ZERO WASTE TRAINING HANDBOOK

Authors: Kadri Kalle, Grete Arro, Mait Kriipsalu, Jack McQuibban, Jaka Kranjc, Žaklina Žnajder, Kadi Kenk.

Editor-in-chief: Kadri Kalle

Suggested reference: Zero Waste Training Handbook, Kalle K., Arro G., Kriipsalu M., McQuibban J., Kranjc J., Žnajder Ž., Kenk K., the BEZWA project, 2022

The BEZWA project (Building a European Zero Waste Academy) was an Erasmus+ funded collaboration between five organisations with the main aim to create a strong educational framework in support of the zero waste cities movement in Europe.

Let's Do It Foundation is a social enterprise that consults, trains and mentors public and private organisations to help scale societal change and innovation for successful implementation of zero waste and circular economy principles. LDIF also directly advocates and promotes policies and develops tools to create new solutions.

Tallinn University is a modern and dynamic research university in Estonia with a leading role in promoting an intelligent lifestyle through education, research, and a unique collaboration across disciplines. We view an intelligent lifestyle as making research-based decisions in order to improve society in general and the well-being of its citizens.

Estonian University of Life Sciences has priorities in academic and research activities, which provide the sustainable development of natural resources necessary for the existence of Man as well as the preservation of heritage and habitat. Research is carried out in three institutes: Institute of Forestry and Engineering, Institute of Agricultural and Environmental Sciences, and Institute of Veterinary Medicine and Animal Sciences. We are the first in Estonia to provide education about waste management.

Društvo Ekologi brez meja is one of the leading Slovenian NGOs dedicated to improving the state of our environment – focusing on efficient resource use and active citizenship. Most of their activities deal with waste at its source and they also run the Slovenian network of zero waste municipalities.

Zero Waste Europe is the European network of communities, local leaders, experts, and change agents working towards the elimination of waste in our society. We advocate for sustainable systems and the redesign of our relationship with resources, to accelerate a just transition towards zero waste for the benefit of people and the planet.

With the support of the Erasmus+ Programme of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

TABLE OF CONTENTS

INTRODUCTION

"Once we adopt a new view of the world (or any part of it), we immediately lose much of our ability to recall what we used to believe before our mind changed."

Daniel Kahneman

This quote by Nobel Prize winning psychologist Daniel Kahneman can be understood in two ways, at least. One is that by expanding our knowledge and understanding, these new views become an integral part of us. This gives us hope that once we adopt the zero waste mindset, it becomes hard for us to imagine a different way of managing resources. But the second side of it is that the more we become experts in something, paradoxically the harder it becomes for us to teach and explain it to those who don't yet understand it. Our system of knowledge (known also as mental models) becomes more and more complex, and at the same time it becomes compact, packed like a ZIP file, where details that are important for the beginner to make sense of things are faded in the background. The steps in our thinking process flow so smoothly that we ourselves do not notice it anymore. As experts we need to unpack our way of thinking in order to help beginners become experts more easily. We have attempted this when creating this handbook and the Zero Waste Ambassador and Trainer curricula.

The aim of this handbook is to support the implementation of the Zero Waste Ambassador and Trainer curricula, with the overall goal to strengthen and spread zero waste competences among changemakers across Europe, helping to empower them to support and drive their communities towards long term systemic change. Whereas the curricula describe the set up, structure and reasons for selecting certain topics and competences into the training courses, this handbook goes deeper into the topics themselves and offers some exercises and materials to anyone wanting to train Zero Waste Ambassadors and/or Trainers.

Since the teaching principles described in this handbook are quite universal, then this handbook can be useful also to anyone wishing to improve their teaching, especially in complex problems such as many environmental issues.

HOW TO USE THIS HANDBOOK

This handbook has two main parts: resources for the Zero Waste Ambassador curriculum and for the Zero Waste Trainer curriculum. In the beginning we have also added two chapters on more general principles that are important to both curricula. These chapters focus on the connection between values, wellbeing and zero waste, and on metacognition – the ability to analyse and plan one's learning process.

Although we consider the Zero Waste Ambassador training course as the first level and the Zero Waste Trainer as more advanced – from understanding zero waste to being able to teach it, we have put the Zero Waste Trainer chapters first. This is to give the educators a better understanding of what are the main principles when creating training courses or workshops and how to shape learning activities. The Zero Waste Ambassador chapters provide a more in-depth view into the (zero) waste topics themselves. Whereas the Zero Waste Trainer chapters provide the "How?", the Zero Waste Ambassador chapters provide the "What?". It is important to note that not all the topics from both curricula are represented in this handbook – we have selected some of the most important ones and those which can serve as background or additional reading to the training course content. All the chapters can be seen as examples for creating similar documents on other zero waste topics for your own purposes.

The handbook can be read through from the first to the last chapter, or simply by focusing on specific topics. Each chapter is also available as a separate file, to make it easier to share in case there is a need to work with just one topic at a time. Here are some options how to use the chapters:

- Read them, answer the questions, do the exercises to learn more about the topic.
- Use the content (the questions and exercises) to set up your teaching sessions on the topic.
- Give them as basic/additional reading material to learners in your own Zero Waste Ambassador or Trainer training courses.

The chapters have been designed so they could also be used as training tools (e.g. home reading assignments). There are different types of questions in the chapters:

- **Opening questions** – to tune the reader's thinking on the topic at hand and think about the existing pre-knowledge.
- **Ending questions** – what could be done with the information from the chapter, what to do next.
- **Questions within the text** – to pause and think about the possible answers, to maintain active thinking in providing their own answers before reading them from the text.
- **Frequently asked questions** – a collection of questions that are often raised by the audience when speaking about this topic.

Why we focus so much on asking questions can be read from the chapter *Why are questions important?*. We recommend taking the questions seriously, pause to think about them, even write them down, as this is the best way to maintain active thinking and focus on the material. Our aim is also not to give answers to all the questions we pose, but to cultivate the habit of asking questions, of trying to find answers, of thinking about things more deeply, of self-testing how much do we actually know about things and sometimes also realising we do not have the answers yet.

We do not have the answers to all the questions and this handbook can therefore also be seen as a way for setting goals for future research and discovery for the readers. If you do find some answers, do let us know as well.

AUTHORS AND THE CREATION OF THIS HANDBOOK

This handbook has been created as part of the Erasmus+ funded project *"Building a European Zero Waste Academy"*. The authors are from five organisations, bringing together necessary experience and expertise in the field:

- Zero Waste Europe: the main umbrella organisation in Europe for zero waste related work and research
- Ekologi brez meja: civil society organisation with long experience in national and local zero waste work and advocacy
- Let's Do It Foundation: civil society organisation with experience in active citizenship projects, environmental awareness and non-formal education
- Estonian University of Life Sciences, chair of rural building and water management: long term experience in teaching waste management and treatment
- Tallinn University, school of educational sciences: scientific knowledge of educational psychology

The back-bone for the structure and topics of the handbook were developed in parallel with the creation of the both Zero Waste Ambassador and Trainer curricula. The main ideas expressed in the handbook are based on the latest research done in the field of waste management and educational psychology. Additional input for the handbook was collected from the two pilot training courses in 2021. The feedback and questions from the test groups helped to form the focal questions for the handbook chapters. Some of the chapters were also tested in early 2022 as learning material in an online course and adjusted based on that. Altogether, the handbook has been shaped based on the feedback and thoughts of 45 people in the test groups, in addition to the authors.

DEFINITIONS

To avoid any confusion, this section includes definitions of key terms related to the process and design of the training courses. Topic-specific terminology is explained in respective chapters.

A **training course** is the implementation of a curriculum.

A **learner** is a participant of the training course (a person who is participating in the learning process) or a person who is in the situation of acquiring new knowledge.

An **educator** is a trainer or facilitator (a person who teaches, trains or facilitates people to help learners to acquire knowledge, competence or virtue).

Zero waste is the conservation of all resources by means of responsible production, consumption, reuse and recovery of products, packaging and materials without burning, and with no discharges to land, water or air that threaten the environment or human health. This is the definition of Zero Waste as adopted by the Zero Waste International Alliance.

A **Zero Waste Ambassador** is a person who can argue, convince, advise local decision makers on zero waste policies and business models, with at least a medium level of zero waste expertise.

A **Zero Waste Trainer** is a person who can effectively develop and execute educational sessions (training, workshop) on different zero waste topics by taking into account the needs of the learners.

Competences are a combination of knowledge, skills and attitudes. As described in "Key competences for lifelong learning" by the European Commission:[1]

Knowledge is composed of the concepts, facts and figures, ideas and theories which are already established, and support the understanding of a certain area or subject.

Skills are defined as the ability to carry out processes and use the existing knowledge to achieve results.

Attitudes are the disposition and mindset to act or react to ideas, persons or situations.

[1] Key competences for lifelong learning, European Commission (2019)

UNDERLYING PRINCIPLES FOR TEACHING ZERO WASTE

ZERO WASTE, WELLBEING AND VALUES

Opening questions for the reader before reading:

- Why do you dedicate your time to zero waste or other environmental issues?
- What do you value the most in life?
- What kind of connections do you see between your core values and zero waste?
- What are the reasons why people get interested in zero waste?
- How can zero waste solutions make our lives happier?

Main ideas in this chapter are based on the self-determination theory by E.L. Deci & R. M. Ryan[1]

For people working in zero waste and in environmental topics in general, it's quite obvious that zero waste helps us to preserve natural resources and serves to protect the environment, which is often the main reason why we are working in it. We value nature and a clean environment. But there are also other connections between zero waste, wellbeing and values which are maybe not that obvious right away.

Values and attitudes are part of human nature and influence everything we do. There are also certain attitudes that are part of both the Zero Waste Ambassador and Trainer competences but they are of course something we cannot just teach in one training course; and they are maybe not directly teachable. What we can do at our training courses is to strengthen the already existing values and open the discussion on their importance. We have not included any specific sessions on values or attitudes into neither of the example training formats as this could be seen as a sort of horizontal topic and embedded into different activities, in the form of discussion topic, group or individual exercise. But of course it could be included also as a separate session.

Values are tricky. We can agree that all of us have certain values and we act based on them, especially in difficult situations. At the same time values are very difficult to change, as they start developing from early childhood and take a long time to form, and it's not always clear what shapes our values.

One theory dealing with values is the life aspirations theory.[2]

First, let's look at the types of life aspirations or goals people have. Take a look at some statements below. What 2-3 options would you pick from this list as important life goals for you?

1. To have many nice things
2. To be able to grow as a person
3. To be known by many people
4. To contribute to making the world a better place somehow
5. To have power and influence over people
6. To have close relationships with friends/family

[1] Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.*

[2] Life aspirations theory, officially goal contents theory, is part of the bigger motivational theory called the self-determination theory, developed by Ryan, R. M., & Deci, E. L.

There has been a lot of research[3] on life aspirations and in broad terms two types can be distinguished. The options 1, 3 and 5 are what we call extrinsic goals and options 2, 4 and 6 are intrinsic goals, sometimes also referred to as hedonic and eudaimonic aspirations, respectively. It is likely that you selected the sentences from one type, not both. And if you are reading this and interested in zero waste education, it's likely that you picked from the intrinsic values' type.

Overview of the two types of values:

Intrinsic life goals *(eudaimonia)*	**Extrinsic life goals (*hedonia*)**
Happiness from knowing you are doing the right thing	Happiness from seeking positive emotions and avoiding negative emotions
Main goal types: • Creating and keeping close relationships • Personal growth • Contributing to your community	Main goal types: • Economic success, having material wealth • Fame, being popular • Image, looking attractive

While we may want to look beautiful and value our family at the same time, on the level of life goals and what we find most important in life, people either have intrinsic or extrinsic value sets, and not a mix of both[4]. One of the value types always has a higher importance.

And now the interesting part:
Guess which group has less anxiety, depression and unhappiness, as well as a smaller ecological footprint?

It's the group with intrinsic values. So valuing community, relationships and work for the bigger cause (like environment) also actually means living a happier life. Why? Because intrinsic aspirations satisfy better our three psychological needs – relatedness, autonomy and competence,[5] whereas extrinsic aspirations are based on comparisons with others, which make us more controllable and controlled by others. Same results have been found in many studies all over the world, across different cultures.[6]

> **So already working for zero waste solutions and improving our living environment is good for our mental wellbeing.**

[3] Kasser, T., & Ryan, R. M. (1993). A dark side of the American dream: Correlates of financial success as a central life aspiration. *Journal of Personality and Social Psychology,* 65(2), 410–422.

[4] Grouzet, F. M. E., Kasser, T., Ahuvia, A., Dols, J. M. F., Kim, Y., Lau, S., et al. (2005). The structure of goal contents across 15 cultures. *Journal of Personality and Social Psychology,* 89(5), 800– 816.

[5] More about that in the *Learning motivation* chapter.

[6] Just to name a few: Grouzet, F. M. E., Kasser, T., Ahuvia, A., Dols, J. M. F., Kim, Y., Lau, S., et al. (2005). The structure of goal contents across 15 cultures. *Journal of Personality and Social Psychology,* 89(5), 800– 816; Williams, G. C., Hedberg, V. A., Cox, E. M., & Deci, E. L. (2000). Extrinsic life goals and health-risk behaviors in adolescents. *Journal of Applied Social Psychology,* 30(8), 1756–1771; Utvær, B. K. S., Hammervold, R., & Haugan, G. (2014). Aspiration Index in vocational students: Dimensionality, reliability, and construct validity. *Education Inquiry,* 5(3), 359–383.

What about people with extrinsic values? Could they also move towards intrinsic values? The question perhaps is: what influences our values?

There are of course many elements in influencing values; childhood and upbringing have a big role here. But there are also some elements in our general surroundings that could have some effect in time. Some of the elements that influence our values are:

- **What the people that surround us (family, friends, co-workers, teachers...) value:**
  - which is emphasised more: cooperation or competition
  - which is more important: fast results or taking time to learn deeply
  - pleasing external parties or finding inner meaning

- **The culture, political regime, tone and style of journalism:**
  - how restrictive laws and rules are
  - what is considered acceptable and non-acceptable in society
  - what is praised as good behaviour in society
  - level of freedom of expression

- **The words we use everyday:**
  - do we talk more about extrinsic or intrinsic values, for example calling people consumers or citizens[7]
  - do we talk more about money itself or how we can invest into human wellbeing

- **Our everyday environment.**

How does our living environment (our cities) influence our values and nudge them? What kind of role could zero waste solutions play in there?

Of course it starts already with city planning: what means of transport and movement are easier (walking and cycling vs cars), what are the options for how to spend your time (shopping malls or cultural spaces and green areas), how much is participatory human interaction supported by these choices and so on. And waste management is also part of that: starting with the basics of how clean and tidy the city space is (how much is common space valued and taken care of) but also showing how we treat resources that we ourselves no longer need.

[7] There can actually be differences in people's behaviour depending on whether they are addressed as consumers or as citizens: Consumerism and its antisocial effects can be turned on-or off, Association for Psychological Science (2012)

If we think about what the most important ideas we promote with zero waste are - waste reduction, reuse and repair centres, community composting and gardens, food sharing - then it's not only about environmental protection and cutting costs, but also about social bonds between people, developing new skills and keeping old (repair) skills alive, being creative and mindful with our things. Zero waste is about more connections between people, more meaningful jobs, it's about prioritising wellbeing over consumerism. Zero waste supports intrinsic values.

A quote by **Carl Jung** on values and human interaction as further thought in the topic:

> ***"Loneliness does not come from having no people around you, but from being unable to communicate the things that seem important to you."***

You can read more about values, communication and getting people on board with environmental issues, in the *Communications and storytelling* chapter and *Learning motivation* chapter.

Ending questions for the reader to reflect upon:

- **In what other ways could we support intrinsic values?**
- **How much do you think we can influence the values of others?**
- **How do you usually communicate the importance of zero waste to others?**

METACOGNITION aka KEEPING TRACK OF YOUR OWN LEARNING

Opening questions for the reader before reading:

- Do you analyse your own thinking process or ways of learning? Why? If yes, how?
- Do you assess or keep track of how well you know the topics that you learn? Why? If yes, how?

First we need to introduce a somewhat strange word called metacognition.

Metacognition can be defined as:

- Awareness or analysis of one's own learning or thinking processes.[1]
- Planning, monitoring and evaluating your own learning, reflecting on your own performance.[2]

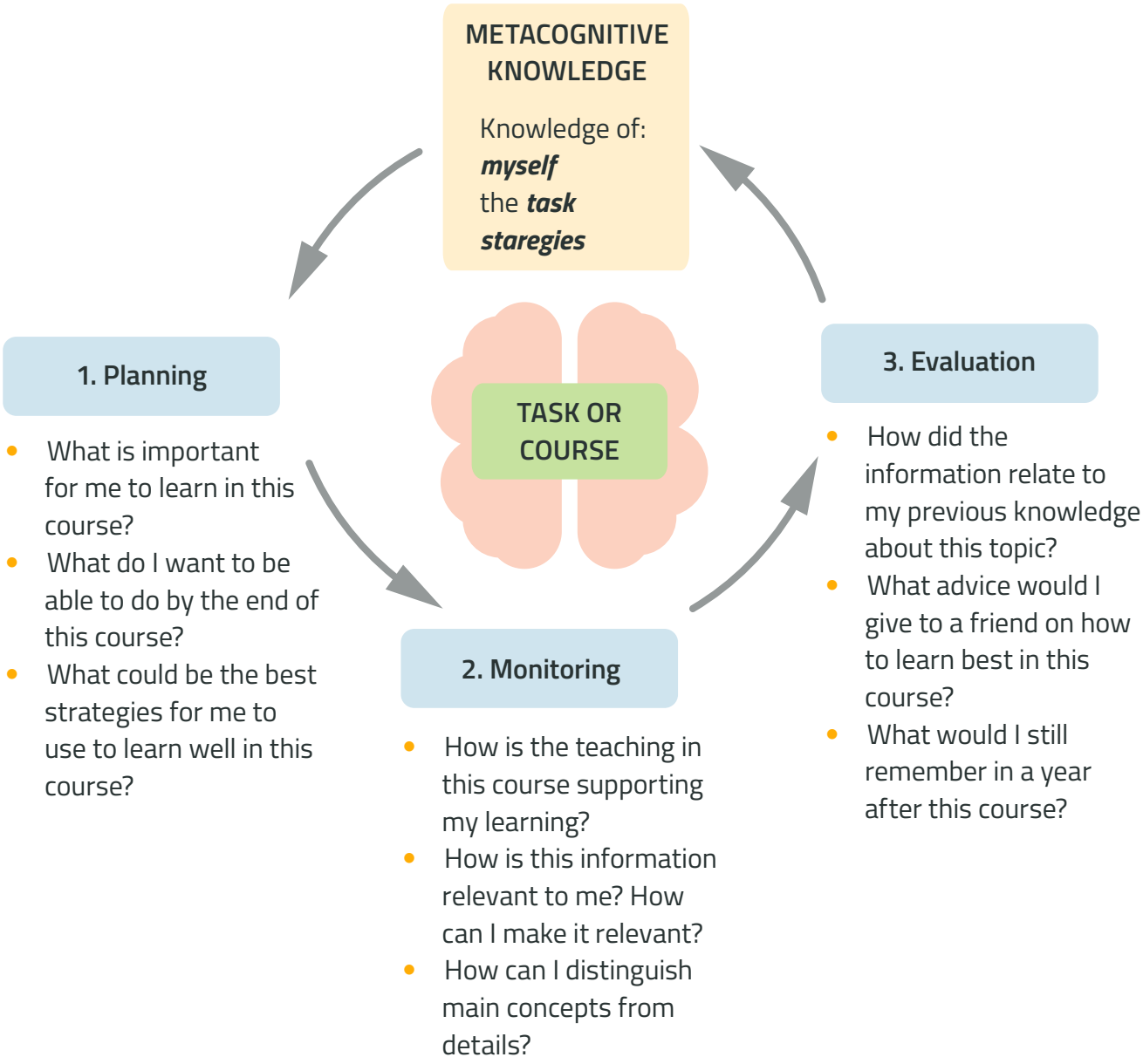
A very simple example: making notes in a lesson is cognitive strategy (to remember the lesson), **deciding that you need to make notes in order to remember** the lesson is a metacognitive strategy.[3] Metacognition is thinking about your learning, not learning itself, for example, what helps you to remember; but also the knowledge of good strategies to learn and think **in order to become better at something.**

Metacognition is an essential part of self-development and learning. It has been said that we might learn more from reflecting on our experiences than from the actual experiences themselves.[4] The human brain is a very complex organ, which brings both many possibilities and struggles with it. It's been well studied[5] that we have many biases that distort the way we process information and we can make "shortcuts" in our thinking that can bring mental flaws into our logic. Becoming better at thinking and learning can often be counter-intuitive and requires practice and effort.

It's important to note that metacognition is a rather complex topic and we are only very briefly touching upon it here. **Good metacognition means being able to assess if we are learning effectively or ineffectively and how we should change our learning strategies.** It's a whole process of mindfully planning, monitoring and then evaluating our learning.

1 Merriam-Webster Dictionary
2 National Research Council (NRC) (1996). National Science Education Standards, Washington, DC: National Academies Press
3 Jacobse, A. E., & Harskamp, E. G. (2012). Towards efficient measurement of metacognition in mathematical problem solving. *Metacognition and Learning,* 7(2), 133-149.
4 Dewey, J. (1933). *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process.*
5 variety of examples in: Kahneman, D. (2011). *Thinking, Fast and Slow.*

Some examples of metacognitive questions that a learner could ask him/herself in each of these stages:



Source: Tanner (2012)[6], Quigley et al (2018)[7]

Developing metacognitive skills is a long process and not something our training courses can teach people to master. But there are some elements which we have included in order to help learners to assess their learning process better and practice metacognitive skills. That's why we have included the ability to self-assess their own skill level and direct their learning more effectively as a part of the Zero Waste Ambassador's competences. Similarly, one of the Zero Waste Trainer's competences is to critically evaluate their own teaching and welcome failure as part of the learning process. Teaching is always also a learning process.

