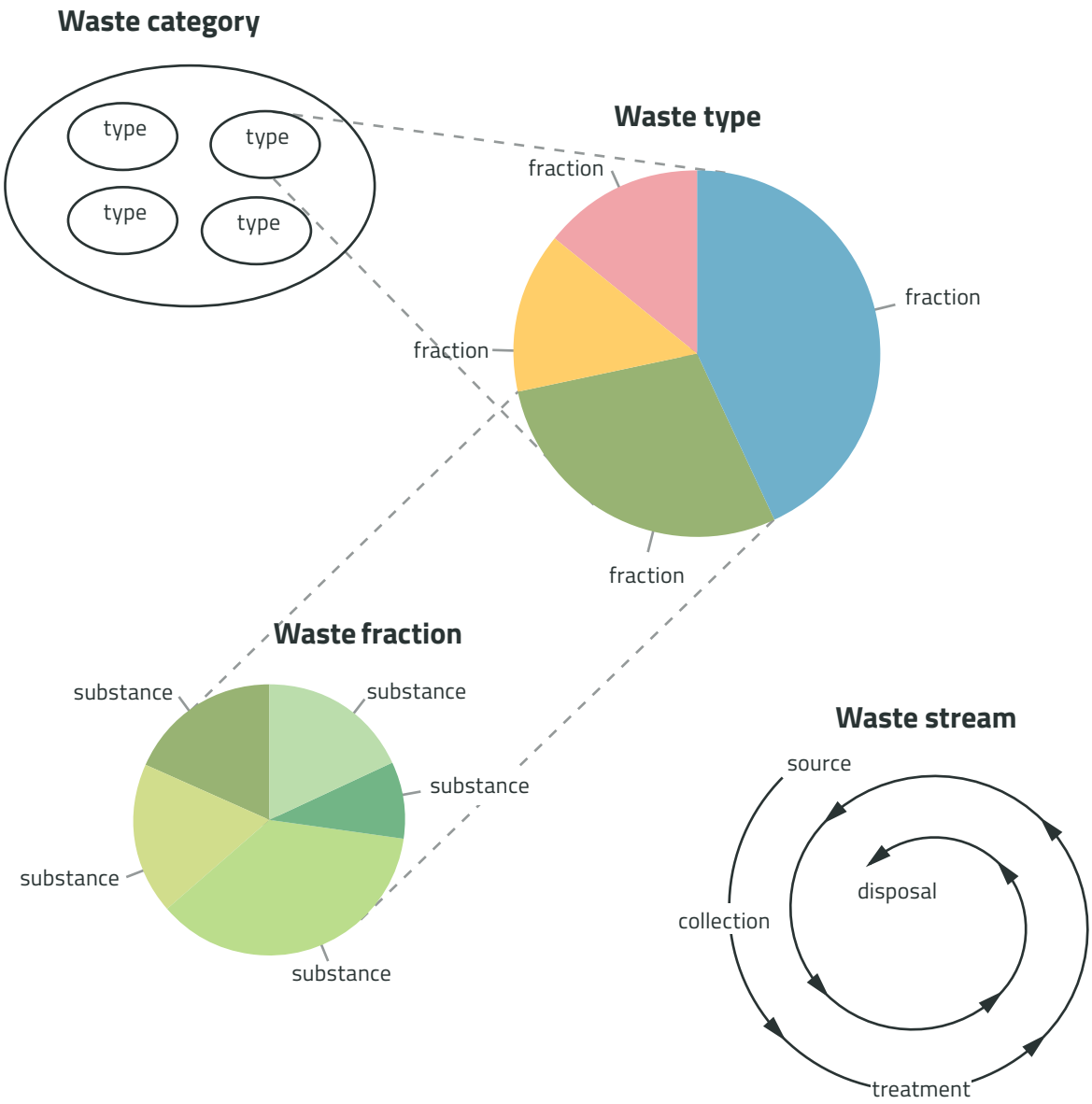
What would your plan of action be? You can also write it down and see if you can get some more hints from this chapter.

TYPICAL WASTE DATA TYPES – DATA ABOUT WHAT?

In general, all waste from a given country is called 'total waste'. One of the essential tasks would be discovering what categories, types and fractions are there:

- **Waste category** is a broad class of waste with common characteristics like residential waste (coming from residential areas, connected to our everyday life or households) or construction and demolition waste. Even though different in details, the composition of such waste is predictable.
- **Waste types** are a subdivision of waste categories. For example, residential waste contains waste from households and waste from gardens.
- **Waste streams** define where the waste goes. At home, citizens source separate waste into fractions, which are then collected and managed as waste streams.
- **(Waste) material fractions** are visually sortable materials: paper, plastic, glass, food waste, etc. Usually this is enough to sort waste according to such categories at home. Each material fraction, however, contains many sub-fractions: office paper, newspaper, books, magazines, cardboard, corrugated cardboard. Sub-fractions are important on the material market where prices are specified at a high detail level depending on the material specifications. Material fractions are sometimes separated into sub-fractions at the source and further separated by quality classes in waste sorting facilities. It is a good exercise to check the local market of waste materials to see which quality classes are most appreciated.
- **Substances** defines the content material that can be described in a laboratory, like the content of water, dry matter or ash, nitrogen, heavy metals, calorific value, etc., or for instance the content of heavy metals in each waste plastic fractions.