[6] Tanner, K.D. (2012). Promoting Student Metacognition. *CBE - Life Sciences Education*, 11, 113–120.
[7] Quigley, A., Muijs, D., & Stringer, E. (2018). Metacognition and self-regulated learning. Guidance Report, Education Endowment Foundation.

For each of our chapters in the handbook we have added opening and ending questions which help to think about what we already know about the topic, what we can do with this knowledge and what we want to do next. This is similar to what we recommend to do during training events:

1. In the beginning thinking about what learners already know about the topic;
2. In the evenings having reflection exercises: ideally learners could write down the most important learning moments and how to use them in the future.

We encourage learners to be confused and to struggle. And perhaps most importantly to notice that **deliberate confusion can also be a metacognitive skill** - to consciously understand what we don't yet understand and what is difficult.

Reflecting on our own learning only based on how it FEELS effective to us is not enough. Why is it so?

It is well studied[8] that the majority of what we believe about our own learning is not correct. For example, if learning feels hard and confusing, we tend to think that we are not good at the topic and the learning process is ill-designed, although the truth is likely the opposite. In order to become a ninja in metacognition, a crucial aspect is to integrate everything you learn about learning into your self-reflection. This is mainly in the *Main principles of teaching* chapter but also the *Learning motivation* chapter of the Zero Waste Trainer section of the handbook.

In this chapter we offer two exercises for Zero Waste Ambassadors and Trainers. One of them is the **self-assessment questionnaire** where different Zero Waste Ambassador and Trainer competences can be rated and reflected on what kind of proof there is for the presence or lack of those competences. The second is **a self-test** – three real life situations where either Zero Waste Ambassador or Trainer knowledge needs to be applied. It is meant to help assess **the gap that we can have between what we think we know about the topic and what we actually know.**

Additional metacognitive questions after these exercises could be:

- **How easy or difficult was it for you to assess yourself? Why was it so?**
- **How similar or different were your answers in the self test from that of an expert? What could be the reasons for that?**
- **In what ways could you plan, monitor and evaluate your learning in the future?**

[8] Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science,* 10(2), 176-199.

ZERO WASTE AMBASSADOR SELF-ASSESSMENT QUESTIONNAIRE

These questions could help you to map your strengths and struggles. They have been grouped by more broader topics but can also be assessed in more detail. It's important to reflect on the reasoning and proof that you add to your assessments.

This questionnaire can be filled before reading any of the handbook chapters, and then checked again after reading and the self-test.

Technical competences

Knowledge of zero waste basics:

- What is zero waste, what is it now, why is it important
- What is a Zero Waste City
- Preferred waste management, reduction and treatment options

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to work with data, knowing the importance of data
How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Policy, advocacy competences

Importance of waste prevention and reduction policies
How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to apply the zero waste principles to different practical contexts

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to advocate for zero waste and convince different stakeholders

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Soft skills/competences

Knowledge of different zero waste stakeholders and ability to communicate between them

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

General soft skills: Empathy, positivity, patience, confidence

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

ZERO WASTE AMBASSADOR SELF-TEST

One of the best ways to test our knowledge of something is to put it into practice, into real-life situations. Here are three scenarios. Read them and first think through how you would respond without looking at any written material. You could even write down your answers and only then compare them with some of the ideas from experts on page 22.

1. A municipality is looking to reduce its organic waste and comes to you seeking advice. Currently it offers a separate collection of organics but it is not mandatory – citizens can buy the bags themselves if they want, which will be collected if left out on the street ahead of the designated collection day. There is very little home-composting done because not many households or businesses have gardens. The rest of the organics are sent 100 km away to an anaerobic digestion site. What are your first thoughts: what additional info would you need, who would you want to talk to, what could be your first steps?

2. Your local municipality has landfilled all of its non-recycled waste in the past. Yet the landfill is now almost full. The municipality is deciding which disposal option to consider – whether to extend the landfill site, build an incineration plant, or decide on a separate/alternative option. What are your first thoughts: what additional info would you need, who would you want to talk to, what could be your first steps?

3. Your municipality wants to reduce its carbon footprint, and it has identified the waste and resource sector as one area where GhG emissions could be much lower. It wants to reduce GhG emissions across the city by 50% within the next 10 years and wants the waste sector to play a leading role in this transition. Municipal officials come to you for policy advice and guidance. What are your first thoughts: what additional info would you need, who would you want to talk to, what could be your first steps?

ZERO WASTE TRAINER SELF-ASSESSMENT QUESTIONNAIRE

These questions could help you to map your strengths and struggles. They have been grouped by more broader topics but can also be assessed in more detail. It's important to reflect on the reasoning and proof that you add to your assessments.

This questionnaire can be filled before reading any of the handbook chapters, and then checked after reading and the self-test.

Educational psychology competences

Ability to create motivating learning environments, by supporting the three basic psychological needs of learners

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to support long-term learning instead of short-term performance

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to assess the learning outcomes of planned educational activity

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?
(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Topical (zero waste) competences

Knowledge of zero waste principles and practices in different contexts

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Understanding of why and how misconceptions occur and how to overcome them, knowledge of the main zero waste misconceptions and how to work with them

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to transform zero waste skills and knowledge into educational activities

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Soft skills/competences

Confidence to perform in public, ability to adapt to the changes in learning setting, ability to improvise

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Patience, empathy, open and warm curiosity towards oneself and towards the learners' perspective, especially in moments of stress/misunderstandings

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

Ability to critically evaluate your own teaching and welcome failure as part of the learning process

How competent do you feel in it, on the scale of 1-10? Based on what do you think so?

(1- not at all competent, 10 - very competent)

1 2 3 4 5 6 7 8 9 10

ZERO WASTE TRAINER SELF-TEST

One of the best ways to test our knowledge of something is to put it into practice, into real-life situations. Here are three scenarios. Read them and first think through how you would respond without looking at any written material. You could even write down your answers and only then compare them with some of the ideas from experts on page 23.

1. You are at a conference. During lunch break you start chatting with a company owner, who proudly tells you that they are also moving towards circular economy, for example all their waste is used to create energy. What are your first thoughts on how to respond to her/him?

2. You are asked to give a 2h training session to a bank on zero waste – what they can do at the office, in their events, in everyday life. Describe your first thoughts on how would you prepare and set up this session.

3. You were invited by the environment officer to give a 1.5 h session at a municipality, with the aim to educate all the municipality staff on zero waste. You know that some people are quite enthusiastic about the topic, while there are also some old school skeptics. What are your initial thoughts on how to start your session and what to try to keep in mind during the session while communicating with your audience?

EXPERT THOUGHTS ABOUT AMBASSADOR TEST SCENARIOS

Besides comparing your answers with the ones from an expert, you can go through different Zero Waste Ambassador chapters to see if you can find out why we have responded this way here.

1. Since the goal is a reduction of organic waste amounts, enabling and encouraging home, community and/or business composting is a sure way to get it done. Making separate collection mandatory would shift the waste from the residual stream to a separate one, may reduce the amounts through evaporation if collected in permeable bags, and enable giving more economic incentives to residents to choose home/community composting instead. An increased organic waste stream will make transporting the waste economically inefficient, while making a new local composting or Anaerobic Digestion facility more viable. For reduction at source the municipality could implement awareness raising and educational campaigns, challenges, research, good practices from elsewhere and provide funding for action/innovation.

2. First the time scale needs to be clarified – how much time is remaining until the landfill is full? If it's a matter of months, then there's no choice but to find some other existing disposal option first, and then think of other measures. Otherwise the Zero Waste Hierarchy should be followed, preferring extending/replacing the landfill over incineration, while at the same time launching work on waste prevention and residual minimization. Depending on the capacities, timelines and ambition, costs for a new disposal site might be avoided.

3. First think of how the GhG inventory is being done. If it's just the default, where the waste sector is represented only through methane emissions from landfills, all the effort should go towards banning landfilling of unstabilized waste and reducing organic content, which is easier when you have separate collection of organic waste. If they are looking at it holistically, then all possible waste prevention measures are candidates for implementation and priority should be given to those with largest potential gains. This will largely depend on the current waste generation and management systems, level of awareness and engagement of the residents and the wider regional or national frame.

EXPERT THOUGHTS ABOUT TRAINER TEST SCENARIOS

Besides comparing your answers with the ones from an expert, you can go through different Zero Waste Trainer chapters to see if you can find out why we have responded this way here.

1. It seems the owner has a misconception about waste-to-energy being a good solution. Delay your wish to explain why it's not a good idea. First give some recognition of his/her wish and attempt to be more circular. Then try to get more information about what specific solution they are actually using and why does he/she think it's circular and if they have also seen some other solutions. Try to get him/her to question the misconception through questions instead of explaining and maybe get him/her interested in wanting to know more about it.

2. Ask for a possibility to do two shorter trainings instead of one, to get the chance to meet the people at least twice, so there could be a possibility to do retrieval and strengthen their learning, and explain why you suggest that. Try to get to know their pre-knowledge before the training or at least in the beginning of the session. Start the session with some questions or a task to activate their thinking, ask what they are already doing, what do they consider as zero waste practices, if and why is it important to them. Build on questions and let them do most of the talking, offer your suggestions and thoughts only after their own ideas. Point out similarities and differences in their and your (the expert) views as well as their reasons, that is why some ideas are effective from zero waste perspective and why some are not. Try to get them thinking about the bigger environmental impact of the bank like their funding and loan principles.

3. It's important to support the three psychological basic needs of all of them. Start by creating relatedness, ask for their ideas and interest. If some say they don't think zero waste works, show genuine open curiosity and ask why they think so? You can give examples of places where zero waste has been implemented and what it has changed in the bigger picture and ask why they think it worked there? Give enough explanations, and include everyone into a common discussion. Accept the emotions of the skeptics, show respect to their thoughts and discuss all their ideas equally. If they express ideas that are not correct, say why they are not true and definitely support those ideas that are true.

RESOURCES FOR ZERO WASTE TRAINERS

MAIN PRINCIPLES OF TEACHING aka HOW THE BRAIN WORKS

Opening questions for the reader before reading:

- How would you define learning? What is it?
- What feelings do you associate with learning?
- Which learning/teaching methods are effective and which are not? Why?
- Can we use the same methods in schools as in a business setting? Why or why not?
- How have you studied and taught in your life? Do you think you have done it effectively? Do you think you have been taught to do it effectively? How do you know?
- What are some good ways to make information stick to our brain permanently?

This chapter is largely based on the work done by many educational psychologists, see references in the footnote[1],[2]

Our brain is a wonderful organ – one of it's amazing characteristics is its neuroplasticity. This means that we can actually change our brains by learning new things. But there are also many illusions about how effective learning happens. This means our intuition about learning is not always telling the truth.

WHEN DOES LEARNING HAPPEN?

From the list below which conditions/activities do you think are vital for learning, which are nice to have but not necessary, and which are not helpful and why?

- Giving rewards (grades, bonuses, free days from school/work…)
- Making mistakes
- Learners being out of their comfort zone
- Giving safe space
- Only theory
- Only practice (solving a problem)
- Theory first, then practice (solving a problem)
- Practice first (solving a problem), then theory
- The topic is relevant to the learner, they see the benefit and connection with their work
- Gamification, edutainment
- Making sure the tasks are not too difficult
- Making sure the tasks are not too easy
- Lots of visual and video support
- Making jokes during the lesson
- Strict rules set by the educator
- Free flow of discussion
- Structure and rules given by the educator in the beginning of the lesson
- Using majority of the lesson just to discuss with learners, with little time to present the theory and slides

Make your choices, some of them are indeed quite tricky and can depend on several things. See if you get the answers from the rest of the text.

[1] Bjork, R. A., Dunlosky, J., & Kornell, N. (2013). Self-regulated learning: Beliefs, techniques, and illusions. *Annual review of psychology,* 64, 417-444.

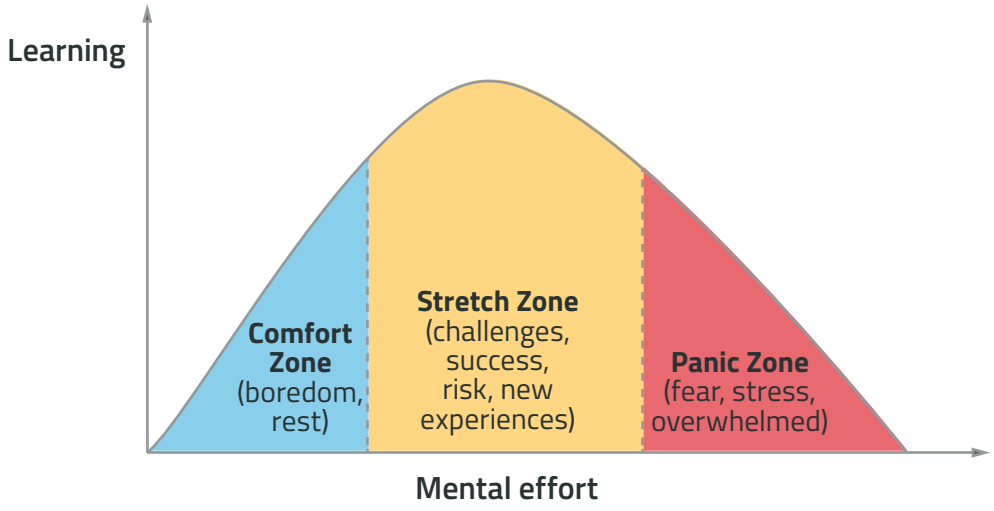
[2] Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make it stick.*

Should learning be easy and fun?

There is so much focus on games and entertainment in education nowadays, making us believe this is how learning should be. Learning can be fun, but this should not be the only aim. The true feeling of learning something new is in fact the feeling of **being confused, feeling stuck, not being sure what to do, and putting in effort to get your head around the material or solving the problem** – this is the starting point of learning! When things come too easily for us, it means we are not really learning – maybe we are doing things we already know how to do; or maybe we get the concept too superficially or have "beginner's luck". Learning means effort for the brain – new connections (synapses) are formed between neurons and some connections can be changed, and that does not come easily. We can imagine that learning is like building new roads between places where there were no roads before – it's a lot of work! And in the same way, making this newly acquired knowledge permanent in the brain means that these roads need to be used again and again (retrieving/recalling the knowledge time after time).

If we only focus on the games, jokes and flashy visuals, without thinking through how they serve the purpose of your lesson, and without asking, who does the deep and thorough thinking, learners or educator, then they may simply be a distraction and can create an illusion for you as an educator, because you might mistake the learners' enjoyment of the session for learning.

There is a quite famous graph about the comfort, stretch and panic zone, which shows in what state learning happens:



Source: Karl Rohnke; Yerkes-Dodson Law

At the same time it's also important to remember that a stressed brain cannot learn anything, especially complex stuff, as it goes into survival mode and the part of the brain which supports the complex thinking, switches off.[3] This means that there must be a sense of emotional security and comfort in the learning setting, while creating mental effort and stretching.

[3] Hohnen, B., & Murphy, T. (2016). The optimum context for learning; drawing on neuroscience to inform best practice in the classroom. *Educational & Child Psychology*, 33(1), 75-90

Learning needs:

- **Mental stretching** (thinking)
  Tasks that make you think just hard enough, when answers don't come right away

- **Emotional comfort** (feeling)
  Not fearing the teacher or fellow-students, feeling it's ok to make mistakes

How do we create mental effort?

Mental effort can most easily be created by having to solve a problem. There are many different ways how problem-solving can be structured in a lesson.

We offer here two different approaches:

1. **Direct instruction design** – learners are first presented with the instructions and then given a problem to solve. This is often the traditional way we are being taught.
2. **Productive failure design** (with delayed instruction) – learners are first asked to solve a problem without giving them instructions how to solve it. After trying, activating what they already know, experimenting and perhaps failing once or several times, the instructions are introduced, discussed and reflected upon.

Which one is more effective?

As stated above the learners have to struggle a bit before they are presented with the answers and right ways to solve the problem. They have to:

- First **realise themselves** that they don't know how to solve the problem,
- Acknowledge that they are missing this knowledge/skill and
- Understand that they want to get this new information to be able to solve the problem better.

So the productive failure design[4] is more effective. This is one example of what is called a **desirable difficulty** – something learners can overcome through increased effort, and what will be helpful to master that specific skill or knowledge.[5] Desirable difficulty is the effort we need in the learning situation.

[4] Jacobson, M. J., Markauskaite, L., Portolese, A., Kapur, M., Lai, P. K., & Roberts, G. (2017). Designs for learning about climate change as a complex system. *Learning and instruction*, 52, 1-14.

[5] Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make it stick.*

Why are mistakes important?

First of all, it's important to recognise that we as humans are often (a)shamed of our mistakes, because we think it's considered a weakness. Unfortunately, this is often transmitted into learning-teaching situations as well. You can simply think of yourself the last time you made a mistake and how it made you feel.

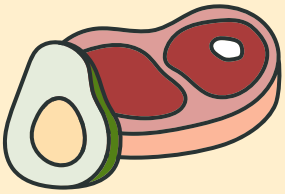
But mistakes are one of the most valuable tools of learning – the moment of analysing and processing the mistakes is the moment when we actually learn the most. Mistakes are where we get feedback on what works and what doesn't and where we need to practice more. In fact learning cannot happen without trial and error. Nobody can know the right answer right away; most of the world's complexity we cannot figure out ourselves anyway. Shaming or hiding mistakes can actually lead to only shallow learning, misconceptions and all other troubles. Instead we should welcome mistakes as gifts of useful information – both our learners' and our own mistakes.

But most important to remember is that the **mistakes need to be reflected upon**, analysed, processed, studied – only then will the mistake be repaired and deep learning occurs.

MEMORY

Getting things to stick in our memory is a big part of learning. And obviously we want the zero waste knowledge to stay in our learners' memory for a longer time, not just for a week. In order to do that, we need to know how lasting memory traces are created.

Consider this real life story:



"I wanted to teach about the environmental impacts of food. I showed the students images of 2 food items: beef and avocado and asked which has a bigger impact and why. Most of them said avocado, because it comes from far away and has a big impact from transport. I then showed them a graph, which illustrates how small the impact from transport is (6%) and that the main impact comes from how the food is farmed (land use, use of pesticides etc). Everybody looked surprised and it felt like a good wow-moment for me.

A month later, when I asked them to assess the environmental impact of different food items and how to lower that, many of them still focused on transport and even after showing the graph again, they still needed several questions/nudges from me to think about the land use impact."

What does it tell us about memory and how learning happens?
What could the educator have done differently?

First of all, the brain is not a voice recorder or camera that stores all the information that it hears or sees. Instead, it is a living and constantly changing network of interacting neurons that represent the memories we have. Our brains pick up information from everywhere, and each of us has a unique set of knowledge, opinions and understandings collected into our minds. And the way new information can find its way to our memory is when we attach it to already existing bits of information – our pre-knowledge. **We only remember things that we have been able to connect to with something already in our memory.** And we store this new information in terms of its meaning to us, as defined by its relationships and semantic associations to pre-knowledge.[6]

A comparison could be networks between people. How do you form new friendships? How do people find themselves into your network of friends? There is usually something that connects that person with you that makes it worth building a longer and stronger bond. It is similar to new knowledge finding its place in our brains.

A good knowledge or skill is described as (and what we want zero waste knowledge/skills to be):[7]

Durable – remembering things also months or years after last using the knowledge.
Flexible – being able to put the knowledge into different contexts, being able to see the same mechanisms and principles in new situations and applying them there.

The process of creating a knowledge or skill happens roughly in three stages:[8]

1. **Encoding** – connecting the info with existing knowledge in the learner's brain, making it meaningful for the learner – this should happen during the learning activity, so there should be time for that (meaning we cannot fill our sessions only with our own talk and presentations).
2. **Consolidating** – securing the new information in the learner's brain. This can happen after the learning activity, where learners can fully connect the new info with their pre-knowledge, organise those connections, fill in the blanks – but this means the learner will actively think about the content of the lesson after it has finished.
3. **Retrieval** – this should happen after there has been time to forget the lesson. Retrieval is essentially training the memory trace to that information – the more times (with forgetting breaks in between) we retrieve the information, the stronger the memory trace becomes. Reflection is also a form of retrieval.

What does this mean to us as educators? What does it mean to learners? What do we need to include into our teaching?

[6] Bjork, R. A., Dunlosky, J., & Kornell, N. (2013). Self-regulated learning: Beliefs, techniques, and illusions. *Annual review of psychology*, *64*, 417-444
[7] Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science*, 10(2), 176-199.
[8] Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make it stick.*.

Choose which retrieval strategies you think are the most effective:

- Massed practice – practicing for long hours
- Self-testing – trying to retrieve information from memory
- Interleaved practice – mixing up, changing between learning different topics and subjects
- Rereading
- Rewriting – making verbatim notes based on materials
- Conceptual mapping – making mind maps from the main ideas
- Testing (without grading)
- Rephrasing information in your own words
- Spaced, distributed practice – learning the same thing with pauses
- Variability of practice – learning the same concept in different contexts/situations
- Highlighting important parts of the material
- Relating the material with own experience or other subjects/topics
- Elaborative interrogation – asking yourself, how things work and then answering (more about what it is can be read from this blog post)

For answers, you can check out this TED talk and check our list at the end of this chapter.

Why is forgetting and retrieving important?

In real life situations we don't know when we might need the learned information. A pilot will never know when they need to cope with a failing engine and emergency workers will not know what kind of aid they will need to give on a particular day. But that knowledge and skill has to be ready for use, even when it hasn't been used since finishing the training. It means we need to practice retrieving it. And we can only retrieve what we have (somewhat) forgotten.

The more we need to put in effort to retrieve (or relearn) something, the better we learn it. The more you've forgotten about a topic, the more effective relearning will be in shaping your permanent knowledge.[9]

LAST NOTE: TEACHING ABOUT LEARNING

Several things in this chapter might be different from what we are used to in teaching-training situations, meaning that many people have illusions about how learning should happen and they are often expecting something quite classical from training sessions. So when we start to put into practice different methods given in this chapter, it might make our learners (or clients who have paid for the training) grumpy and unhappy. And that's not the kind of confusion we want to have in our sessions.

[9] Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make it stick.*

This means that parallel to teaching people zero waste, **we also need to explicitly explain what effective learning means**, so that people would be more open to participate. It can be as simple as asking in the beginning of your session what learners themselves think how they could learn best in your session and even giving them a short list of options to choose from. For example:

A. Listening to a lecture
B. Listening to a lecture and making notes
C. Discussion on questions connected to the topic
D. Solving practical cases connected to the topic

This small exercise can be followed by a short intro how the session is built up and how it supports learning best.

SUMMARY

There are many things we need to take into account when planning and facilitating learning. It can be quite overwhelming when our own experience of learning has been often quite the opposite. So here's a small check-list to keep in mind:

Main things that need to be present in order for learning to happen

1. Learner's brain is active – only reading or listening is not enough!
2. Learner's thinking is made visible – there is interaction with the educator and between the learners.
3. Learner constructs new knowledge themselves – solves a problem, proposes solutions and predictions.
4. There are tasks where learner makes mistakes, so s/he can analyse them.
5. The tasks require effort in the brain – new connections are starting to form in the brain.
6. Learner gets feedback on their work and tasks from the educator – mistakes are reflected upon and corrected.
7. There is no emotional stress, tension or anxiety – brain can focus on learning.

> **The one who thinks and speaks (constructs knowledge) the most, learns the most. Should it be the educator or the learner? :)**

Here are few of our practical tips for teaching zero waste and circular economy:

- Try to get as much info as possible about learners' understanding of the topic beforehand. Ideally it would be before the learning session, but you can also use the first part of your session asking what they know of the topic already or let them solve a problem connected to the topic. Then you can see where they lack knowledge and skills and adjust your session to their level of expertise.
- Don't show the Zero Waste Hierarchy or circular economy "butterfly" (or any other scheme, graph of a complicated system) – ask people to first draw it themselves or give pieces of the graph that they need to put together themselves – this way they are constructing the knowledge themselves. Afterwards you can show the official version and ask them to find differences and similarities with their versions. Same can be done for asking people to define the terms (circular economy, reuse, recycle…) themselves, before presenting the official terms. It's often that people think they know what these things are, but once they are asked to talk about them, they can realise they don't know it that well after all.
- Present them first with a problem: what would be the best management option for biowaste? How to improve recycling rates? Let them come up with their ideas and solutions, then discuss it with them, ask additional questions and only then show your solutions.
- Wait before giving your answers or solutions. First ask them questions that make them think about different aspects of their proposal and that finally could lead to your solution. Ideal would be if they can reach the same solution that you as an expert would propose, themselves. A well-phrased question always teaches better than a well-phrased expert answer.
- A practical way to delay your expert answers is to add an extra empty slide in your presentation. Copy your original slide with information and then delete the main content, just leaving the title/main question. Ask the learners what they think should be there? After their ideas and discussion show your original slide with your thoughts.

Can you think of any other good examples? Let us know if you do :)

Here's the list of the retrieval practices grouped based on their effectiveness.[10]

Useful practices and why?

Useful practices are:

- Self-testing, retrieval practice
- Interleaved practice
- Spaced, distributed practice
- Variability of practice
- Rephrasing with your own words (but preferably after a pause; actually it is more a consolidation strategy)
- Relating the material with own experience or other subject/topics
- Elaborative interrogation

These practices are effective because they demand effort and an active reconstruction of the learned material. They assume activation of the material – information is to be retrieved from long-term memory, almost like giving the brain the signal that this information may be needed also in the future. They may be more effective when done in written form, because we are more precise in our words then and it's easier to notice if some information is still vague or unclear.

Not so useful practices and why?

Not so useful practices are:

- Massed practice, practicing for a long time
- Rereading
- Rewriting

They are not very useful, because they demand little effort, and tend to create the illusion of knowing/mastering the material, as it keeps circulating between our short term memory and our active processing "workspace" (which is called working memory, which is actually not a space, but a process). As the material is not retrieved, that is, activated from the long-term memory, the brain does not learn how to find this information from memory.

So-so usefulness and why?

So-so practices are:

- Conceptual mapping – could be useful as encoding strategy, which is done quite often in the beginning of learning;
- Highlighting important parts of the material – demands little effort, creates the illusion of learning; can be useful for sophisticated learners or short-time learning goals though.

[10] Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science,* 10(2), 176-199.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think for yourself: **how would you answer them?**

1. But I've heard everyone is prone to one learning style (auditive, visual, reading/writing, kinesthetic), shouldn't we take that into account when designing teaching activities?
2. I feel I'm learning better when focusing on the topic for hours and studying it all day (called massed practice). Can it be different for different people?
3. What methods are best to teach different age groups and use in different settings (business meeting, volunteer training etc)?
4. It seems this way of approaching teaching takes much more time. Sometimes we are asked to get a specific topic across, which also requires actually giving quite a lot of info from our side (like explaining reuse policies or separate collection). How can we accommodate all this into the short time we are given?
5. Do images and visuals help people learn faster and remember longer the topics we are teaching?

1. **But I've heard everyone is prone to one learning style (auditive, visual, reading/writing, kinesthetic), shouldn't we take that into account when designing teaching activities?**

   Learning styles is a very common learning myth. This means we can have our preferences on how we like to learn, but it doesn't mean we learn more effectively like this. The best summary of this topic is a TED talk by Tesia Marshik.

2. **I feel I'm learning better when focusing on the topic for hours and studying it all day (called massed practice). Can it be different for different people?**

   This is also a common learning illusion that we have. The brain and memory work more or less the same way for everybody, it's like the lungs function the same way for everybody. The information starts to feel familiar and clear, because it keeps circulating between our working memory and our short term memory. What we actually want is for this knowledge to stay in our long term memory also perhaps in critical moments in a few years from now, when we haven't used it for some time. This means that we need to practice forgetting and recalling it again. This means learning should also incorporate this pattern and it's better to learn in shorter periods of time, with breaks in between (called spaced practice), where we are doing other things, so that we can forget it for a while.

3. **What methods are best to teach different age groups and to use in different settings (business meeting, volunteer training etc)?**

   We should not be focusing so much on methods as they can also distract us from the main purpose of our teaching. The main question would be, in which situation the learner thinks the deepest (with deep thinking we mean that new information will be connected to various previously known material and, when lucky, even organized meaningfully), is the most actively cognitively engaged to the material and discussion, and this may sometimes mean confusion and even a little frustration – in case the learner does not know that entertaining and passive listening is not optimum context for their learning. Thus, a simple question and answer session can deliver a better result than a session full of videos and images, if it's well connected to the session's goal. The main thing is to think about what is happening in the brains of the learners. It's about following these principles: activating learners' pre-knowledge, making their thinking visible to you, creating effort and allowing mistakes to happen, delaying your own expert opinion and giving it only after learners have struggled to find it themselves first. And these principles should be put to use in all different settings, regardless of the age or the background of the learners. If you need some more concrete guidance, you can check the *Trainer's checklist* of this handbook.

4. **It seems this way of approaching teaching takes much more time. Sometimes we are asked to get a specific topic across, which also requires actually giving quite a lot of info from our side (like explaining reuse policies or separate collection). How can we accommodate all this into the short time we are given?**

   We cannot change the brain into learning more and faster than it does, this is just something that we need to accept. And it can be difficult to get this idea across to people who have hired us to give the training or workshop. We should still try to explain what is in reality doable in short sessions, if we indeed want people to learn, and give our best explanations for that. It could change our clients' minds :) Of course it is not always accepted and we are still asked to give lectures. In these cases we can at least create micro-discussions in the session, start with questions, leave little pauses for people to think, give them small tasks (which option is better: A or B? Why?) and so on.

5. **Do images and visuals help people learn faster and remember the topics we are teaching for longer?**

   It is true that getting information from different senses (talk, text, visuals) can help learning – it allows us to link one and the same information unit in our memory with different stimuli. But images alone may not activate deeper (and often more abstract and complex) thinking; they are probably not enough on their own. Second, sometimes we want to use pictures that have great emotional load (which is often done in environmental communications) – shock, disgust, horror, fear etc. While it's true that they draw attention, negative images could also suppress people's need for autonomy (one of the basic psychological human needs), as they can create a sense of pressure, guilt and control, a sense of being pushed to do something.

But of course, they may help to enhance meaning, if creating empathy – but this impact, when activated solely through emotion, may be short-term. What we need is to activate people's pre-knowledge and support constructing new knowledge, and help them find their own meaning in the topic. So the images need to be combined with activities that do that.

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 does it relate to your own learning and teaching experience?**
- **Have you taught differently than recommended in this chapter? How does it make you feel?**
- **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?**

LEARNING MOTIVATION aka HOW TO GET EVERYONE ON BOARD ON ENVIRONMENTAL ISSUES?

Opening questions for the reader before reading:

- Why aren't some people on board already? Your ideas?
- Do you think it is important to focus on (learning) motivation in your work? Why?
- What do you think is needed to create/support learning motivation?
- Does the learning motivation depend on the learner or the teacher?

This chapter is based on the self-determination theory by E.L. Deci & R. M. Ryan[1]

Motivation is essential for learning – or anything – to happen. Although we can for short term manipulate, force or inspire others, motivation itself is a very internal process. What we can do, however, is to **create conditions** for motivation to emerge.[2] So the good news is that we can actually significantly support the motivation of other people, by actively creating those conditions.

What could these conditions be?

First, we must separate between two types of motivation: **trash** (controlled) and **quality** (autonomous) **motivation**. And then there is amotivation – the state when there is no motivation at all.

Characteristics of trash motivation and quality motivation:

Characteristics	Trash motivation	Quality motivation
Time	Can be created fast, starts to work fast, but also lasts for a short time	Usually can take time to build up, but lasts for a longer time
How it is created	Fear, pressure, control, punishments and prizes, competing, creating guilt and shame, expressing disappointment, giving ready–made solutions	Support, open curiosity, giving a choice and voice, helping to find a meaning in the topic, enabling to think, enabling to offer ideas and solutions
Strength	Doesn't hold in new and challenging situations as other deeper motivations will start to prevail	Can persist even in challenging situations when there is need to make difficult choices
Examples	• Giving a monetary prize for environmentally friendly behaviour (money prevails over the motivation to do the right thing for the environment) • Opposing strict rules on how to behave • Competitions	• Having reflective discussions, that help to find deeper personal meaning for environmentally friendly behaviour • Participatory process and explanations on why certain rules are needed • Giving possibility to discuss, define the problem, find and test solutions, analyse them

[1] This chapter is largely based on the work by Ryan & Deci in self-determination theory (Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.*)

[2] a concept developed by prof. dr. Johnmarshall Reeve

When speaking about environmental issues, there is often a prevailing sense of urgency and need for things to change fast. **However, we must realise that forcing people to change rapidly/in a short-time, is trash motivation and will only create new problems later on.** Covid-restrictions are a good example here: if the deeper understanding of the rules is not embedded in people, they will only be following them for a short time. Therefore, when it comes to adopting more environmentally friendly practices and behaviors, we need to support quality motivation as this will create the long-term change we want.

HOW DO WE SUPPORT QUALITY MOTIVATION?

According to the Self-Determination Theory (SDT), the leading theory in motivational science, the foundation for creating quality motivation are the **three basic psychological needs** that are universal for everyone. Supporting these needs helps to create the environment where motivation can emerge and learning (and behavioural change) can happen. A basic psychological need is defined as a psychological nutrient that is essential for individuals' adjustment, integrity, and growth.[3]

Exercise: Look at these small situation descriptions, where the educator/zero waste activist is actually suppressing the basic psychological needs of his/her learners/ stakeholders. Can you guess the needs which are not being met?

First exercise:

- During the lesson, someone trolls the educator. The educator just ignores them.
- During the lesson, someone trolls the educator. The educator makes an elegant and sarcastic joke about the troll to "discipline" them.
- The educator starts the lesson with clearly stating the goals of the lesson and then continues with the content.
- In order to get the municipality to do more on zero waste, a zero waste activist tells the municipality officer in the beginning of a meeting: "It's because of the municipality's wrong decisions that we are creating so much waste, you need to do more!"

What one basic need of the learners/stakeholders is not being met in all these examples?

[3] Ryan, R. M. (1995). Psychological Needs and the Facilitation of Integrative Processes. *Journal of Personality,* 63, 397-427

Second exercise:

- The educator gives a task for the learners during the lesson. Then some of the learners find the answer and say it out loud. "Thank you, this is right!", says the educator and goes on with the lesson.
- During the lesson, the learner asks, "Why doesn't this plastic bag biodegrade?" The educator answers: "Because this is oxo-degradable".
- The educator does not explain why the homework is given.
- Learner asks a question during the lesson and the educator answers: "Thanks for the question, but this is not important in this context", and continues.

What one basic need of the learner is not being met in all these examples?

Third exercise:

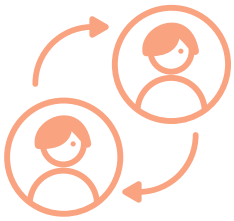
- The educator spends most of the lesson speaking about his/her view on the topic.
- As the time for the lesson is limited, the educator pushes the learners to hurry up with thinking so that the tasks will remain unfinished and not reflected upon.
- In order to motivate learners, the educator clearly states the goal of the lesson.
- A NGO organises a competition between schools on who can reduce their food waste most, with prizes for the student groups who track their food waste most and report the smallest waste amounts.
- A zero waste activist is having a discussion with a person about waste sorting. The person says: "But I don't want to sort, it's yacky!" The zero waste activist replies: "C'mon, you are overreacting, it's not that bad!"
- And this one :)

What one basic need of the learner is not being met in all these examples?

Write down your guesses and also how you would act instead. To check out our ideas on how you can act in these situations, you can check out page 45. Alternatively, continue from the next page.

THE THREE BASIC PSYCHOLOGICAL NEEDS[4]

The first need is the feeling of relatedness (*opposite: coldness*)



This is often the first need that we have to meet, but it also can be the easiest to meet. It can simply be asking the names of the people, looking them in the eye and smiling genuinely, showing warm and open curiosity towards their thoughts and ideas (even if you think they are silly). Even in times when it gets challenging to meet the other two basic needs, this is the one that should always be present, as it talks to the more primal need in us.

Relatedness is feeling:

- Socially connected
- Cared for by others
- Significant among others
- Being part of social organisations beyond oneself
- Giving or contributing to others.

It's not about making your learners like you, it's more about them feeling that you as the educator like them. It's about allowing them to feel welcome, creating a warm environment where they can learn, ask questions and provide insight. And it should be authentic, humans can easily realise if another person is not genuine.

The second need is the feeling of competence *(opposite: chaos)*

The need for competence means the need for mastery, to be able to operate effectively within your important fields of life. For learners, this does not relate so much to the skills and knowledge that they have, but rather, that they are able to understand what is being asked from them in the learning activity, what they need to do and feeling that (with some effort) they can handle that.

Feeling competent usually means also having helpful structures in place. For example, knowing why it's important to collect biowaste separately, knowing what to put and what not to put in your biowaste bin, being able to get the most suitable bin, and having access to the service/ infrastructure that supports your biowaste collection.

[4] Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.*

Competence is feeling and knowing:

- How to do things, solve problems
- What is expected from me
- From where and how to get help when I need it
- The tasks are not too difficult and not too easy for solving
- The choices given are not too few and not too many (suitable for the learner's level, for example small child probably needs less choices than an adult, beginner less choices than the expert)

Competence can mean different feelings, from scientific curiosity towards the world to wanting to get better at a game or skill.

The third need is the feeling of autonomy *(opposite: control)*

Autonomy means acting with free will upon things that are important to you. It's not quite the same as independence or self-reliance, which are more connected to not relying on others. Autonomy means that we can willingly turn to others for help or guidance. You can be autonomously/willingly independent or dependent. The same way you can be autonomously/willingly individualistic or collectivistic.

Autonomy is feeling that:

- You choose your own actions
- You actions are aligned with your values
- Your actions are valuable and meaningful for you
- Your way of thinking, your actions and values are also valued/respected by others.

Giving autonomy to people does not mean anarchy and lack of rules. On the contrary, structure is a precondition of autonomy. This can mean that rules can be created jointly by the educator and learners, or that learners feel that they have a say in what are the boundaries of the learning activity and they understand the need of boundaries. Autonomy means that learners find the learning activity and its goal meaningful and/or valuable for them; it also can be interesting, but does not have to. In practical terms, it can mean small things like giving learners enough time to think at their own pace, letting them solve problems instead of having ready-made solutions, asking what they find important in the topic, respecting those meanings etc.

On the next page there are some recommendations on how to support the basic needs. It's important to point out though that sometimes we might be **pseudo-meeting** the need – thinking we support them, but actually might be suppressing them. Some examples are shown in the exercise answers.

Table on examples of supporting and suppressing the basic needs in learning situation[5]

	Relatedness	Competence	Autonomy
Supporting the need in learning situation	• Warmth, open curiosity, even if somebody "trolls" – it is not about you, it's probably their own struggle with something • Look at every situation from their perspective • Nobody should ever feel that they are left out from the "herd" • Find ways for everybody to feel significant and valuable • Make them genuinely feel that they and their contribution is wanted by you • Make them feel that they are respected	• Make them explicitly feel that you are there to help them; that you and them are in the same boat • Be explicit in what you expect from them and how to achieve that; and from where to get help and support if they need it • Give tasks that help them to get better step by step • Follow the rules that you have agreed jointly; from time to time check whether all the rules are still relevant • *After action review* – reflect (collectively) after every task you do – how did we think and act; why did it work or did not work? • Give informative feedback, that says *what they should try next*	• Help them to understand why the activities are valuable to them • Give meaning to every activity from their perspective • Let them think, to come out with their ideas and solutions • Follow patiently their pace and rhythm of learning • Accept and welcome negative emotions • If possible, give meaningful choices (meaningful from their perspective) • Take their "I", their personality into account, if possible – e.g., if somebody have some skill that might be useful, involve them
Suppressing the need in learning situation	• Make them feel as units, not individuals • Make them feel incompetent and shamed – preferably in public! • Bully or let others bully • If someone acts wrongly, let them feel that they are no longer part of the group	• Do not say what you expect from them or do it in a way that they do not understand • Threaten with failure, make them anxious • Provide little or no help and support • Keep rules inconsistent • Be not present, when help is required • Give comparative or judgmental feedback or say something about the performance, not process	• Compare, make social comparisons, create rivalry! • Do not let them think, think for them, give solutions • Force your pace upon them • Do not explain,why an activity is needed • Ignore or diminish their negative feelings

[5] adopted from a lecture by prof. Maarten Vansteenkiste

Second part of the exercise:

The first need is relatedness

How to act instead:

- During the lesson, someone trolls the lecturer. The educator expresses open curiosity towards the learner in order to understand what need of the learner is not being met.
- The educator starts the lesson with creating a warm relationship with the audience (looking people in the eye, asking their names and interests in the topic). Then s/he first tries to understand what could be the goal from the learners' perspective and unites it with her/his own ideas.
- In order to get the municipality to do more on zero waste and therefore first start to think about it, the zero waste activist starts the meeting with the municipality officer by asking: "How is our municipality doing? What are you proud of and what would you wish would be different?", then after the response asks: "And how are we doing in waste management in your opinion?" and then leads the discussion on anything they need help with.

! Pseudo-meeting the needs:

- The educator asks for learners' names and their interest for the topics, but looks at his/her notes, computer and/or phone while the learners are speaking.
- In order to get the municipality to do more on zero waste, the zero waste activist tells the municipality officer in the beginning of the meeting: "We see that our municipality is having problems with waste management, we are here to help you!"

The second need is competence

How to act instead:

- The educator gives a task for the learners during the lesson. Then some of the learners find the answer and say it out loud. The educator thanks them in a warm manner and also asks for some other ideas. When no new ideas appear, the educator starts the discussion, why this answer is right and what else could be right and why some other option would be wrong.
- During the lesson, the learner asks: "Why doesn't this plastic bag biodegrade?" The educator notes that it is a damn good question and turns the question back to the audience, asking, does anyone know the answer; either way they end up with discussion, that leads to the understanding of the topic (in this case, the composition of the oxo-degradable material and why this material does not biodegrade).

- The educator helps the learners to see how the homework helps to develop the skills they expressed are important to them. This might take some time.
- Learner asks a question during the lesson and the educator answers: "Thanks for the question, but this is not important in this context", and explains why, and from where the learner could get additional information, before s/he continues.

! Pseudo-meeting the needs:

- The educator only asks after the presentation: does anyone have any questions?