Overview on how different waste data types relate to each other:



Typically, waste quantities are reported as:

- **Wet weight**, since this is easily measured. Wet weight is measured at the scale after collection and it is subject to change: it reduces because of evaporation or due to biological degradation; or increases due to rainfall.
- **Volume** based, since volume is easily estimated. Volume can be easily reduced by compacting; therefore it is not a reliable parameter. Knowing the bulk density (kg/m^3) allows transformation between mass and volume.
- **Chemical composition** from the laboratory is usually obtained from very small quantities (few grams) and expressed on a dry weight basis (dry matter, dry solids, total solids). It is accurate compared to errors, which are made in sample collection.

WASTE DATA SOURCES – WHERE TO GET DATA?

Follow the waste stream and split the responsibilities at each lifecycle stage between possible actors. Therefore, **who is responsible** for collection (of every type of waste), where these waste streams end up (waste sorting facility, material recovery facility, composting site, incinerator or a landfill)? You can ask for data from the responsible body or from the authority to whom it reports.

In the case of a public entrepreneur, the data is likely public. In the case of private companies, the data is public as much as the contract allows or as transparent as the company is. If we do not know the responsibilities then we do not know with whom to talk about zero waste. This means we need to study the existing contract of waste hauler (if public). What kind of wastes are covered by these, and which wastes are not covered? It is also important to specify waste types which are separately addressed (e.g. household hazardous waste) and which collection is a duty of some other organisation (e.g. Extended Producer Responsibility organisation) to understand who is doing what, where and if there are any significant gaps.

First we need to know all the waste which is **collected**. Note: waste generated does not equal to waste collected. The waste hauler needs this data for calculating **fees**. The treatment facility needs this data periodically for design adjustments and frequently for calculating fees. Data on kg per street address is not very useful, unless we know the number of inhabitants per address.

Costs associated with waste are at the centre of many calculations and decisions about how to run waste management. It can be insightful to calculate the total sum per year of waste related costs in a particular municipality. One should know how much a person or household is paying for waste collection and treatment/disposal. One should know what is the current gate fee[1] at the landfill or incinerator. Cost of any collection and/or treatment method proposed by the Zero Waste Ambassador, which is comparable to existing one, would be acceptable to waste producers.

Some waste data is collected because it is mandatory. This is when authorities require information i.e. the types of waste being disposed of at landfills, the amount of waste that is incinerated, and what materials are treated by the recycling sector. Publicly available data can be found in national databases. Also Eurostat offers different datasets, for example: waste generation and waste treatment, in all Member States, key waste streams and shipment statistics.

DATA ACCURACY AND PRECISION – IS THE DATA RELIABLE?

Perfectly representative data is rare, because of:

- Spatial (area-wise) variation of waste;
- Temporal (time-dependant) variations;
- Uncertainty (duration of waste audit, amount of waste studied, sampling errors).

[1] Gate fee is the fee paid at the reception to any waste treatment plant. It does not include transportation cost, but it does include the cost for processing of waste and taxes.

It is important to also know the **age** of the data, the best being of course data from the latest year. Older data series, however, offer trendlines. So we should not ignore data from the past. Data can be illustrated by drawing a time series chart to identify basic trends more easily.

One common pitfall involves data about **separate collection and recycling**. People often refer to them interchangeably when talking about collection performance, so it is important to verify whether the numbers are for actual recycling or just separate collection. The latter is a good proxy, but because of process losses and impurities it will always be lower than the former.

Other waste related targets need scrutiny for the same reasons. Sometimes legal definitions are involved, sometimes what is actually being measured is surprisingly different from what the name suggests and sometimes there are multiple valid methodologies for computing the targets, potentially giving significantly different (or incomparable) results. You can read more about it in the *Waste policy and advocacy* chapter.

For reasoning and advocacy work we often also use qualitative or even non-waste related data. In these times of ubiquitous access to the internet, it is progressively easier to get data on whatever we desire. Often however the true sources are not given, data is misrepresented, omitted or forged and reuse becomes tricky. The Full Fact team (and several others) have prepared a useful toolkit for detection of doctored images, fake news and other mis- or dis-information. Explore it at Full Fact Toolkit.

MUNICIPAL SOLID WASTE

The EU defines **municipal solid waste (MSW)** as waste from households and waste from other sources, such as retail, administration, education, health, accommodation, food and other services and activities, which is similar in nature and composition to household waste.

- ☑ MSW includes waste from park and garden maintenance, such as leaves, grass and trees clipping, and waste from market and street cleaning services, such as the content of litter containers and street sweepings.
- ☒ Materials such as sand, rock, mud or dust, and waste from activities such as production, agriculture, forestry, fishing or construction and demolition are excluded from the scope of MSW.