The third need is autonomy

How to act instead:

- The educator first asks for the learners' views and thoughts on the topic, listens to them and then integrates his/her views into the discussion, asking for additions and feedback.
- Although the time for the lesson is limited, the educator never pushes the learners to hurry up with thinking. So there may be less topics, but every one will be worked through deeply.
- In order to motivate learners, the educator tries to see the perspective of the learners and link the lesson's goal to their meaningful and valuable goals.
- A NGO creates a collaborative project between schools, where students get to know how food is produced, they can investigate, discuss and build their own understanding on the value of food and the importance of not wasting it
- A zero waste activist is having a discussion with a person on waste sorting. The person says: "But I don't want to sort, it's yacky!" The zero waste activist replies: "Yes, I know sometimes waste can seem quite yacky and many people have had a similar feeling first, myself included. Then I discovered that its possible to do it in a quite clean way."
- And new design for the bag:

! Pseudo-meeting the needs:

- The educator asks for learners' expectations for the lesson, but then carries on with her/his content without connecting the gathered input with his/her plan and ideas.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. Why are these needs so important for learning? What happens when they are not met?
2. Is it even possible to meet all these needs all the time?
3. What about trolls and interrupters who make it hard to relate to?
4. But what if I try to meet the needs of one learner and with that suppress the needs of several other learners?
5. How can I avoid chaos in the learning activity without suppressing the basic needs?
6. How do I support the basic needs of different age groups or settings (formal, not formal, children, elderly…)?
7. What about the psychological basic needs of the educator?
8. What about the environmental regulations in terms of these basic needs? There has been a lot of improvements on environmental work in general and we cannot imagine having discussions with everyone on the need of those regulations.
9. The learning motivation theory says that competitions are part of the trash motivation. But competitions are used quite a lot in environmental education activities, for example between schools, as it gets students involved. Does this mean we shouldn't do competitions? It's quite hard to stop doing them…

1. Why are these needs so important for learning? What happens when they are not met?

In order to learn, people need to feel psychologically safe. If there is fear of not feeling accepted, the brain can switch to survival mode, and learning, which happens in the "higher parts" of the brain, cannot happen. Also, as humans we cannot truly thrive and contribute to our community if our psychological needs are not met.

2. Is it even possible to meet all these needs all the time?

It is not always easy and it takes practice to even start noticing when we might be suppressing these needs for learners. There are situations when not all of them can be met, for example when a child wants to run on the busy street, then we need to suppress his/her need for autonomy, just to protect him/her. But while doing so we can still keep the relatedness with the child, hugging him/her, explaining warmly why she/he cannot run to the street. So what we should aim for is that even if we struggle to meet all the three needs, we should always, at the least, keep the relatedness. This can be difficult when we ourselves feel attacked by the learner, are irritated by them or we are meeting with them only for a very short time. Although deep learning cannot be achieved in a short-term period, a simple one-hour meeting can also

support motivation, by showing curiosity towards the thoughts and ideas of our listeners/ learners, therefore, already supporting their need for competence and autonomy.

3. **What about trolls and interrupters who make it hard to relate to?**

   Zero waste and circular economy, like many other complex issues, come with their critics – people who have contra arguments. Sometimes these arguments make sense, sometimes they have no solid logic behind them. A troll is a person who is troubled with something, and feels that their identity is somehow "attacked" by our teaching, or perhaps they feel lonely and rejected by other people.

   Trolling and interruptions are usually a symptom of some need not being met in that person. If our aim is to teach people, then somehow, we need to get the trolls on board as well. If their troubles run deeper, we of course cannot be their therapists, but we can show that we care about them as humans and we treat them as thinking beings. Experience has shown that people who at first are hostile and interruptive, can shift to contribute to the discussion in a meaningful way, if the educator keeps the relatedness with them. This means welcoming their thoughts, politely correcting those ideas which are false, explaining why they are false and pointing out positively those ideas which are correct.

4. **But what if I try to meet the needs of one learner and with that suppress the needs of several other learners?**

   This is also why structure and some rules are needed. If one person starts to take too much space, then the educator can suggest that perhaps there is a need to create a rule for how much time each person takes for talking. This can be done while still keeping a warm attitude towards the person talking too much.

5. **How can I avoid chaos in the learning activity without suppressing the basic needs?**

   Supporting relatedness, competence and autonomy does not mean there is no structure or rules. In fact, they should be present in order to support the three basic needs. Structure gives a feeling of safety, the educator can give choices and freedom within this structure, and rules on how to act can be agreed upon together with learners. If the discussion starts to go off topic, the educator can point out that this is not the topic for today, give an explanation on why it is not so and give either a source or some other option when and how to tackle the other topic.

6. **How do I support the basic needs of different age groups or settings (formal, not formal, children, elderly...)?**

   The three basic needs are universal and the same for everyone. It doesn't matter if you are a 3rd grade student or an adult politician – both have the same needs of relatedness, competence and autonomy. It's just the words and teaching tasks we use that can be different.

The competence level of a child is different from that of an adult expert. But we still need to adopt ourselves to their level of competence. Therefore getting to know the pre-existing knowledge and skill level of our learners is very important. You can read more about that from the *Main principles of teaching* chapter. But showing relatedness by being warm, looking people in the eye, smiling and being interested in their thoughts works the same for all the people in all ages and all settings.

7. What about the psychological basic needs of the educator?

This is a valid question and concern. It can happen that as educators we suppress our own needs in order to meet the needs of our learners. But we have to remember that once we are aware of the needs of our learners, we can consciously choose to put our needs aside for a short while, because learners are probably suppressing our basic needs subconsciously and often not on purpose. Of course we cannot ignore our needs in the long term and have to strive towards creating learning environments where we also feel safe, competent and autonomous, but for the learners, deep learning will not happen without us as educators supporting their needs.

In addition, when we talk about respecting and accepting all the different emotions and opinions of our learners in order to support their basic needs, it doesn't mean that we will just let them "run over us". We can (and should) still keep structure and boundaries in place. When people are starting to feel over-emotional or aggressive, then we can still respond to them kindly that we see there is something hurtful going on for them and it's better for them to step away from the current activity, and we can try to address it privately later. In the end there are things in our learners' lives that we cannot help them with and it's also not our job.

We as educators should support our learners' basic needs by acknowledging them as feeling and thinking human beings, but we are not their therapists. We are also allowed to say if the situation becomes uncomfortable for us.

8. What about the environmental regulations in terms of these basic needs? There has been a lot of improvements on environmental work in general and we cannot imagine having discussions with everyone on the need of those regulations.

Of course we need rules and structures in our society. With some regulations people probably don't even notice that they are in place (like regulating harmful substances in products). We also need to realise that debating on every rule and regulation can go against the need for competence, as people are not experts in these fields. It's more about having the meaning of environmental laws and rules in general internalised for people. Of course for those who the regulation or law impacts directly, they should be explained and with a possibility to ask additional questions, which in turn will be given to them at their competence level.

9. **The learning motivation theory says that competitions are part of the trash motivation. But competitions are used quite a lot in environmental education activities, for example between schools, as it gets students involved. Does this mean we shouldn't do competitions? It's quite hard to stop doing them...**

   Competitions are tricky in the sense that yes, it's easy to get people to participate, if you offer them prizes or fame. But then that will be the essence of their motivation, not the topic you want them to know or care about. They will have much less (if any) attentional capacity for the more complex questions and issues of the topic that might need deep thinking in order to internalize the behavior for a longer time. The enjoyment of the prize or fame goes away fast. In human psychology, once the competition element is added, that will prevail over other motivations. There's a real life story of competition for kids who would collect the most aluminum tea candle holders (because collecting them separately is the easiest way to send them to recycling), which ended up with kids asking their parents to buy more and more tea candles, just so they could win the competition. In this case, therefore, the initial purpose was hindered.

   Competition is suitable, if there are skillful people wanting to get better at their skill level and test themselves, because then it's connected to their need for competence. But in other cases, competition works against the need for autonomy, because it's a form of control. So in the end the question is how much do we actually want long term change or short term excitement. If it's the first, then yes, we should stop doing competitions.

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?
- If and where have you noticed your basic needs being supported or suppressed?
- If and where have you noticed supporting or suppressing others' basic needs?
- What do you think are the best ways to get better at supporting others' basic needs?
- 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?

MISCONCEPTIONS aka HOW TO HELP PEOPLE DECONSTRUCT THEIR FALSE THINKING (ON WASTE)

Opening questions for the reader before reading:

- Have you had situations when you, talking to someone about zero waste, notice that you do not come through? Have you ended up with the discovery that they have totally different basic understanding (misconception) about it?
- How do you usually deal with people's misconceptions?
- How do you recognize that you have effectively corrected people's misconceptions?
- What does it take and how long does it take to correct someone's misconceptions?
- How have you found out about your own misconceptions and how did they get corrected?
- How do you feel when someone points out that you are wrong about something and tries to correct that misconception (which they think that you have)?

This chapter is based on the work done by many educational psychologists, see references in the footnote[1],[2]

Misconceptions (or alternative conceptions or intuitive theories) –

- Understandings of certain phenomena based on experience, observation and/or incorrect information that conflict with currently accepted concepts and scientific findings.[1]

What do you think is more effective when talking to someone who has a (zero waste) misconception?

A. Tell them why their idea is wrong and what is the right way.

B. Ask them why they think so, and through questions, slowly get them to question their own ideas and wanting to find more information.

This can also be illustrated by an internet-joke:

Someone told me: "People change their minds if you show them the facts."

I responded with links to different studies: "Actually here are some studies showing that this is not true."

The person responded: "Well, I still think it works."

What does it tell us about the way we often act when our statements are being corrected?

Option A is for sure quicker in terms of passing on the information you want them to have, but if you have read other chapters on learning, you will probably know that it's option B that has more chances of making a change in the way the other person thinks about this issue.

Each of us probably has misconceptions in most of the fields where we are not experts in. We form misconceptions based on our everyday life, from what our friends and family tell us, what things happen to us, what we see happening to others etc. So, misconceptions are actually totally normal; yet they do not help us with the complexity of the world. An important characteristic for misconceptions is that they **rely on perceptual information,** but the mistakes in the logic cannot be found through our senses and perception.

As a very basic example, thinking that the Earth is flat is based on observing the horizon being flat. The knowledge of Earth being round comes from scientific inquiry and, in a way, goes against our first-hand experience of the world. Similarly we cannot know only by observation, what

[1] Verkade, H., Mulhern, T. D, Lodge, J. M., Elliott, K., Cropper, S., Rubinstein, B., Horton, A., Elliott, C., Espiñosa, A., Dooley, L., Frankland, S., Mulder, R., and Livett, M. (2017). *Misconceptions as a trigger for enhancing student learning in higher education: A handbook for educators.*

[2] Lucariello, J., & Naff, D. (2013). How do I get my students over their alternative conceptions (misconceptions) for learning.

phenomenon is lightning – a theory needs to be developed and tested step by step, as well as scientific method needs to be applied to understand that it is electricity. We know that we should wash our hands with soap to kill unwanted germs based on scientific knowledge, as we cannot see germs with a naked eye. So misconceptions form around information, which is hard to understand without higher conceptual thinking, and without empirically tested theory. For example, people can have difficulties understanding why incineration is not a good idea. To them it seems that the waste disappears, the problem goes away and energy is created – this seems like a good thing.

DEVELOPING EXPERT THINKING

One of the keys for correcting misconceptions is practicing thinking like an expert. This means understanding all the steps and details that experts consider when approaching an idea or statement.

For example, you can watch this video and write down your thoughts in two different roles:

A. Yourself as a zero waste expert,

B. As a regular person, who is not familiar with waste management.

Questions to consider:

- What do you notice in the difference between these notes? How does expert thinking differ from that of a non-expert?
- As an educator, how would you talk to the regular person about their thoughts and opinions? How could we get the regular person closer to thinking like an expert?

Some characteristics of an expert thinking:

- Knows, what are the key defining – but often invisible – features of the phenomenon; that is, knows more precisely, what is the essence of the phenomenon,
- Applies formal logic and checks their assumptions,
- Thinks about two things – about the subject matter and **about how they think** – so there is critical metacognitive reflection about one's thinking,
- Is able to inhibit in themselves the urge to make conclusions based on how things "seem to be".

The road towards expert thinking takes time and we need to realise that others might think about zero waste a lot differently than we as the experts. Here one way to get closer to expert thinking and making learners aware of their misconceptions is the productive failure design approach introduced in our *Main principles of teaching*. There is a very nice TED talk on that and expert thinking.

Correcting misconceptions is called **conceptual change**. It's important to know that in most cases we cannot replace misconception with correct conception by simply stating it to the learner (although in some easier cases it can be that simple). Also we cannot make others change their misconceptions – the **willingness to correct them must come from the learners themselves**.

Before we can start correcting misconceptions we need to understand what they are in their core. Are they all similar or different?

Exercise:

Look at these five misconceptions – what are the reasons why such misconceptions appear? In what sense are these misconceptions different?

- Cigarette butts biodegrade
- Burning is a solution for the waste problem
- Tuna is a smaller fish than the whale
- Biodegradable dishes are a solution to single-use plastic
- Some children are just not interested in learning as they are so passive in lessons

How could we help to modify them to more correct conceptions? Do we need the same or different strategies?

TYPES OF MISCONCEPTIONS

Not all misconceptions are created equal. As the roots and reasons why they form can be different, so can their essence and therefore approaches how to correct them, be different.[3]

Inaccurate misconception type – it is incorrect in comparison to the accepted concept, but is in the same 'dimension' or quality.

E.g. all separately collected plastic gets recycled (reality: only a small amount of separately collected plastic gets recycled). The same dimension is the process of recycling.

Incommensurate misconception type – the information relates to a different, incorrect 'dimension' or quality.

E.g. incineration is a form of recycling (reality: in incineration materials are lost and not put back into use like in recycling). The processes are of different "dimensions" in their essence.

[3] Verkade, H., Mulhern, T. D, Lodge, J. M., Elliott, K., Cropper, S., Rubinstein, B., Horton, A., Elliott, C., Espiñosa, A., Dooley, L., Frankland, S., Mulder, R., and Livett, M. (2017). *Misconceptions as a trigger for enhancing student learning in higher education: A handbook for educators.*

Inaccurate misconceptions have two subtypes:

1. **False beliefs** – misconception about a single idea that can usually be expressed in one sentence.

Thinking that all plastic gets recycled vs that only a small amount actually is recycled is an example of a false belief.

2. **Flawed mental models** – one or several flawed ideas or assumptions that are internally consistent with one another, but contradict the assumptions of the correct model. Because of this internal apparent consistency, flawed mental models can be quite difficult to correct.

Believing that the solution to the plastic problem is better collection and recycling could be a flawed mental model, because it mainly consists of the elements of plastic and recyclability, which are internally consistent. Therefore believing that if we improve recyclability and collection, our problem gets solved, but the element of oil extraction and plastic production is not included into the model, which makes it inaccurate in the end.

Incommensurate misconceptions also have two subtypes:

1. **Category mistakes** – when a thing or concept is placed in the wrong category, and thereby inherits the characteristics of that category.

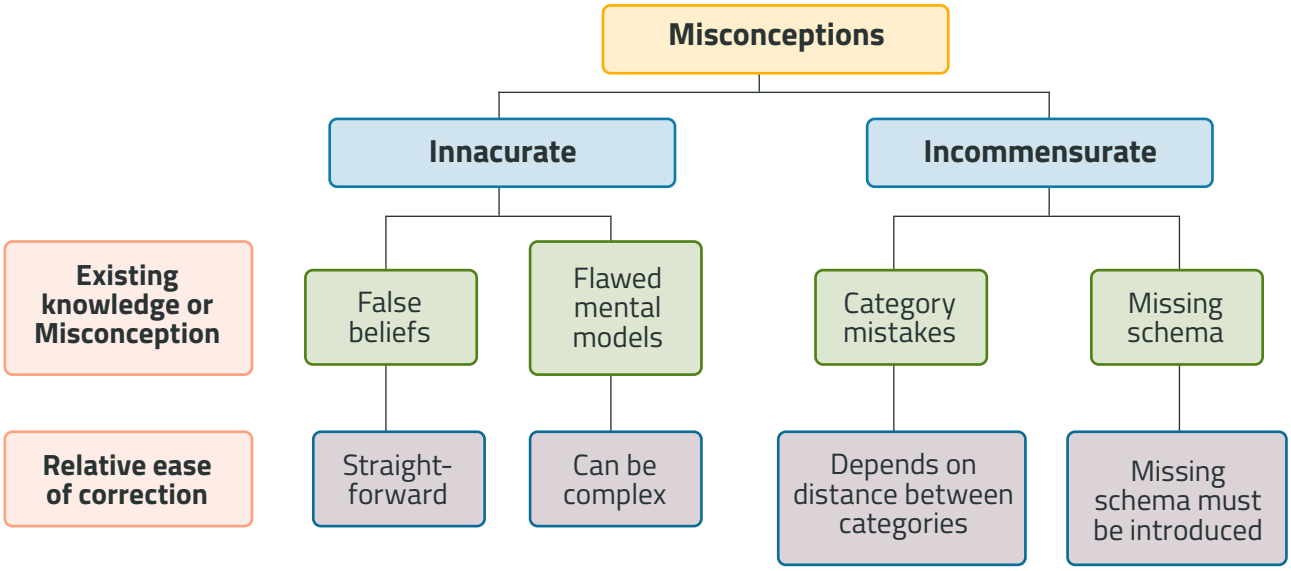
Incineration and recycling are both waste treatment methods, which is their common bigger category. However placing incineration in the same category as recycling would mean that they are both considered to keep resources in circulation, which is not true in the case of incineration.

2. **Missing schema** – putting something into the wrong category, because the right category is not represented in the person's mind. This type of misconception could be especially difficult to correct, as besides identifying that the misconception comes from the person having it in the wrong category in their mind, the right category must be first introduced, with its characteristics, before the misconceived information can be corrected.

For example thinking that bioplastics are a good solution, because they are of natural origin and biodegrade in nature. A whole schema of differences between biobased, biodegradable and compostable plastics is missing, including differences in their composition, production, collection and treatment methods. Another example connected to this is thinking that organic matter will become compost in every condition – there is a missing schema on differences between aerobic and anaerobic decomposition processes and what is actually needed for organic matter to become compost.

Here is a flowchart on the types of misconceptions and their ease or difficulty of correction:

Definiton of four types of misconceptions, adapted from Chi



Graph: Misconceptions model from Chi[4], adapted by Verkade et al[5]

CORRECTING MISCONCEPTIONS

While false beliefs can be corrected quite easily by explaining the right data, other misconceptions are more difficult to tackle. So if the misconception is actually something other than simple false belief, then only showing our correct data won't do much to change the misconception.

The steps for correcting misconceptions are[5, 6]:

1. Us as educators identifying the misconception.
2. The learners recognising their misconception.
3. The learners constructing a new model.
4. The learners using the new model.

1. Identifying the misconception

This can be done by asking open-ended questions. For example, asking to define words "redesign", "reuse", "recycle", "upcycle", "downcycle" and asking for examples from real life. People tend to think they know these terms, but when asked to define them, it often turns out they can be

[4] Chi, M. T. H. (2013). *Two kinds and four sub-types of misconceived knowledge, ways to change it, and the learning outcomes,* in S. Vosniadou, (ed.), International handbook of research on conceptual change.

[5] Verkade, H., Mulhern, T. D, Lodge, J. M., Elliott, K., Cropper, S., Rubinstein, B., Horton, A., Elliott, C., Espiñosa, A., Dooley, L., Frankland, S., Mulder, R., and Livett, M. (2017). *Misconceptions as a trigger for enhancing student learning in higher education: A handbook for educators.*

[6] Lucariello, J., & Naff, D. (2013). How do I get my students over their alternative conceptions (misconceptions) for learning.

quite mixed up. It is always worth asking your participants/listeners even what common terms mean, just to see if everybody actually understands what is being talked about. Any other approach, where learners have to demonstrate their thought process, can also help to unveil the misconceptions.

2. Helping to recognise the misconception

The **learners themselves must notice** that maybe there is a gap in their knowledge, maybe their understanding is different from the scientific understanding. Questions are good in this stage too: asking to explain their reasons for the misconception, why do they think that way? Comparisons are also a good tool in this stage, asking for example people to compare "their" data with the correct one.

3. Constructing a new model

This means finding a better and more sense-making model that can explain the observed facts and which can replace the misconception. The new model should be:[7]

1. Intelligible – learner can understand how it works, we can use analogies, models or directly showing the mechanism.
2. Plausible – it feels true and believable, learners must see how the new conception (theory) is consistent with other knowledge and a good explanation of the data.
3. High quality – besides good quality in scientific standards, the new theory should feel of better quality to the learner and not contradicting their other unidentified misconceptions.
4. Fruitful/generative – useful to the learner, they can put it into practice, we can illustrate the application of the new concept/theory to a range of problems.

4. Using the new model

Since misconceptions tend to be quite sticky in our heads, there should also be opportunities to put the new conceptions into practice – learn different cases, see where this new info is useful and can be applied. There could be a slightly different problem presented where using this new model is needed in order to solve it. This could also help to assess whether the misconception was indeed corrected.

[7] Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science education*, 66(2), 211-227.

SOME METHODS FOR CORRECTING MISCONCEPTIONS

General recommendations:

- Explore and activate preconceptions – for example ask some questions beforehand, to get a sense of learners' understanding of the topic(s) and adjust teaching to that.
- Some of preconceptions may be correct – use them as a bridge of examples to the new conceptions.
- If you present new concepts, then in a way that learners see these as plausible, high-quality, intelligible and generative.
- Help them to become aware of their own misconceptions.
- Help them "self-repair" their misconceptions – ask questions!
- Once they got over their misconceptions, allow them to use their new knowledge, e.g. in debates, to strengthen them.
- Throughout the process: don't rush to tell your own expert knowledge, always ask questions from learners first and allow them to construct their conceptions as independently as possible.

Here are some methods and ideas how different zero waste misconceptions could be addressed.

Bridging analogies

Bridging analogy is the approach of using the learner's already existing correct belief or conception (called "anchoring conception") by "bridging" it to the new conception ("target conception") where the learner has a misconception.

An example in zero waste could be:

Misconception: biowaste and compost are the same, just piling up biowaste is already composting.

Questions to get to the bridging analogy:

What is the end result of composting?
How does the biowaste turn into nutrient-rich soil? What could we compare this process with? Perhaps another example of turning organic matter into "a product" like making pancakes.

1. Anchor example: in order to make pancakes you need to mix the right ingredients (and only food ingredients) and heat them on the stove. You wouldn't add the plastic food package into the pancake dough, and you wouldn't expect pancakes to cook if you haven't turned on the stove.

2. Bridging example 1: compost needs to be "cooked" (prepared) the same way as we use food ingredients to make meals. Biowaste itself is not compost yet.

3. Bridging example 2: in order to make a specific meal, we choose the right ingredients in right proportion and prepare them in the right way (we mix flour, eggs, milk before pouring onto to the pan), the same way for compost, we need to mix food waste with bulky wooden materials to adjust nutrients, moisture and air flow in the compost, which allows microorganisms to do their work, which is needed to get good compost.
4. Target example: in order to make compost, you need to collect it separately, so that you only have organic waste and you need to use the proper technology to degrade it in the way that it makes good compost.

Diverse instruction

Misconceptions can often be a collection of more than one wrong belief, for example a whole missing schema. Diverse instruction means addressing several of them at once. Studies[8] have shown that conceptual change is more likely to happen if we give less examples, but about several wrong assumptions rather than many examples of only one wrong assumption.

An example in zero waste could be:

Misconception: biodegradable plastic is better than regular plastic. It composes of several missing schemas:

- It is made from biomass/plants so it's better than regular plastic (right conception: regardless of the material, single use is still a waste of resources).
- It simply degrades in the environment (right conception: biodegradable plastic has to be collected together with food waste, transferred to composting facility and composted by skilled personnel to fully degrade).
- It's just as good for compost as biowaste (right conception: biodegradable plastic is still plastic and doesn't add value to the compost).

For example: a takeaway food restaurant owner tells you proudly that they are now plastic free – all their dishes and cutlery are from biodegradable plastic. How do you respond?

At first we could express that it is great/makes us happy to hear that they are trying to improve and make steps towards better solutions. And then continue with these questions in a warm manner:

- Why did you decide to make a switch from plastic? Why do you think plastic is a problem?
- Why did you choose this solution?
- Why and how is it better/best solution?
- What is this material (biodegradable plastic) made of?
- What do you think, what will happen to it if thrown away?
- How can we be sure?
- Would you put it into your own garden compost? Why or why not?
- What happens to it in the compost?

[8] Vosniadou, S., & Brewer, W. F. (1992). Mental models of the earth: A study of conceptual change in childhood. *Cognitive Psychology*, 24, 535-585.

Predict-observe-explain model

In this method, an experiment is made to correct a misconception. The experiment doesn't have to be hands-on, it can also be a video or thought experiment.

The first step is for learners to predict what they think would happen. Then the experiment would be done and learners can compare their prediction with the actual result and explain why it is so, why they differ, if they do. This allows learners to become aware of their own thinking and logic.

One version of this method is the predict-explain-observe-explain model, introduced briefly in this short video.

An example in zero waste could be:

Misconception: there is no room in my flat to source separate waste, I don't have room for 3-4 different bins.

Question to be predicted: how much more room do you need if you sorted your mixed waste by fractions?

Experiment: taking that mixed waste (or clean "mock up" waste) and sorting it by fractions, and then putting it into separate bins, which are all just smaller than one big mixed waste bin, showing that because the waste amount is the same, you don't actually need more space, just more but smaller waste bins.

Discussion and explanations.

Cognitive conflict

This means offering the learners new experiences that don't match with their current conceptions, which can lead to conceptual change. Ways to create this:

- Present data to learners that doesn't match their existing conceptions (anomalous data). The anomalous data should be credible and ideally somewhat known from their everyday experience. If possible, illustrate the data with experiments. Use this as a basis for discussion.
- Present texts that introduce a common misconception and then overturn it, and offer the new conception/theory. This would again be the basis of discussion where learners could support their views with the evidence from the text.

An example in zero waste could be:

Misconception: the amount of waste entering a waste treatment facility is the same you can recycle, eg. 100 t of biowaste means you get 100 t of compost, 100 t of packaging waste means you can recycle 100 t of materials.

Presenting data:

100 t of biowaste enters the composting facility, 40 t is sold as compost.

100 t of packaging waste enters the recycling facility, 90 t is sold for recycling.

Basis for the discussion: what happens to the missing 60 t / 10 t?

Biowaste is largely water that goes away during the composting process. Packages are never totally empty, bottles also have liquids inside – liquids are pressed out during the process. Input waste can be wet from poor storage conditions as well, increasing its water content.

Socratic method

Socratic method is one of the oldest forms of learning through discussion. It focuses on revealing the preconceptions of the learner and asking questions designed to prompt the learner to challenge their own assumed prior knowledge. It is a four-stage process that involves:

A. Bringing out preconceptions/misconceptions;
B. Asking clarifying questions to pinpoint the nature of these preconceptions and lead the learner to form their hypothesis or prediction;
C. Testing these hypotheses through further questioning, fact-checking, counter-arguments, identifying contradictions etc. which require the learner to critically evaluate their preconceptions;
D. Reassessing their thinking and deciding whether to accept or reject their preconceptions, predictions and any new information.

The socratic method can be found also from surprising places like pop-culture (for example "Pulp Fiction").

An example in zero waste could be:

1. Bringing out the misconception: "In our city we have a new environmentally friendly way to treat waste: we have an incinerator that burns the waste completely and creates energy."
2. Clarify: Can you explain why burning waste is good? / How burning the waste relates to the issue of shortage of (basically all) materials we use?
3. Testing:
   - How much waste does the incinerator need in order to produce that energy? What if we don't create that much waste anymore (do more reducing, reusing, recycling)? Can the incinerator still operate then?
   - What types of waste are being burned in the incinerator? How much of it is left at the end?
   - What about the energy that was needed to produce those materials, which are now lost in the burning process?
   - Is incineration helping or stopping us to get closer to a circular economy, where materials are kept in circulation and waste amounts are reduced?

4. After these questions the learner can decide whether to accept or reject their original misconception.

Can you find any common traits or characteristics of all these methods?

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. In zero waste work we often have only very little time to meet with people (one business meeting etc), where we don't have time to go through these exercises. What can we do there?
2. We both have one-to-one meetings and larger group presentations/sessions in zero waste work. It can be harder to work with misconceptions when you have a big group of people, each of them with different misconceptions. How can we deal with this multitude of misconceptions?
3. In zero waste there are not many misconceptions, or they are actually quite easily corrected with the right data. Shouldn't we focus more on giving people the correct knowledge on zero waste?

1. **In zero waste work we often have only very little time to meet with people (one business meeting etc), where we don't have time to go through these exercises. What can we do there?**

   The hard reality is that we cannot speed up the way the brain functions/processes new information, even when we would like it to and have little time and want to get more done in that short period of time. Correcting misconceptions does take time and when we are given only short time, what we can do is at least get a better understanding ourselves of the kind of misconceptions people have, pose some open questions to them and make them wonder if there is perhaps more to discover/know, so that they would be interested in meeting you again and/or digging into the topic themselves more. That's why it's good if we already have done some pre-communication with them and gotten to know what exactly their misconceptions are, so that in the meeting we can already go to building new conceptions. In every situation we can decide to ask questions instead of telling the right answer (which is something that often comes almost automatically to us as zero waste experts) – while it could make us feel better that we shared our wisdom (and could listen to our beautifully organized knowledge), a question will help the other person much closer to discovering that truth themselves – as building and organizing the correct knowledge in their own mind is actual learning. But this also means not appearing or sounding passive-agressive and attacking, but rather curious questions with the sense of how we can solve this contradiction of views together.

2. **We both have one-to-one meetings and larger group presentations/sessions in zero waste work. It can be harder to work with misconceptions when you have a big group of people, each of them with different misconceptions. How can we deal with this multitude of misconceptions?**

   Misconceptions tend to be quite common, meaning people often have similar misconceptions in one broader topic (like zero waste). So even if you think only some people have one particular misconception, it could easily be that others also have it, they just haven't expressed it verbally or haven't even realised that they think the same way. So picking one misconception to tackle could still benefit many people in the audience.

   When you can identify several different misconceptions among the people, then one possibility is to tackle them together, if they are similar in their logic. For example, thinking that the washing process of reusable dishes takes a lot of energy and thinking that biodegradable plastic dishes are a solution are part of the same misconception where people don't realise the environmental impact of the whole lifecycle of the product. So it would be a possibility to group some misconceptions and focus on their common trait and address that to your audience.

3. **In zero waste there are not many misconceptions, or they are actually quite easily corrected with the right data. Shouldn't we focus more on giving people the correct knowledge on zero waste?**

   It could be true that some zero waste misconceptions can be easily corrected by showing the data. But what might for some be a missing piece of data (not knowing the actual recycling rate) could be a whole missing schema to the other (not understanding what recycling even is). Without getting to know exactly what it is that the person doesn't know or has misconception on, we cannot approach it the right way. The main question is perhaps, how do we know that we corrected someone's misconceptions? If we cannot check if people actually changed their minds after we told them the right info, then how do we know that they accepted our facts?

   Maybe sometimes people's inactivity towards zero waste could be not because of not wanting to act but that in the end they have deep hidden misconceptions about it?

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?
- Can you think of any examples how to implement these practices in zero waste work?
- Do you think it's worth approaching people's zero waste misconceptions the way described in this chapter? Why or why not?
- 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?

WHY ARE QUESTIONS IMPORTANT?

Opening questions for the reader before reading:

- What do you think happens in your brain when you ask a question?
- What do you think happens in your brain when you hear an answer?
- What do you think happens in your brain when you hear an answer that you didn't ask for?
- How do you know when the solution/statement/opinion you are giving is wanted/needed?
- How often do you ask questions in your teaching sessions? What kind of questions do you ask?
- Why do you think we have created a chapter about questions?

Historically teachers have often been viewed as the people who provided correct answers and trained students to know those right answers. The contemporary view of education has (hopefully) evolved from this idea and we now know that in most things in the world, there is no one simple fixed answer. Much depends on the context and our scientific understanding of the world changes over time.

Of course in a given specific situation there can be distinctions between right and wrong solutions, but even these cannot be taught in a top-down approach to masses of students, because we cannot prepare people for all the specific situations they might face in life. So **the essence of education becomes the ability to find the right answers yourself and adapt those answers when changing situations call for it.** This means that the skill that people need to learn is **how to look for answers – that means knowing what questions to ask**. And this in turn means that we should also teach through questions.

What happens when we ask questions

When asking questions, our thinking is more active than simply listening to someone talk. We have realised there is something we don't know and we want this missing information. It could also be that we want the person from whom we are asking a question to start thinking about a certain topic. So questions also help to activate the thinking of those around us.

But not all questions are created equal. How many times have we heard at the end of a lecture:

"Does anyone have any questions?"

- How often is it followed by a lively debate between the lecturer and listeners?
- How eager are people usually to ask questions at that point?
- How long is usually the time when the questions can be asked and how quickly does the lecturer move on and/or close the lecture?

There are of course exceptions, but quite often in these cases this question almost feels like a compulsory element that has to be said and after a very short moment of silence everybody moves on. Why is that so?

It could be that from the lecturer's side there is no skill of discussing the questions of learners, there is even a fear of it or there is no understanding of the importance of questions. Also the lecture might have been set up in a way that the learners were passive during the whole lecture and therefore were not able or wanting to ask good questions in the end. For the latter there could be many reasons which can be found in other chapters of this handbook, but it also may mean that the question itself was wrong, asked at a wrong time and probably in a wrong way.

Thus, when designing training courses, the crucial part is not only asking questions but also what kind of questions are being asked, how they are presented and when they are being asked.

When should the questions be asked?

The answer could be found in another question: when do you want your learners to start thinking about your topic?

Probably you want them to be focused on your topic from the beginning. So this is also the moment when to start with the questions. Questions could be asked throughout the learning activity, almost every topic could be formed into a question and discussion instead of a statement made by the educator. Of course there is information that we want to pass on to our learners, they are just more likely to grasp it if they discover it themselves through the questions. When we are engaged in a discussion, our thinking is much more active than when simply listening.

Who should be asking the questions?

Is it important that the educator asks questions from learners or that learners ask questions from the educator? Why one or the other?

Although there can be very active learners who already have many questions in the beginning of the session, questions are a tool for the educator to direct the flow of the session and learners' thinking. So while learners can have their questions "all over the place", the educator could give them a direction with his/her own questions in the beginning of the session.

The trick of teaching is to **get the learners themselves to say out the things you would want them to know**. So while it is much faster to just say it to them ourselves, in terms of learning, it is more effective if they get there themselves. In the end it's important to ask, who do we want to be answering the questions? For effective learning we want the learners to come up with the answers first and the educator is there to add on, correct and help to analyse the answers. Educators can guide the process with their questions, and direct the learners' questions back to them. If someone has a question, we can ask the whole group how they would answer that and then the educator's answer would be the last one.

What kind of questions should the educator ask?

The art of teaching is in fact the skill of coming up with such questions that would lead the learners to want our answers. A good question to your learners is the one whose answer is the main topic of your session. And it's not easy to create questions like this. One indicator for the educator here can even be: how much time from your preparation did you spend on developing good and deep questions?

Questions in their structure can be very different in terms of what kind of thinking processes they evoke. They can be divided into types based on the complexity of thinking that is involved in answering them. Not all questions in a learning session have to be around conceptual change, actually it can be good to have a mix of different types of questions. Just to keep in mind that at least a few of them should be more complex. Here are few examples of the types:[1]

Question type	Example
Lower order: Explanation – asking to explain a process or phenomenon	How is organic waste different from other waste?
Higher order: Analysis – asking to explain the elements of the topic, taking a concept into parts, comparison questions	What are the differences between separating organics from other waste at home and at a waste facility? What makes organics collection effective?
Conceptual change: Application – asking to put information into concrete situations	What is needed to put in place an effective separate collection of organics in your municipality?

Questions can also be longer than just one sentence. For example, when we want to teach about productive failure design (read more about it from the *Main principles of teaching* chapter), then instead of first explaining what it is and only asking "What are good teaching methods?", we could open the session with this kind of example:

Two teachers have different teaching strategies for teaching complex systems, like circular economy. Which teacher has an effective strategy? Why? Which one has an ineffective strategy? Why?

A: Teacher X starts with giving a complex problem to the students (how to make a specific sector more circular)

- *Students then have to find different solutions for the problem*
- *After that and hand-in-hand with discussing the solutions of students, teacher X gives direct instruction and offers expert knowledge of the topic*

B: Teacher Y starts with introducing and explaining the topic (circular economy)

- *Then students will be presented the complex problem and asked to solve it*

Instead of introducing the topic of different teaching methods, the topic is presented as real life situations and learners are asked to give their opinion about them.

What is the most important element of this exercise?

[1] Yip, D. Y. (2004) Questioning skills for conceptual change in science instruction, *Journal of Biological Education,* 38:2, 76-83.

There are of course several important elements, but perhaps the most important is the question "Why?", because this gives us information about the reasoning behind the answers and this is what we want to know. Sometimes the answers might be correct just by chance and the logic behind it incorrect. Also the reasoning process is where the learner is actually constructing knowledge him/herself and can discover his/her knowledge gaps and this is where the discussion starts. So it's the why-element that should be part of all learning sessions, asking questions starting with "How?" can also be good.

In general the questions should initiate a deeper thinking in the learner's brain. So also the questions should be more than just with yes-no answers, open rather than closed. For example, a question like "Isn't landfilling all the waste the most expensive option?" is closed, leaving only yes or no answer and implying what answer is expected. Instead it could be "Why are the waste management costs high?" or "How could the costs from waste management be lowered?"

On how to create learning evaluation questions, check the *Learning assessment* chapter.

What kind of questions should the learners ask?

As educators we should direct our learners towards starting to ask questions, if they don't have that habit to do so. We would want the learners to start thinking deeply about the topic at hand, so we should direct the questions towards the underlying principles, not just the superficial details which might distract both the educator and the learners. It's ok to also say if some questions are not relevant, but then there should also be an explanation why.

One important aspect is also the learners' self-reflection of their level of understanding of the issues, their knowledge gaps and what they would need to learn more about. This is connected to the skill of metacognition, which is tackled briefly in the *Metacognition* chapter.

Are questions more important than answers aka the expert knowledge?

When we as experts are presented with problems (or new solutions) in our field, we start asking detailed questions in our head, in order to get a better understanding of how to form our expert opinion around it. This is actually how the expert knowledge is activated – beginners either don't have any questions to ask or their questions are much less detailed. So again the art of becoming an expert is the skill of asking the right questions. When we teach through our questions it also makes our expert thinking visible to the learners and can help them to start asking more detailed questions as well.

So in the end, yes, the expert knowledge is also important, but it's the questions that make people want and understand our expert knowledge.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. What if the learners don't want to answer my questions and there is this awkward silence?
2. Isn't there a risk of getting lost in learners' questions and don't we have to finally also give our information in the lesson?
3. Is it possible to over-do it with questions?

1. What if the learners don't want to answer my questions and there is this awkward silence?

First – your time as educator runs in our subjective perception much faster than theirs – when they might just start to get their head around "What was just asked from us?", you already feel the inner panic ("They probably roll their eyes and think it is stupid/obvious/obscure question!"). **The awkward silence can happen and it's also something that we as educators should get comfortable with**. The reason for the silence is usually not that people don't have any answers in their head, there is always some pre-knowledge, mostly it's the case that people are not used to being active in learning situtions or they fear of sounding stupid, or they simply need time to truly think about it. After a certain point someone will break the silence and answer, or as educators we can also ask specific people to answer. You can also count to 10 in your head to pass the time before breaking the silence. In the end we need them to be the ones speaking, so this is also something that can be already communicated before the session or at least at the start of it, that the educator will be asking questions and the session will involve discussion.

2. Isn't there a risk of getting lost in learners' questions and don't we have to finally also give our information in the lesson?

Yes, there is that chance and facilitating this process is one of the tasks of the educator. But without asking questions from learners and allowing them to come up with their own questions we run the much higher risk and that is not activating their thinking at all or keeping their misconceptions intact. If we just present our information without the learners feeling the need for it and without discovering it on their own, it is much less likely that they would attach it to their pre-knowledge.

3. Is it possible to over-do it with questions?

Yes it is. This is the part where the educator should follow the three basic psychological needs of the learners and make sure they are not suppressed, perhaps the need of competence in this case the most – the feeling of tasks (or questions) being not too easy and not too difficult. Questions are meant to activate learners' thinking and make them struggle a little bit, but not to interrogate or exhaust them. It is the task of the educator to find that balance of not overwhelming the learners with too many, too difficult, or too trivial questions and creating just enough mental effort for them to want the answers from the educator.

In order not to over-do it with questions in this chapter, just two ending questions to further reflect upon:

- What would you ask from your learners if you wanted to get them interested in your topics?
- What makes a question good?

LEARNING ASSESSMENT aka HOW DO YOU KNOW THAT LEARNING HAPPENED

Opening questions for the reader before reading:

- What is it that you usually want to achieve with your teaching?
- Can we measure learning? How?
- Do you usually assess if your audience learned anything? How?
- When do you assess their learning?
- If and how do you assess yourself as an educator?

In zero waste and in environmental topics in general our main end goal is usually that people start to think and behave differently, that they take different decisions than before, which also incorporate environmental reasons. So we want them to start acting differently based on the new things they learned. And knowing if your teaching actually helps them to do that, is essential.

What is the best way to assess a change in behaviour?

Probably this means we should know what the behaviour was before and after the learning-teaching intervention. Would this mean that we should follow people around and see how they behave? Well, basically yes. This however is often rather difficult to do and more or less only scientific research teams with strict ethical protocols are able to do that. What is often done instead is asking people about their behaviour. But here it's important to remember that **asking people about their behavior is not always a reliable source of information.** One of the reasons for it is human psychology again – when asked about our behaviour, we tend to make things nicer than they are, tell small lies without even noticing it ourselves – most of us want to look better than we are in reality. It's also because our perception of our own behaviour is not actually the same as our actual behaviour. This can often even extend to our actual behaviour – if we know someone is watching, we can act differently than usual. So the observation usually means having to set up official scientific experiments, where the participants are informed about the study, its goals and agree with participating, but at the same time are not conscious what part of their behaviour is under the study.

Truly assessing the impact of an intervention (a learning activity) is difficult and not something we can easily do by simply asking questions to the learners, unless we are able to design a really reliable and valid set of questions, which usually takes a lot of time. So it can be quite a messy process.

But this doesn't mean that we shouldn't try to assess learning. We just need to accept that every assessment comes with some margin of error. We can still find ways to check whether the things we taught are remembered afterwards and if some concepts or skills are put into practice. If we are working with our group of learners for a longer term (e.g. consultation process for a company or municipality), then this also allows us more easily to check if and what they have learned, by noticing if they still have some misconceptions and asking inquisitive questions about that.

When it comes to assessing learning, we first need to define what it was that we wanted our learners to learn in the first place. And we need to be sure whether we are assessing:

A. Their perception of their own learning
B. Their enjoyment of the learning activity or
C. Their actual learning

Probably in the end we are interested in the last one. So the first thing is to **define our desired learning outcome**. And more importantly, making it a realistic one. Reading through our chapters on how learning happens and how slow the process actually is, it is quite fair to say that we often **tend to overestimate what can be realistically learned** in the time given to us, for example in short one hour sessions. In that one hour we will probably not have time to enable someone to correct his/her misconception. In one hour we can probably only find out that there are misconceptions and help learners to start questioning them.

Learning cannot be hurried (as it also suppresses the feeling of autonomy), our working memory has a limited amount of new things it can process at a given time. So this is simply something we need to accept as educators.

HOW TO ASSESS LEARNING?

Take a look at this list and think which ways would be a good way to assess learning and why, and which would not be that good; why?

What have you used yourself in the past?