It constitutes approximately 7–10% of the total waste generated by weight, but is amongst the most complex ones to manage, as it is a mixture of many individual waste types and materials. So it is **one of the key waste streams to monitor** and regularly collect data about. One good way to understand this heterogeneous waste better is to conduct a waste composition audit.

THE ROLE OF WASTE AUDITS

Waste audit or assessment is the only exact option for learning the composition of MSW. In general a large sample is chosen from collected MSW, which is then mixed up to be more uniform. A smaller sample to analyse is then chosen from it. Finally, through sorting (characterisation) of individual waste fractions contained in the sample, an overall composition is concluded. By averaging several samples the real composition can then be properly estimated.

The purpose of a waste characterisation event must be clearly determined because the data will later be used for solving specific problems. This means that it is important to think into which and how many fractions the waste should be sorted in the analysis.

Example: National MSW composition analysis for Slovenia (simplified), MOP, 2019

Waste fraction	Share %
Paper	10.3
Biowaste (organics)	28.2
Plastics	14.3
Glass	3.2
Metals	2.9
Textiles	8.9
Composite packaging	1.6
Wood	1.5
Batteries	0.1
E-waste (WEEE)	0.8
Other	28.4

What to expect? As a rule of thumb, one third of our municipal waste is biodegradable/organics, another is paper products, and the third part is all the rest combined. About two third of municipal waste by volume is packaging, and by weight is biodegradable waste.

In developing countries the amount of organic waste is higher, but the amount of paper and plastic is lower. This is because of different consumption habits.

Looking at the table above what is the % of – waste by weight or volume?

It is always good to specify in which units the waste is described.

USEFUL WASTE DATA UNITS

The **quantity of waste** per defined time and per unit is called a unit generation rate. Most often weights should be expressed as such 'unit generation rates' to make data fairly comparable. Examples:

- kg waste/capita/year, (also ton, m^3, number of bins, etc.);
- kg waste/employee/year;
- kg waste/m^2 of building demolition;
- kg waste/hospital bed/year.

For municipal waste, the most common unit generation rate is in kg/person/year. Since the number of people per household is a flexible character then sometimes the rate kg/household/day-week-month is used.

Worldwide, waste generated per person per day varies widely, from 0.1 to 4.5 kg. In Europe, one person generates 1 or 2 kg of MSW per day. Assuming that people are quite similar, one should start with assuming that every person generates ONE kg of MSW per day.

Exercise:

Multiply the number of inhabitants (in your city or country) by 1 kg and by 365 days per year. This gives you a total amount of MSW per year. It is in kg! To get it in tons, divide it by 1000.

About half of this is generated at home, and half is generated elsewhere (at work, dealing with hobbies, sports and leisure). This is your starting point to target waste reduction or improve source separation (at home or in the office?).

In order to have comparable and reliable data on waste generation and treatment in all EU countries, clear definitions and a common understanding of waste classification is necessary. Classification of waste in the EU for administrative purposes divides waste into 20 classes.[2]

Each waste type is characterised by a six-digit code. First two digits identify the source generating the waste, e.g. means waste category (20 is municipal wastes); next two digits waste type (20 01 is separately collected fractions), and last two digits indicate it in more details (20 01 01 is waste paper and cardboard; 20 01 02 is glass etc.)

In Europe waste management prices are expressed in euros (or other local currency) per ton or per kilogram.

[2] Commission Decision 2000/532/EC

DATA PRESENTATION

To make understanding of data easier it is important that we pay attention to how we present it. Like with voice communication, visual communication has many nuances and dimensions due to the peculiarities of our perception. One might think a chart is a chart, but consciously or subconsciously we do care about things like colour choice, line thickness, size and visual noise. As with any style of communication, clarity is key, so simplicity is usually prefered. That is something we have to deliberately implement, as the software tools we commonly use force needlessly cluttered designs on tables, charts and other representations of data.

Check out an excerpt of Edward Tufte's seminal The Visual Display of Quantitative Information for a detailed explanation of why certain data presentation practices are bad and what to replace them with.

Check out also the interactive Data Viz Project web toolkit helping users pick the right visualisation for their data. It sports beautiful examples and explanations of why particular representations are used, when and how.

For basic data collection and what is good for a Zero Waste Ambassadors to know about their municipality, the data gathering assignment in the Annex 2 of the *Zero Waste Ambassador Curriculum* can be consulted.

Ending questions for the reader to reflect upon:

- **What parts in this chapter were most confusing or difficult for you to understand? Why do you think it was so?**
- **How easily can you access your local and national waste data? Do you trust it? Why or why not?**
- **What kind of data would be helpful for promoting zero waste solutions?**
- **To whom would you go with this data?**
- **What do you want to take with you from this chapter?**
- **If and what next steps do you want to take in your work regarding this topic?**
- **What do you want to know more about?**