- Quiz right after the session
- Quiz after some time has passed after the session
- Asking people to compare their knowledge in the beginning of the session with the end of the session
- Systematic observation of people's behaviour (or traces of behaviour, like amount of trash in certain place, etc) before and after the session
- Observing what kind and how many questions learners had throughout the session and after it
- Using valid and reliable questionnaires (if there are any) about the topic you are interested in
- Asking people to send data (e.g. images) about their behaviour afterwards
- Asking people if they liked the session
- Asking people what they liked most in the session
- Asking people to solve a problem related to the session's main topic before the session and after some time has passed from the session
- Using experience sampling apps
- Asking them to keep a diary for some time

Also think about this example you might know from the *Main principles of teaching* chapter:

> *"I wanted to teach about the environmental impacts of food. I showed the students images of 2 food items: beef and avocado and asked which has a bigger impact and why. Most of them said avocado, because it comes from far away and has a big impact from transport. I then showed them a graph, which illustrates how small the impact from transport is (6%) and that the main impact comes from how the food is farmed (land use, use of pesticides etc). Everybody looked surprised and it felt like a good wow-moment for me.*
>
> *A month later, when I asked them to assess the environmental impact of different food items and how to lower that, many of them still focused on transport and even after showing the graph again, they still needed several questions from me to think about the land use impact."*

What does this story tell you about assessment of learning?

Before continuing with the rest of the chapter, reflect about both the list and this example, what does it mean for learning assessment and what are the best ways to do it?

Here are some thoughts:

- What the story tells us is that if there would have only been one session, the educator would have left the whole experience thinking that she succeeded in teaching people something new. It was only thanks to the next session a month later that she realised that this new concept hadn't actually reached her learners. So although it was a teaching failure, it was valuable information for the educator on the learning goals not being met. How often do we actually leave without checking if we made that trace into our learners' long term memory? It's not always possible to check that, but then we also need to realise that we also don't know for sure if our work had an impact.
- If you have read the *Main principles of teaching* chapter, then you probably know that it makes more sense to check whether people learned from your session some time after it happened and not right after it.
- It is always advisable to use open ended questions and not quizzes with multiple choice answers, because retrieving information is actually good for making the content also retrievable in the future. The opposite – just recognizing the right option – will not. And second, when using multiple choices, it's harder to know what were their own thoughts and where they still might have knowledge gaps or even misconceptions.

- It's natural for humans to want to be liked and we tend to ask that also about your learning activities and we feel good if people say they liked our sessions. But it's important to know that enjoyment and learning are not the same thing. They can happen together, but enjoyment is not a metric for learning, because sometimes learning can be difficult and at the same time we can also enjoy situations, where we don't learn anything new. So it's better not to ask learners about that, because it just tends to distract us as educators. Learners liking you is a bonus, but not our main focus.
- Having to solve a problem, where learned knowledge and skills need to be applied (kind of a test), is quite a good way of assessment (in the story above it would be environmental impact exercise of new food items). This also means meeting the learners at least twice, so that same problem-solving task with some time apart can be given to learners. But we have to keep in mind that in test-like situations, everything that makes people feel stressed or anxious harms the actual problem solving – for example time pressure, social comparison, high-stakes, telling them that we are testing their learning etc. And as an educator we may not always understand what aspects in a given situation may be perceived as stressful.

Should the context of the problem solving test be the same each time or different? Why?

What does the chapter on learning basics and memory tell us?

In reality we want the learned skill or knowledge to be **flexible** – meaning people are able to use it in different contexts. So the problem solving test should offer a new context for the concept learned. One way to do this is also during the learning session/ training. In our training programs we have included these parts (scheduled on the 4th and 5th day of the training):

- For the **Zero Waste Ambassadors** there is the Zero Waste City role play game, which incorporates all the knowledge and skills tackled in previous sessions and puts learners in the situations where they have to solve problems by using skills and knowledge gained on previous days.
- For the **Zero Waste Trainers** there are the teaching mini-sessions, where in the same way learners try to put into practice the main elements of teaching, and the session is then jointly analysed by the whole group.

In both programs, the expert trainers are there to first offer challenges (role playing) and observe and then give feedback. This of course is in a training setting right after the learning sessions, so ideally another assessment could be made later on, in learners' real life situations. If this is not possible, having another session or meeting later on, where learners can even try to solve hypothetical new problems, would work as well. In our training programs we offered some zero waste and training related scenarios to solve during a follow-up interview a few months after the training event.

HOW TO MAKE EVALUATION QUESTIONS?

What we often do and which is also a way to assess learning, is evaluation questionnaires to learners. Creating good questions is actually very tricky. There can be questions which actually don't give us the info we need, we are just used to asking them (like "What did you like most about the training?"). We should remember to respect the time of our learners and choose our evaluation questions very carefully, only leaving in the questions where we know clearly what information we want to get from there, how we will use this info and making sure that these questions do give us this data reliably.

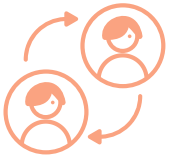
Much of the rules mentioned before apply here too: questions should be open-ended and as neutral as possible, avoiding implying questions and socially desirable answers (e.g. "Were the trainers nice and supportive?" implies that you should answer "Yes") and in a good way tricking the respondents slightly so that their thinking process wouldn't be too much directed and that they are actually able to answer the questions. But you also could use scales with (rather neutral-phrased) statements about the topic that interests you and ask the learners how much they agree/disagree with these. Such scales can be used in various contexts – asking about values, attitudes, but also knowledge and behaviour; or feedback about educators, etc.

For example if we want to assess whether we met the three basic psychological needs of the learners, we don't ask that directly, because they might not be able to estimate themselves if they were met. Instead we can put it into practical context, for example:

Rate from 1 - 6 (1 - I do not agree at all 2 3 4 5 6 - I completely agree):

1. During the training I understood why the learning activities were set up the way they were
2. During the training I felt as if I were "invisible" to the trainers
3. During the training I felt, that I can slow down the pace of training to ask for additional explanations
4. During the training I felt that I could not say out loud what I really thought about the topics we learnt
5. During the training I felt that the trainers were really caring towards the group
6. During the training I was not sure how to best learn the material

Can you guess which question is about which basic need?



Here are the answers:

Relatedness – 2 (reversed version) and 5
Competence – 3 and 6 (reversed version)
Autonomy – 1 and 4 (reversed version)

The reverse version questions add diversity and balance to the questions, so that not all of them are framed positively and the respondent has several angles to evaluate the educational activity. Also it could help to test if the respondent actually reads the questions and doesn't just answer the same way to all of them (giving the same score to all the questions).

SUMMARY

A short summary of the messiness of assessment and how to put it in practice:

- Don't rely solely on the emotions nor the skills and knowledge your learners have **right after** your learning activity.
- If you want the material you taught to stick with your learners for a longer time, try to find ways to assess that after some time has passed from your session. Offer possibilities to retrieve the learned material (check *Main principles of teaching* chapter for more) – this helps to make the memory traces stronger.
- Use open ended questions as much as possible – this way you'll get a more correct idea of your learners' actual understanding.
- Use cases and scenarios, problems to solve in different contexts to see if the learners can apply the learned things in practice. If possible, give a problem to solve in the beginning of your learning activity and some time after, so you can compare the difference and impact of your teaching.
- If possible, test your evaluation questions with fellow-experts and also non-experts, to see if they are easily understandable, assess the aspects you planned to assess and give you the information you need.

Valid and reliable assessment is difficult and complex and requires work on the level of scientific research (e.g. observing people's behaviour without any other influences; or making a functional measurement instrument, like a questionnaire). In usual training situations we do not have the time or resources for that. There are still ways and methods mentioned above that we can use to get some sense of if and what kind of learning happened. But it is important to keep in mind that with wrong types of assessment we create the illusion of teaching for ourselves.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. After my session I got many compliments from my audience and several of them said they really liked it. Can this be considered as proof of successful teaching?
2. I feel my session went a bit out of hand: people had so many questions, they wanted to discuss the topic and then the time ran out and we had to finish up in the middle of the conversation. Is this a sign of not so good teaching?

1. **After my session I got many compliments from my audience and several of them said they really liked it. Can this be considered as proof of successful teaching?**

   Actually not, or – we do not know. If you want to assess teaching, assess (durable and flexible) knowledge. It's very nice if people are having a good time and enjoying something, but this is not necessarily connected to the fact if they learned or not. It might be that you simply offered them a lot of amusing things and told them exactly what they wanted to hear (and what they already knew). But it can also mean that you really created a learning experience – where everybody thinks, struggles, feels confused from time to time, asks substantial questions, draws conclusions, debates and so on, and while doing that, you supported their three basic psychological needs at all times. It can also mean as a side-effect of learning and with you supporting their basic psychological needs, that they enjoyed the session. The point is that praise for your session only cannot be used to assess whether learning happened.

2. **I feel my session went a bit out of hand: people had so many questions, they wanted to discuss the topic and then the time ran out and we had to finish up in the middle of the conversation. Is this a sign of not so good teaching?**

   Although the reality here really depends on the specific situation, the questions being asked, etc, it is generally actually a good sign if people have questions and you feel there is not enough time. This of course means if the questions are related (even if related not that closely) to the topic in discussion. It means that people's thinking and pre-knowledge was activated and they wanted to know more. We can never teach everything we want and the time will always be too short. If the learners leave the session with questions and wanting to know more about it, then this is a better situation than if they just enjoyed themselves but have actually no need to ask for more – this probably means they didn't learn much new as with deeper learning, questions tend to arise.

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?
- From the examples in the chapter, what methods of learning assessment could be applied in your work? Why?
- What do you think, do we more often tend to assess the illusion of learning or actual learning? Is there anything that needs changing in that?
- 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?

HOW TO MANAGE YOUR TEACHING TIME aka "There's no time for this today"

Opening questions for the reader before reading:

- How detailed time plans do you make for your teaching sessions?
- How strongly do you stick to your time plans usually and if not, why?
- How do you decide what activities get the most time in your teaching sessions?
- How much time do you plan in your sessions for learners' questions, discussion, interaction?
- How long does it take for new knowledge to set in the learner's brain?

Time is always an issue, there is never enough time to go deeper into the topics, for the learners to fully understand them. How can we deal with the constant problem of time running out?

First thing is probably to accept the fact that we will always be running out of time and there will always be topics that didn't get discussed at the session. Even if we plan more time, we will simply find more things to discuss. And this is not necessarily a bad thing. The feeling of wanting to know more, ask more, discuss more is actually something that we aim for in learning situations, so sparking that interest and getting the feeling of "I don't know enough of this" is a good outcome. This means that learners might be willing to go and learn more about the topic themselves later on.

Maybe what we need to change is our expectations and relationship with time, especially how we use the time in our teaching sessions. In the end managing time means managing the content you teach and how you teach it.

Some thoughts on time:

- The most important is to address issues that are **on learners' minds** during the session, when they are thinking about the topic at hand. It's better to dig deeper into something that learners don't understand and are eager to discuss, rather than run through everything you planned and maybe lose your learners' attention/interest in the process.
- At the same time we don't have to follow all the ideas that learners have. For some topics that get too big or detailed, we can say that this would need a separate session (time) on its own, giving specific reasons for it, maybe some resources where to look for more info. It is the balance to find what aspects of the topic can be discussed so that learners can think about the elements they are interested in and at the same time keep within in the general topic you wanted to tackle.
- It is very difficult to actually change someone's mind in only one hour or less (it's simply how our brain works), which is the time often given to us for presentations, especially when we also don't have time to create proper connection with our participants (for example in online contexts). But even if we cannot make people accept new knowledge, we can always use this time to **get to know their thoughts** and pre-existing knowledge on the topic. Even in online workshops, we can ask questions through polls or chat and that at least gives us a better sense of how our audience perceives this topic and we can use this information in the future.
- As educators we tend to overcrowd our sessions with our own knowledge and content, where there is not much room for the learners to digest the new information (to encode it). Depending on the context and specific nature of the lesson, the time allocation could be different, but it could be good to plan around **⅔ of your time for discussion** and questions of the learners with possibilities to discover and construct new knowledge, and ½ for your own talk and expert information. Remember, the brain is not a voice recorder, it needs time to connect new information with existing pre-knowledge and if needed, start re-constructing incorrect ideas.

Our experience of the flow of time is subjective depending on how we feel about the situation we are in. As educators we usually sense it a bit differently than our learners. If the topic is new to them, then they need the pace of the lesson to be **much slower** than to us, the experts, because they process that information more slowly. Also, when we get a little bit nervous, we tend to start speaking faster. So although we might feel that there is so much we need to cover in one session, we actually need to take a slower pace so that the learners would be able to follow us. Asking more questions instead of simply providing information is a good way for slowing down, as it both helps to see where learners might be struggling and it also can calm us, and our speed of talking gets slower. On how to design questions to ask from your learners, you can check the *Why are questions important?* chapter.

Time and the basic psychological needs

Time is tricky because pressing with time can also be a form of control and can suppress the learners' need for autonomy, because they need to feel there is time for their questions and confusions. They need time to think and discover the answers, solutions and ideas themselves, in other words, to deeply understand. Then again, a commonly agreed and set timeframe also offers structure in the learning setting and that supports the feeling of competence – the feeling that I know what is going on. So perhaps we should see **time management more as a dialogue** between the educator and learners:

- If there is an interesting discussion going on and time is running out, the educator can pause for the moment and ask whether everyone would prefer to stay a bit longer in the session to finish the discussion or finish on time, so that the learners themselves can decide what is more important at that moment. This might also mean continuing the discussion later and that in turn could mean changing the initial plan of the educator.
- Depending on the possibilities, the educator could also offer choices on which specific topic to continue within the broader topic at hand. For example, if there are different interesting questions being discussed, the educator could give the learners the option to vote which they want to discuss and which the educator could later provide written information on.
- In all this it's also important to explicitly communicate and explain this way of teaching and managing time to the learners and why it is done differently than perhaps what they are used to.

Some tips for a better relationship with time

- Don't overcrowd your session with information. The aim of the session is not to run through all the slides that you had but to help people learn new things. Learners need to feel that they have time to think and learn. So we as educators should adapt ourselves to their pace, not them to our pace.
- Time is precious for both you and the learners, so make it meaningful for both. Ask your learners what they want to know. If you teach them something they are interested in, then it's also time better spent for you.
- Accept that there will always be a level of unexpectedness in your teaching sessions. Accept that you will not be able to talk about all the important things you wanted. Once we start to let go of that need for control, we also become more relaxed, more interested in what our learners actually think about things and our teaching becomes more deep and meaningful. And paradoxically we may end up actually teaching much more.
- If you use slides, you can plan them not as a final structure for your session, but as a pool of information on your topic that you can pick based on the needs and interests of the learners – information that you can either skip or add, depending on how the discussion goes.
- For how to plan time for different activities in your session you can check the example learning session format in the *Trainer's checklist.*

FREQUENTLY ASKED QUESTIONS

Before reading the answer, think to yourself: **how would you answer this?**

What if learners themselves get anxious around time and expect the educator to "finish all the slides" so they could get all the information planned for the session?

As we are so used to workshops being about "passing on the information" and just following the slides of the educator, the feeling of not seeing all of those slides can create some disappointment. But this is again one of the learning illusions. Having seen all the slides and actually learning the topic that was on the slides are of course not the same things. This is something that us as the educators probably need to explain explicitly: we have the structure, general idea and expert knowledge of the topic, but we are here for the learners, their interests and their pace and that can mean not talking about all the planned topics, but making sure that what gets talked about, is discussed thoroughly and made sure that everyone understands it.

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?
- As a learner, what do you experience more: too much time taken for discussions or not enough time? How does it make you feel in those sessions?
- As an educator, what do you tend to do more: putting too much time on discussions or not enough? Why do you think so? Would you want to change it? Why or why not?
- 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?

TRAINING VIDEO GUIDE FOR ZERO WASTE TRAINERS

This training video (12 minutes) gives an example of how a Zero Waste Trainer could tackle misconceptions in a training setting and it can be used as a training tool for practising teaching similar kinds of topics.

The simplified graph shown in the video is based on the findings from the report "Reuse Wins at Events: Life-cycle analysis of reusable and single-use cups."

In reality our training sessions are of course longer and more time can be taken to discuss different topics and discuss them more in-depth, however in this video we have tried to capture the essence of a good teaching practice on complicated issues such as zero waste.

An example exercise how this can be used in a training session.

1. **Give a task to learners to practice:**

   You are giving a workshop to cafes and restaurants about sustainable alternatives for single-use plastic take-away cups and tableware. You can already guess that biodegradable plastics might be mentioned as a good solution. How do you approach this misconception?

The task can be organised in several ways:

- **A.** Learners work in pairs or groups of three, where they do role play: one is the trainer, other(s) the learner(s),
- **B.** Learners work in pairs, where they simply discuss what their approach would be OR
- **C.** Individual work, where learners write down their thoughts, which is then followed by discussion in smaller groups or in one big group.

2. **After the task, the video is shown. This is followed by another discussion, some possible guiding questions:**

   - What did you notice in the video?
   - What did the Trainer do differently in the video than you would have? What could be the reasons for that? What would work better in reality?
   - What was done well? What could be done better?
   - What principles of communication/teaching can we deduct from here?
   - How could the Trainer continue the workshop from here?

Some parts of the video can be shown again, or the video paused at certain moments, for example when the graph with the life-cycle analysis is shown.

The expert reasoning for the Trainer's approach in the video that can be shared in the end:

- The Trainer starts the session by showing warmth towards the learners, listening and showing support for the attempt to make environmentally friendly decisions, and simply being sincerely interested in what is important to them – their business. This creates relatedness from the beginning.
- Instead of starting with a presentation why biodegradable plastic is not a good solution and what is, the Trainer asks clarifying questions to understand where the roots of the misconception are – that biodegradable plastics create no waste and therefore cause no environmental harm. This allows to address the underlying misconception of what elements form the environmental impact of these products.
- The Trainer tries to avoid getting into too detailed discussion around issues with composting problems and composition of biodegradable/compostable plastics, in order to keep the focus on a larger conceptual change – that it's the single-use, regardless of the material, that is the problem. This is supporting the need for competence – getting too technical with the details could be distracting, as the main concept around environmental impact first needs to be formed by learners. If the learners would start asking more questions about the details, then it can be explained or indicated clearly when these questions will be answered or if not, why.
- The Trainer tries to delay sharing her own knowledge and continues asking questions from the learners to get them to doubt their misconception, and gives them time to think.
- The Trainer writes down the arguments from the learners and based on that asks them to predict what they think would have the biggest impact and why, before showing them the data, maintaining their active thinking.
- When the data is presented, the Trainer again asks the learners to explain and define what they see there. In the end it's ideal if the learners themselves say what is the underlying principle – that all kinds of single use items are a burden to the environment and refuse/reuse is the best option.
- All questions from the learners are welcomed and recognised as valid concerns – supporting relatedness. If they are not answered right away, it is explained when and why they will be answered – supporting competence.

Anything else that you noticed?

For the purpose of the video's length, the flow of the discussion in the video is a bit rushed and faster than in reality. In a real life situation, in what moments and how could the Trainer act differently than shown in the video, following the same principles mentioned above?

TRAINER'S CHECKLIST

It's difficult to always remember everything we need to take into account when designing and facilitating learning processes. So this checklist could be helpful for remembering all the elements. It's also fine if you don't manage to fulfill all of these things, as the learning contexts can be different and not all is needed every time. Plus none of us are able to create perfect learning sessions.

This checklist can be used when planning your training session and also when analysing it. It can also be used to brainstorm ideas on how to embed each element into the session. If it feels overwhelming, just pick a few which you'd like to focus on and practice.

You can first answer these questions with your own ideas and then consult with the other chapters from the handbook, to get more ideas from there.

☑ **What is the intended learning outcome (what is the new knowledge or skill the learners should gain)?**

Make realistic estimations, take into account the length of your session, how much time is available for deep thinking and practicing, how much or little do learners already know about the topic, what could be the misconceptions that first need to be tackled.

☑ **What do you want the learners to start thinking about during the session?**

In order to reach the planned learning outcome, what is the thinking process the learners should go through, what should they realise and think about first? What should you ask and do to get them thinking about it?

☑ **Do you activate learners' thinking? How? When?**

Easiest way to activate the brain is to let people speak, let them ask questions and give answers themselves. Learners' brains should be active and construct the new knowledge from the beginning of the session. How much and what kind of interaction is there with the learners? When and how often do you ask for their input?

Do you get to know learners' pre-existing knowledge and their misconceptions? How? When?

Is there a possibility to get some information about their opinions and knowledge before the session? That could already help to prepare the session which takes into account some existing misconceptions. In any case, asking people their opinions and knowledge at the start of the session also helps to adjust your session content on the go. What kind of questions could you ask to get the best overview of the pre-knowledge and misconceptions?

Do you help the learners to challenge their misconceptions? How?

There is not always time to correct the misconceptions, but raising the right questions, offering comparative data, asking to give examples and comparing different options could help to make learners question their misconceptions.

Do you create possibilities for effort and mistake making for learners?

Having to solve some problem or task where the learners lack some skill or knowledge is a good way to create mental effort which is needed for learning.

Do you help the learners construct new knowledge? How?

Solving a problem is knowledge constructing, but also asking to explain something or compare different options, or creating opportunities when learners need to phrase a principle based on examples or create definitions or find principles on their own.

Do you help to analyse and reflect on mistakes made and give expert feedback so that learners understand what would be the right approach? How? When?

Providing expert guidance is a crucial part of mistake making, so that the learners won't leave the session confused and without full understanding of the issue. Reflection should have enough time after problem solving, so that there can be discussion between educator and learners. Another option is to do it after the session in writing.

Do you assess if learning happened? How? When?

If we want the things we have taught to stay with learners for a longer time, we should assess it after some time has passed, maybe with a follow up call or questionnaire. If that is not possible, what could be the ways to test if the learners are able to put the learned things into practice during the learning activity?

Do you make sure that learners later also retrieve the learned things? How? When?

In order for information to stay in our long term memory, retrieval needs to be practiced – trying to recall information from the memory. Of course it can be done right at the end of the session, but it is impactful only if it is also done after there has been time to forget the info. So it has to be some time after the session, which is not always possible to organise. If possible, reminder questionnaires can be sent or the retrieval exercise made at the beginning of the next session.

Do you create relatedness with learners? How?

Relatedness means that the learners feel that you as the educator like and accept them. Creating relatedness starts from the beginning of the session, how you create relationships with them and what attitude you have towards all of them. And it needs to be kept throughout the session.

Do you support the autonomy of learners? How?

Autonomy means that the learning activity is meaningful for the learners, they understand its importance for them and/or can find that meaning during the session. This means their point of views should be heard, and they should be allowed to find that meaning themselves, and they have the possibility to create and discover solutions themselves.

Do you support the competence of learners? How?

Competence means that learners understand what is happening in the learning activity, what tasks they need to do and how to do them, and the tasks are at the right level (not too easy, not too hard). This means giving clear instructions, being present to help and guide.

EXAMPLE LEARNING SESSION FORMAT

In order to create some understanding how this all could work in reality, we have made this example. This should not be taken as universal form, it is simply one example how these principles could be put into practice. Timeshare can really depend on the specific group of learners and how the flow of the session goes, where some activities may need more time than others.

Timeshare	Activity	Purpose
Before the session	Small questionnaire with open questions for learners about what they know and find important about the topic	Getting to know learners' pre-knowledge and possible misconceptions
5%	Asking everyone their name, keeping eye contact, asking why they are here and their connection to the topic, telling how you will merge it with what you had in mind for the session	Creating relatedness, supporting autonomy
10%	Asking how they define the problem or issue, what examples do they have	Getting to know learners' pre-knowledge, activating their thinking, supporting competence and autonomy
20%	Asking questions about their opinions and thoughts – why do they think so? Probing more with questions, giving your examples, info, data, asking to compare contradictory data or information	Challenging misconceptions, supporting autonomy and relatedness
25%	Dividing participants into groups and giving them a problem to solve on the topic	Creating effort, room for mistakes, allowing participants to construct their own knowledge
25%	Discussion and feedback based on the group work, asking input from other groups, if they solved things differently, asking more probing questions	Allowing participants to construct their own knowledge, supporting autonomy
15%	Giving expert feedback and factual input on the correct solutions and data, asking participants to reflect upon it, guiding with questions	Analysis of the mistakes made, constructing new knowledge, supporting autonomy
Throughout the session	Trying to see things from the perspective of your participants, before saying their understanding is wrong, asking why they think so, correcting it politely and explaining why, staying calm and warm towards participants, acknowledging their emotions	Supporting relatedness and competence
1-2 weeks after	Sending feedback questionnaire, asking to recall from memory also main takeaways and how to put them into practice	Retrieval exercise, assessing the learning

Not everything is always possible to put into practice and sometimes we need to choose priorities in our workshop design.

What would be the few priority things you absolutely need to do?
What would you pick from the text above?

These are the few things we recommend and that are doable in almost any situation:

- Ask for learners' pre-existing knowledge and build relatedness – open with questions about what they know about the topic, if and what interests them about it. If nothing else, at least you will learn something about them and how they think about the topic.
- Delay your own answers and knowledge. If someone has questions, ask first if someone else has an answer, what they think the answer is, give them time to think, and only then give your thoughts.
- Even if you are presenting to a big audience where interaction possibilities are limited, you can ask people to write down their own answers first or ask them to have a short discussion with a person next to them or use different digital tools like Mentimeter to get their input.

Few finishing thoughts:

> **The one who speaks most, gets to learn most. It should be the learners, not the educator.**
>
> **We as educators are there for the learners, not the learners there for us. Learning activity is their process and should be accommodated to their needs.**

And finally:

Don't forget to breathe and tell yourself: none of us can control everything. Some things we simply must let go. And it's also ok :)

TEACHING MINI-SESSIONS

The teaching mini-sessions were designed as a final activity in the Zero Waste Trainers training event, in order to practice all the competences needed for being a Zero Waste Trainer. This gives the learners a life-like, yet safe environment for testing the level of their skills and understanding. These are the main elements of the sessions:

- Design a teaching session using the principles taught in the training,
- Test and experiment new ways of teaching,
- Practice supporting the three basic psychological needs of learners,
- Learn from own and others' mistakes, analyse them in safe environment,
- Share teaching ideas and methods with each other through practice,
- Practice analysing own and others' teaching.

For better time management but also to make it easier for learners, the sessions are recommended to be conducted in pairs. In this way, the pair can exchange thoughts and ideas gained from the whole training course, which also supports their further learning. It is recommended that the learners can choose their own partner as it's important that the pair works well together. The whole group including the trainers will assume the role of learners in these sessions.

Each pair can choose their own zero waste topic they want to use in their session and they can also assign roles to the learners depending on their choice of teaching sessions (municipality workers, event organisers, new volunteers of local zero waste group, etc).

Main timeframe for teaching sessions:

Time	Activity
At least half a day (4h)	Find your teaching partner and prepare the session – trainers are available during this time for mentoring and consultation
30-40 min	Per teaching session
15 min	Feedback and analysis for each pair from the trainers and the whole group

If the training schedule allows, the teaching sessions could last longer, in order to give a better real life feel, but with a bigger group of people that can be difficult. If the group is large and there is enough room, then one option is also to have parallel teaching sessions and trainers are divided between them, so that all sessions are observed by 1-2 trainers. The sessions shouldn't be shorter than 30 min, in order to give some time to try out more things.

Up to two days could be dedicated to these sessions, so that every learner can have a practical experience. Although the session set up is the same for all the pairs, experience shows that everyone will approach the task differently, even if the specific topic is the same, and therefore there is no fear that having a full day of these teaching sessions will get monotonous.

RESOURCES FOR ZERO WASTE AMBASSADORS

ZERO WASTE BASICS

Opening questions for the reader before reading:

- What do you think zero waste is?
- What is for sure not zero waste?
- What are the most common zero waste examples that you know of?
- What could be the guiding principles of zero waste?
- Why is zero waste important?

Zero waste can mean many things to different people but the key connection is that zero waste is a goal that is pragmatic and visionary, local and global, at the same time. Inspired by nature, the zero waste philosophy works in an ecosystemic way to maximise what is available in the community alongside building local resilience and increasing the natural capital available for future generations.

How would you define zero waste? How do you usually explain it to people?

Can you guess the missing words in the most used definition of zero waste?

"Zero waste is the _____ of all resources by means of _____ production, consumption, reuse and _____ of products, packaging and _____ without burning, and with no _____ to land, water or air that threaten the environment or _____."

Make your guesses, read on and see if you can get some hints in the text before reading the full definition on the bottom of the page.

Zero waste aims at rethinking the way we produce and consume in order to preserve the value and energy embedded in our planet's resources whilst enabling civilization to flourish and prosper. While waste management aims at turning waste into resources, zero waste is about **keeping resources from becoming waste**.

It's also about designing waste – and the toxics and inefficiencies associated with it – out of the system. In a zero waste system, the value of materials and products is kept within the community where they are used over and over again. Any technology that doesn't allow for materials to be taken back to circulation is deemed as unacceptable and phased out (e.g. incineration which does not support the zero waste thinking). Meanwhile, recycling is important to close the loop on a smaller scale and it should be seen as an end-of-pipe solution because we cannot recycle our way out of a wasteful society.

Why is recycling not enough for zero waste (vision)?

If you are not sure of the answer, see if you can find it from the rest of the chapter.

And here is the full zero waste definition:[1]

Zero waste is the conservation of all resources by means of responsible production, consumption, reuse and recovery of products, packaging and materials without burning, and with no discharges to land, water or air that threaten the environment or human health.

[1] Zero Waste Definition, Zero Waste International Alliance (2018)

What is the difference between your wording and the official one?
Would you be able to explain all its elements?
For example: what is the difference between recycling and recovery?

The main waste terminology in the EU is defined in the Waste Framework Directive.[2] This is the legal basis everyone working with waste in the EU has to follow:

Recovery – any waste management operation which results in waste serving a useful purpose by replacing other materials which would otherwise have been used. Recovery operations are listed as R-codes R1 to R 13 for legal purposes.
It's important to note that under recovery we can distinguish:

- **Material recovery** – any process of obtaining materials from waste that still have useful physical or chemical properties and can be reused or recycled for some purpose.
- **Energy or thermal recovery** – conversion of waste into usable heat, electricity, or fuel. Examples are incineration, pyrolysis and gasification.
- **Chemical recovery** – decomposition of mainly mixed plastic waste to new polymers. It converts pyrolysis oil or gasification gas into feedstock for production of new plastic materials.

Disposal – any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Disposal operations are listed as D-codes D1 to D 15. Landfilling is a disposal method.

Treatment – recovery or disposal operations, including preparation prior to recovery or disposal.

Recycling – any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material. It does not include energy recovery or landfilling.

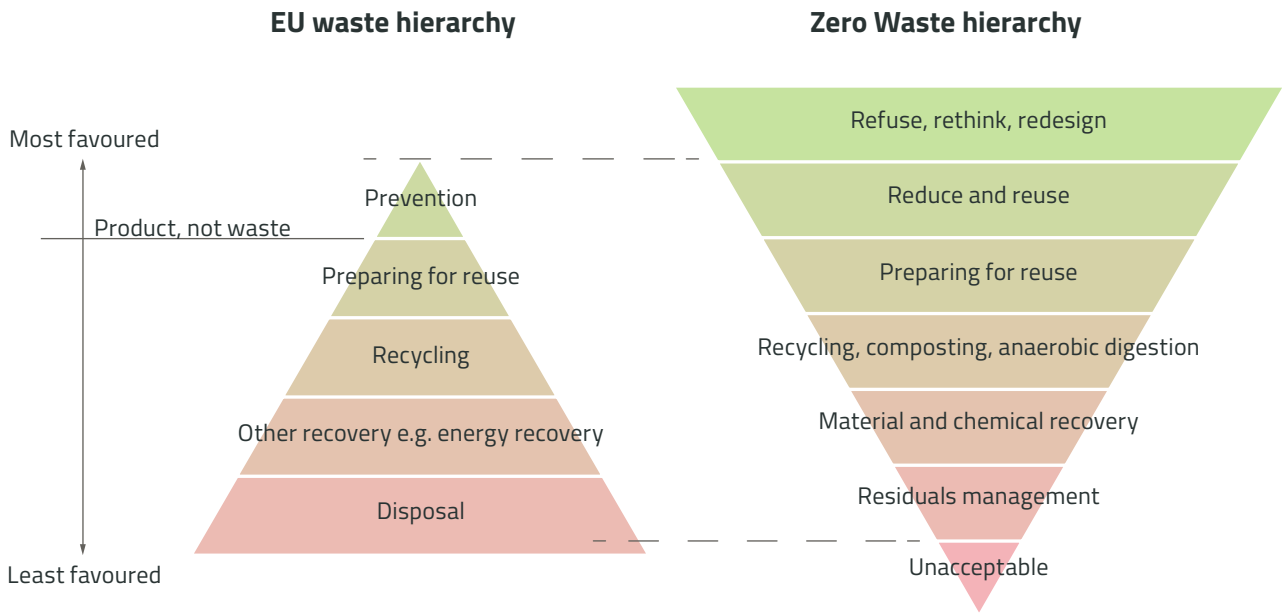
Reuse – any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.

Waste treatment methods can be listed in hierarchies, where they generally lay down a priority order of what constitutes the best overall environmental option in waste legislation and policy. In addition to EU waste hierarchy defined by the EU Waste Framework Directive there is also Zero Waste hierarchy.

The fact that recycling is not the first solution towards zero waste, is described within the Zero Waste hierarchy.[3] Take a look at the Zero Waste hierarchy together with EU waste hierarchy.

[2] Waste Framework Directive 2008/98/EC (amended with Directive 2018/851)
[3] The Zero Waste Masterplan, Zero Waste Europe (2020)

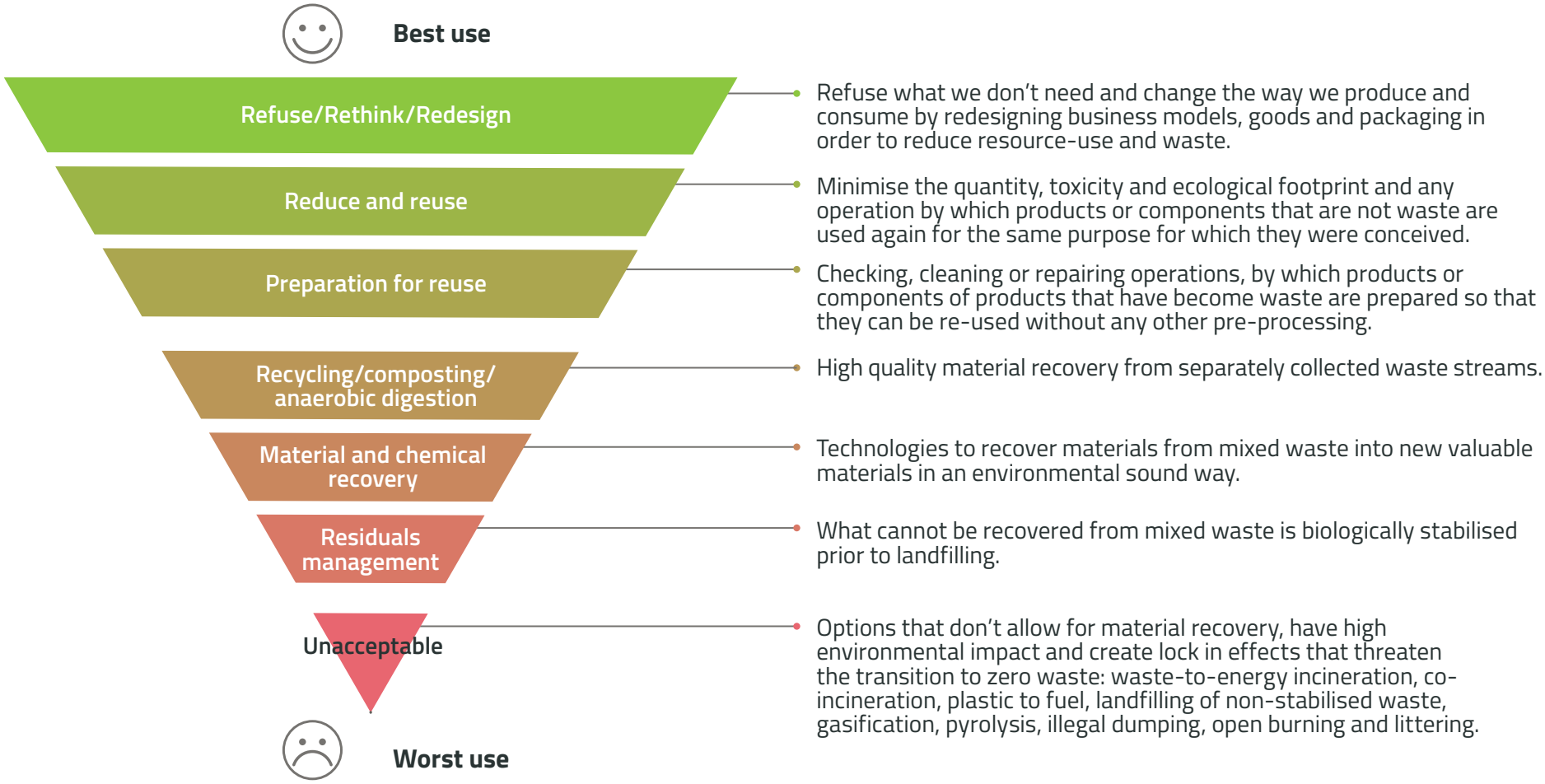
What are their differences and similarities? What could be the reasons for the differences?



It is important to note that while we prefer to use the Zero Waste hierarchy, the EU waste hierarchy is the one officially in use in the EU and it's the one that decision makers and waste management sector mostly refer to. So as Zero Waste Ambassadors we need to be ready to clarify and explain their differences and reasons for it.

Besides the most obvious visual difference in the direction of the pyramid, the EU waste hierarchy has two steps less and is less circular. The Zero Waste hierarchy gives more importance to the preservation of high quality products and materials, plus optimizing residual (mixed) waste treatment before opting for disposal. And the reason why the pyramids are presented in opposite directions is also a form of prioritising – in zero waste we want to show the focus on prevention, and minimisation of disposal. On the next page you can see a more detailed overview of the Zero Waste hierarchy.

Zero Waste Hierarchy



Zero Waste Hierarchy has been developed together with Zero Waste International Alliance[4]

[4] A Zero Waste Hierarchy for Europe, Zero Waste Europe (2019)

ZERO WASTE PRIORITIES: PREVENTION, REDUCTION AND REUSE

The best waste is the waste that is not produced in the first place. Hence intervention at the design stage is key to prevent having to manage waste that shouldn't exist. For example, food waste can be reduced with the right training, incentives and procurement policies in canteens, restaurants, hotels, hospitals and homes. Packaging-free shops and local markets can prevent packaging and food waste whilst providing fresh food. Most single-use packaging is superfluous and can be easily replaced with the right intervention at the city level. Coffee cups to go, containers for take-away food, throw-away water bottles or single-use straws are just a few examples of items that can be replaced with solutions that don't generate waste.

City authorities can also play a key role in facilitating the roll-out of refillable systems for beverages and reuse systems for nappies, as well as guaranteering availability to alternative waste-free sanitary items within local shops. For durable goods such as electronics, furniture or clothes, it is key to encourage repair and reuse operations in the form of second-hand shops or reuse activities and platforms both offline and online. Using the purchasing power of public procurement to change the market, promoting paperless offices, establishing material banks and libraries for tools are other ways to prevent waste from being generated at local level.

Additional reading:

Putting second hand first – the guidance from Zero Waste Europe outlines the key principles that every reuse strategy should prioritise, the benefits these strategies can bring for a municipality and highlights examples of how similar policies have been successfully implemented throughout Europe.

Zero waste is a vision of hope for the future.
Zero waste is an attitude.
More than a destination, zero waste is a journey, and it is open to anyone.

Cities, restaurants, hotels, events, communities, and individuals worldwide are already proving that a better world is possible by adopting the zero waste philosophy.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. But in reality we can't get our waste production to zero, so isn't zero waste a utopia? We can't just close all our landfills…
2. What is the difference between zero waste and the circular economy? Are they the same thing?
3. Why can't we just focus on recycling?

1. But in reality we can't get our waste production to zero, so isn't zero waste a utopia? We can't just close all our landfills…

You will say zero waste is an illusion and you are right. A waste-free society is not a goal, but a journey. Zero waste should be understood as a mindset, not as a physical outcome. There is no simple transition and it does not happen overnight, but with small steps to continuously reduce waste generation and improve waste separate collection. Zero waste has been increasingly adopted throughout the world by both urban and rural communities. In Europe, over 450 municipalities have committed to this journey through implementing impactful policies, community education and participation, and other action supporting that waste generation is taken to the minimum and from the waste generated, as much as possible is put back to circulation. In some Italian cities, like Bitetto, the separate waste collection rate increased from 16% to 78% while producing just 79 kg of non-recyclable (residual) waste per inhabitant in the period of 4 years. Bitetto has achieved these impressive results in such a short time through economic incentives to produce less waste (Pay-As-You-Throw), and by ensuring that citizens have a wide range of accessible information available to them to better understand the system, their waste generation, and how to reduce it. For more best practices see The State of Zero Waste Municipalities Report.

2. What is the difference between zero waste and the circular economy? Are they the same thing?

While they both have the same goals, they are two different models which complement each other in multifaceted ways. A circular economy is one that does not waste or pollute, an economy that keeps products and materials in use and rebuilds the natural capital of our ecosystems. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling. This is in contrast to a linear economy which is a 'take, make, dispose' model of production.

Zero waste is guided by principles known as the Zero Waste hierarchy which is focused on waste prevention that encourages the redesign of resource life-cycles so that all products are reused. Zero waste is a translation of circular economy or a practical toolkit that can be meaningfully implemented on the ground. Zero waste strategies perfectly integrate the circular

economy narrative into local level solutions, providing concrete guidelines and policies that municipalities can implement within their communities to ensure a healthier environment.[5]

3. Why can't we just focus on recycling?

Although we might reach high rates of separate waste collection, do we know how much of it is actually recycled? It is true that with source separation it is possible to increase recycling rates, especially when we talk about the recycling of biowaste (composting or digestion). However, when it comes to manmade materials like single-use plastics (e.g. wrappers or straws), real recycling happens very rarely. In most cases such materials with high calorific value are incinerated due to being unwanted – or downcycled because the new material has lost purity in comparison with virgin counterparts. Plus, recycling's effectiveness depends on the material type, economic value of the output materials (is there a market for them?) and safety for the environment and people. For example aluminium and glass are theoretically infinitely recyclable into material of the same quality, while paper and cardboard only enable a handful of cycles. So in order to reduce the material and energy consumption without reducing living standards, working on waste prevention, minimisation, raising awareness, lasting product design, proper treatment, Extended Producer Responsibility, etc. is sorely needed. For more information about recycling see the *Waste treatment* chapter.

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?**
- **In your experience what is the hardest thing to explain to people about zero waste? Why do you think it is so?**
- **What is the difference between looking at zero waste as a lifestyle and as systemic change?**
- **What good examples do you have from reuse and prevention?**
- **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?**

[5] Creating a methodology for zero waste municipalities, Zero Waste Europe (2020)

THE ZERO WASTE CITIES MODEL

Opening questions for the reader before reading:

- Why focus on cities/municipalities with zero waste instead of individuals or national governments?
- What do you think makes a Zero Waste City?
- Where are the Zero Waste Cities in Europe today?
- What would be the reasons for a city to want to become zero waste? What would be the reasons why they wouldn't?

'Zero Waste City'

Any municipality who has committed to become zero waste by a specific timeframe, through the implementation of local policies that create a system which simply does not generate waste in the first place.

"Zero Waste Cities" is a term used by Zero Waste Europe and their Zero Waste Cities programme, which is dedicated to help cities and communities transition towards zero waste. It brings together an European-wide collective of expert knowledge for local stakeholders to implement best practices, as well as providing mentoring and recognition for municipalities wishing to implement zero waste strategies. Zero Waste Cities is jointly run by Zero Waste Europe in Brussels and its member organisations throughout Europe. It is worth noting, though, that the Zero Waste Cities movement is global, with other municipalities also committing to zero waste and implementing activities in other parts of the world. For more information about the Zero Waste Cities work outside of Europe, check the website of Global Alliance for Incinerator Alternatives (GAIA).

A great focus is placed on municipalities as this is where **waste is created, managed, and most visualised for the majority of people** – and, therefore, is where the biggest impact can be made. In most countries, municipalities are the ones responsible for the collection, management, and reduction of waste in their area, organised via public, private, or hybrid waste companies. Furthermore, greater emphasis has been given to zero waste at the local level as this helps empower community stakeholders on their collective journey. By working with local households, businesses, schools, and the entire community, municipalities can embed zero waste behaviours and policies within the community, ensuring the long-term strength and viability of such strategies.

Ambitious EU legislation regarding waste and recycling is in place today, whilst the EU's **Green Deal and Circular Economy Action Plan 2.0** will provide further requirements and incentives for Member States to transition towards a circular economy. While national governments are the ones responsible for reaching these goals, their fulfilment will require local authorities to accelerate and change gears in the coming years. This means that prevention and reuse policies are designed and implemented effectively, whilst the separate collection of high-quality recyclable materials becomes the norm. With lowering levels of waste generated in Europe, this will facilitate the phasing out of disposing waste into landfills and incinerators, with increased emphasis placed on the positive impact this will have on achieving the EU's target of becoming carbon-neutral by 2050. For more information about what targets are set by the European waste policy, check the *Waste policy and advocacy* chapter.

DEFINITION OF A ZERO WASTE CITY

What do Zero Waste Cities do differently from other cities?
What would your city need to do differently?

Zero Waste Cities all hold one central feature: the desire to keep improving and optimising their existing strategies to reduce waste even further. Whether a municipality is at 7% or 70% separate collection rates, it can always be better, and it is this desire which sits at the heart of our approach.

The foundation of a Zero Waste City is an effective waste collection, one that allows for high-quality recyclable materials to be collected, including most notably organics. This is a door-to-door (kerb/curbside) separate collection system, which delivers that quality.

Why is the door-to-door collection most effective, and why does it give the best quality materials for recycling?

If you are unsure of your answer, you can read more about this from the *Waste collection* chapter.

However, Zero Waste Cities go beyond just recycling by creating and maintaining systems that prevent waste from occuring in the first place. Policies that **prioritise reuse** are adopted, such as laundry systems for cloth nappies, whilst municipalities can set a legal and regulatory framework to enable business-led solutions to flourish, such as Deposit Return Schemes and packaging-free shops.

Furthermore, a key distinction of our Zero Waste Cities is that they commit to work towards **phasing out** their use of **rigid residual (mixed) waste management** facilities that do not allow for the constant improvement of waste prevention and recycling rates. Zero waste programmes, in the long-run, only accept residual waste management facilities that:

- Maximise the recovery of recyclables,
- May be progressively converted into recycling platforms,
- Avoid any thermal treatment, which is considered as "destructive disposal" and a loss of resources.

All Zero Waste Cities implement policies which prioritise the upper end of the waste hierarchy.

THE FRAMEWORK OF A ZERO WASTE CITY

Zero Waste Cities have acted as pioneers for others, consolidating the principles for operationally optimised, cost competitive schemes. Key practices within these strategies include:

- The separate collection of dry recyclables.
- The separate collection of organics.

- The implementation of Pay-As-You-Throw (PAYT) schemes or other economic incentives.
- Reuse and repair initiatives.

One key element to highlight is **residual waste audits**, as they expose materials that are hard to recycle/reuse, and this is a mighty powerful tool in generating messages to industry representatives, reminding them of their responsibility for redesigning such products that cannot be reused, repaired, or recycled. Furthermore, these audits have been used to promote new business models that provide solutions to the most problematic materials, such as centralised washing services for cloth nappies and rental services for reusable tableware.

A residual waste audit or assessment

is the process of understanding what remains in the non-recycled bin. The process includes collecting residual waste from a certain % of local households, and then analysing this to collect data on the type and volume of materials found.

Residual waste assessments are fundamental within a local zero waste programme, as they help municipalities understand what continues to not be recycled. Local authorities can then use this data to better design and optimise the system, whether that's reducing collection rounds for residual waste or increasing educational activities on the types of plastic that can be recycled but may currently still be put in the residual waste bin.

An example of using a waste audit for zero waste:

Capannori, Italy was the first municipality to have formally committed to a zero waste programme in 2007. After reaching around 80% separate collection, audits by their Zero Waste Research Centre found a growing number of coffee capsules which are impossible to recycle. The information was passed on to industrial coffee-makers, who started dedicated research for reusable or compostable capsules (which can be collected together with organics).

Whilst separate collection for recycling and composting has been the cornerstone for local implementation of zero waste programmes (it's effectively the "low-hanging fruit"), lately we have seen a growing focus on reduction and reuse. This will surely be the next step to make a dent in the already minimised amount of residual waste, so as to make further progress towards the magic number: "zero". Propelled by the new vision of a circular economy, an increased emphasis on reduction and reuse is the foundation of a long-term roadmap to sustainability.

In the meantime, optimised kerbside (door-to-door collection) and PAYT programmes are helping us minimise disposal and keep materials/resources in the loop in their best quality for as long as possible. Municipalities that already achieve 80-90% separate collection rates, and consistently less than 100 kg/person residuals a year (in both rural and urban areas), show us that not only is it sensible to adopt a zero waste approach, but that it is also possible and effective.

On a practical level, we talk about **10 steps** for a municipality to become zero waste.

Before checking the list below, what kind of 10-step plan would you make for a municipality starting from scratch?

10 steps towards becoming a zero waste municipality

1. **Source separation** – beginning at the household and business levels (the source of municipal solid waste generation), individuals separate recyclable materials from non-recyclable ones.
2. **Door-to-door collection** – it is then the responsibility of municipalities to organise the collection of as many recyclable materials as possible directly from households/businesses. This includes paper/cardboard, plastics, metals, glass and, most importantly, organics.
3. **Composting** – once food and garden waste is being separately collected and therefore of a high quality, Zero Waste Cities should establish infrastructure and incentives for community members to compost. This could be done either at home or via community compost centres; if neither are suitable, larger composting sites can be established.
4. **Recycling** – with higher amounts of recyclable materials being collected, which are less contaminated due to their separation and, therefore, of a higher quality to the secondary material market, municipalities should be able to operate effective recycling systems that form the foundation of a Zero Waste City. Revenues can increase and the amount of waste sent to landfill/incineration can be dramatically reduced in a short period of time.
5. **Community reuse and repair centres** – every Zero Waste City should recognise that recycling alone is not enough, and therefore a culture and system needs to be established locally which prioritises reuse and repair. One of the biggest policies available to municipalities is to create community reuse and repair centres, where individuals can bring materials that otherwise would have been previously discarded, so that they can be repaired and prepared for reuse again.
6. **Incentivise waste reduction** – economic incentives should be introduced to support the community to reduce their waste further. Most commonly this is done via a Pay-As-You-Throw system, which introduces a higher fee for households and businesses that generate the most waste. However, many other options are available to local authorities, such as rewarding homes which compost with discounts to local services and businesses.
7. **Zero waste research** – zero waste systems make waste visible. Cities adopting such strategies should continually conduct regular research and analysis (e.g. residual waste assessments) into the waste that is not being recycled. With this information, municipalities are in a much better position to understand what isn't being recycled, so that policies can be put in place to address and overcome these remaining challenges.

8. **Banning single-use items**– municipalities have direct control over the events and activities which are held in public spaces and buildings. One of the best ways to reduce waste and also send a strong message to the community is for municipalities to ban all single-use materials in all public spaces, events and buildings, with reusable alternatives offered instead.
9. **Residual separation and stabilisation facility** – an important aspect of managing the dwindling amount of residual waste that's being generated is its proper stabilisation. Stabilisation means that residual waste has been properly treated to remove as many recyclables as possible and to reduce its fermentability. It's a key method in helping reduce subsequent toxics and greenhouse gas emissions from arising once the waste is landfilled. All Zero Waste Cities recognise the incompatibility of incineration within a society that is circular and zero-carbon. Therefore, alternative facilities should be established to conduct a post-sorting on the residual waste and maximise the recovery of recyclable materials, which is then further supplemented by the biological stabilisation of the remaining waste.
10. **Transition to safe landfill** – with the remaining residual waste biologically stabilised, this should be sent to a safe landfill instead of any form of burning. Over time, as the effectiveness of municipalities' reuse and recycling systems increase, the volume of residual waste will continue to decrease and, therefore, reduce the need for, and impact of, landfill sites.

Example of a Zero Waste City compared to a city without such a commitment

City with a traditional waste management system	City with a zero waste system
Different recyclable materials collected altogether in one bag or bin	Recyclable materials are separately collected in different bags and bins
Citizens put their recyclable materials into shared bins on the street	Citizens separate recyclables into bins at home which are collected from the kerbside
Citizens do not compost their organic waste	Citizens are provided with equipment and education on how to compost at home, whilst community compost centres are established with the help of the city
All citizens pay a standard waste fee	Citizens pay a varied waste fee dependent on the volume of waste they generate
The city has a fixed long-term contract with a landfill or incinerator	The city has a flexible residual waste disposal option that does not lock in the need for continued waste generation
Businesses who want to offer reusable alternatives must do this by themselves	Businesses who want to offer reusable alternatives are provided with financial and/or knowledge support and/or put in contact with companies that can provide the reusable products/infrastructure
The city does not have any data on what waste is not recycled	The city conducts regular residual waste assessments to understand the composition of the current non-recycled waste, and uses this to inform future policy-making processes
Public events, buildings, and spaces offer single-use items, such as cutlery and cups	Based on a common policy, public events, buildings, and spaces only offer reusable options
Citizens are unaware of where they could take Items that need repairing, which will otherwise be discarded and waste	Citizens can easily access information on a large number of reuse and repair opportunities within the city

Benefits of becoming a Zero Waste City

There are several potential and meaningful benefits available to local communities who adopt a zero waste approach. We break these down into 3 main categories: economic, environmental and social.

Before checking the list below, what benefits would you write under each category?

Depending on the local context, the benefits for each city will differ. For example, for municipalities with Extended Producer Responsibility (EPR) systems, the economic benefits will differ to those where no EPR exists. However, here are the general benefits from which communities have benefited over the past decade:

Economic

- Reduced operational costs for municipalities as the collection system becomes more optimised with less residual waste.
- Higher revenues for the municipalities as they have a higher volume and better quality of recyclable materials to sell onto the secondary market.
- Fewer fees having to be paid by the municipality to send the residual waste to landfill or incineration.
- Fewer capital investment required for large scale incineration technologies, with zero waste infrastructure offering a much cheaper and yet more effective methodology for reducing waste.
- Zero waste systems create more jobs throughout the whole supply chain and therefore municipalities can increase local employment. On average, zero waste policies create 10x more jobs than landfill or incinerator alternatives.[1]

Environmental

- Obviously, zero waste policies result in less waste generation. This means less pollution, via discarded waste, leaks into our oceans, land, soil, and our air – doing vast amounts of damage to our planet's biodiversity and ability to fight climate change.[2]
- Zero waste systems produce less greenhouse gas (GhG) emissions throughout the whole cycle of a product. If a material can be reused, then there is no need for extraction and manufacturing, which damage landscapes and biodiversity and are huge sources of GhG emissions. On the other hand, the incineration of materials continues to unnecessarily contribute towards climate change, as do ongoing methane emissions from organic material ending up in landfills instead of composting sites (proper composting is chemically a different – managed – process from what happens to organic waste in landfills).

[1] Ribeiro-Broomhead, J. & Tangri, N. (2021). Zero Waste and Economic Recovery: The Job Creation Potential of Zero Waste Solutions, Global Alliance for Incinerator Alternatives.

[2] The True Toxic Toll: Biomonitoring of incineration emissions, Zero Waste Europe (2021)

- A system using reusable materials and less single-use packaging is one that has much less toxic chemicals in circulation, which are doing severe damage to the natural environment and human health. Chemicals found in many forms of single-use packaging are proven to be dangerously harmful to human health There is also growing evidence showcasing the negative impact that toxic emissions from incineration plants are having on local communities.[3]

Social

- Zero waste jobs are jobs in sustainable fields of work, therefore helping to protect the livelihoods of those involved in the long-term. By supporting businesses and social enterprises which focus on reuse, repair, redesign and recycling, local authorities can help empower their communities – integrating and upskilling individuals into the wider community.
- Zero Waste Cities are cleaner and safer than most of today's cities, bringing pride and a sense of collective togetherness to the community. For example, community composting, repair cafés, cooking with food discarded by supermarkets, to name just a few, are all zero waste activities which help bring the community together and build its resilience as a collective unit.
- Zero waste is all about local solutions to manage resources. This means investing in new business opportunities that design waste out of the system, in awareness-raising and education together with optimising separate collection to manage the waste locally. This is in stark contrast to traditional waste management, which is capital investment- and technology-intensive. This means investing money in creating local jobs that cannot be delocalised later down the line.

The exact benefits available to each municipality that wants to become zero waste will differ every time, depending on the specific context and regulatory environment. However, in typical European conditions, adopting a well-designed zero waste programme will help local authorities reduce costs of the waste system, create local jobs and, obviously, reduce the volume of waste that is generated.

Additional reading:

Zero Waste Masterplan – an in-depth introduction to zero waste and what it means for municipalities.

Zero Waste Cities Certification – launched in 2021, the Certification provides the most robust and structured framework on what a Zero Waste City is.

State of Zero Waste Municipalities Report – the most comprehensive overview of the current network of Zero Waste Cities and the impact they are having.

[3] Food Contact Materials, Zero Waste Europe

Zero Waste Cities best practice case studies – presentations about the best examples of zero waste at the local level.

Zero Waste Cities website – full of resources on the topic and the number of Zero Waste Cities across Europe.

The Keep it Clean Plan – a practical guidebook on how to start implementing zero waste on different levels of society.

Factsheet on the cost effectiveness of zero waste – showcasing the economic benefits of zero waste.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. How do I know where my city stands according to the waste management system and policies?
2. How can I get started in supporting and planning the transition of my city to zero waste?
3. What are the best examples from European Zero Waste Cities?

1. How do I know where my city stands according to the waste management system and policies?

For potential scenarios and suggested steps please refer to:

- The Masterplan (part 3) where you will find the questions to help a municipality get started and examples of different starting points in different contexts around Europe.
- These 3 starting scenarios to help municipalities overcome the most common challenges facing them today.

2. How can I get started in supporting and planning the transition of my city to zero waste?

Please refer to the 10 clear steps for designing a zero waste plan at the municipal level, as well as the documents linked above as they each provide a good overview of how to begin with your local municipality. The main resource is the Zero Waste Masterplan by Zero Waste Europe and the toolkit Creating a methodology for zero waste municipalities, which includes the savings calculator that has been designed to help you visualise and understand the benefits that adopting zero waste policies can bring to your local area.

3. **What are the best examples from European Zero Waste Cities?**

   You can find many examples from State of Zero Waste Municipalities Report and various case studies of zero waste frontrunners on how a city can move towards zero waste.

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 are responsibilities divided among different waste management stakeholders in your country?**
- **Who could be your main allies in establishing a Zero Waste City? Who would likely oppose it the most?**
- **What initiatives are already in your city that could form part of a Zero Waste City ecosystem?**
- **What do you want to take with you from this chapter?**
- **What are the next steps, if any, that you want to take in your work regarding this topic?**
- **What do you want to know more about?**

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?

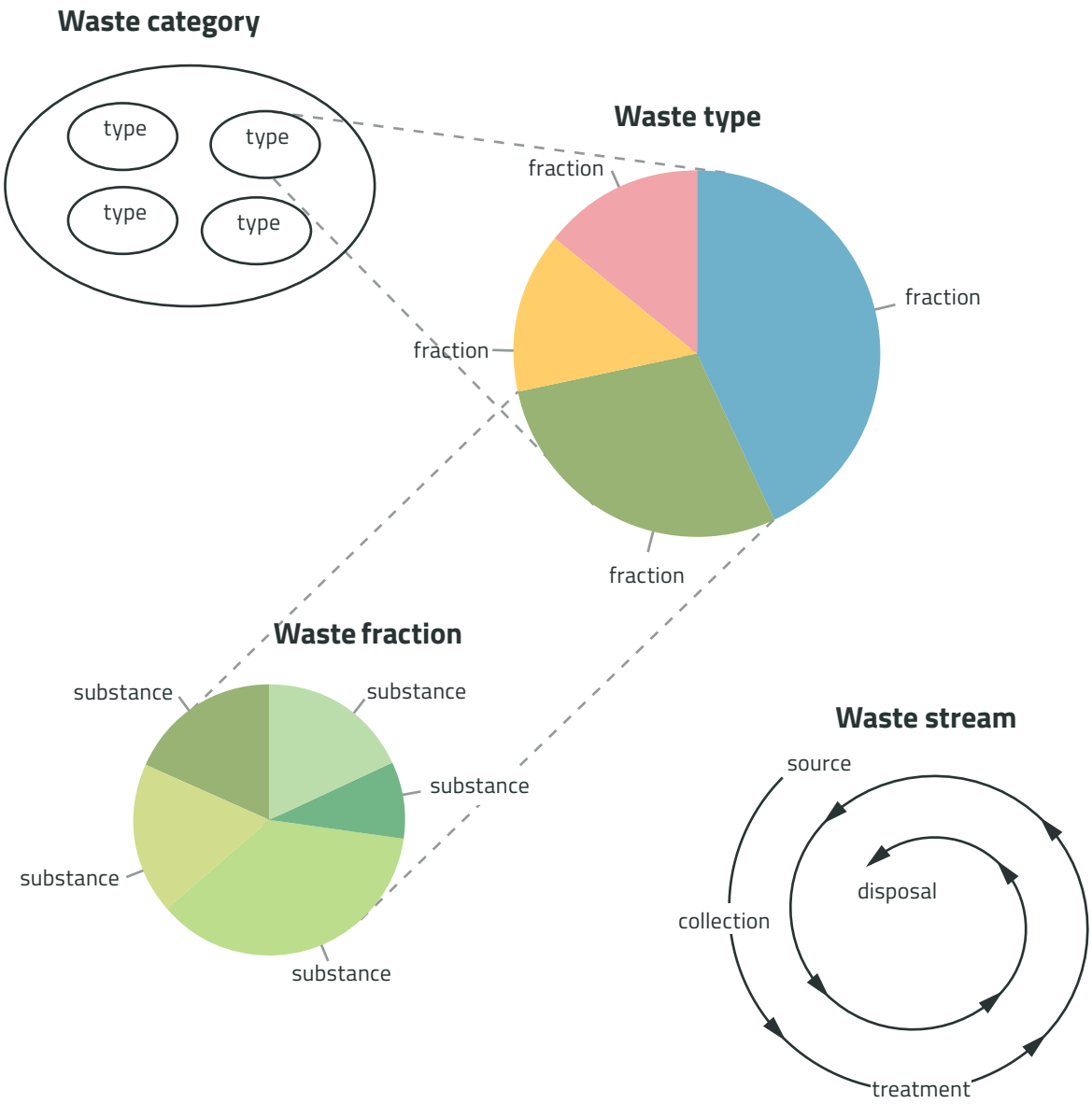
What would your plan of action be? You can also write it down and see if you can get some more hints from this chapter.

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?**

WASTE COLLECTION

Opening questions for the reader before reading:

- What waste fractions[1] are collected separately in your municipality? How is the collection organised?
- How transparent and understandable is the waste collection system in your municipality?
- What are the characteristics of a good waste collection system?
- How does waste collection influence material recovery?
- What do you need to know before selecting which collection system suits your local context the best?

[1] for waste unit terminology, check the *Waste data basics* chapter.

Waste collection is a generic name for a series of activities on how waste from the location of its generation flows to the treatment or disposal facility. It includes:

1. The gathering of waste, including the preliminary sorting and preliminary storage and
2. Mechanical processing of waste for the purposes of transport without changing the composition and nature of the waste.

Let's start with an exercise.

Design a waste collection system for scenario 1 or 2 (select one). Do not yet read the chapter to the end, try to see what you can come up with on your own. Just do the brainstorming!

What would you suggest and why?

Scenario 1

- The municipality has 200,000 inhabitants. The population density is 4200 pers/km².
- 70% are high-rise block houses, 30% are private houses with gardens in the suburbs.
- The total waste per capita per year is 550 kg, which includes a lot of waste coming from local cafes and restaurants.
- The average income of local residents is below that of the EU. Most residents' income comes from the tourism and hospitality sectors.
- Challenge of the language diversity: 5 different languages are spoken by residents.
- The municipality partners with the local private waste management company which is responsible for implementing the waste and separate collection systems.
- Currently there is a 35% separate collection rate in the municipality:
    - Glass, paper and cardboard, plastic bottles and metals by drop-off system
    - No separate collection of organics
- Waste transports to a distant incineration plant, which holds a contract for 6 more years.
- There is one public recycling centre for hazardous, bulky, and garden waste, which is 10 km outside of the town with low participation rates of around 5-10%.
- Residents pay a flat base rate of tax to the municipality regardless of the amount of waste they produce or recycle.
- The municipality is interested in introducing a Pay-As-You-Throw scheme to offer fair price.

Scenario 2

- The regional government consists of 4 small municipalities of 2,000-3,000 inhabitants each with 10-15 km distance between them. The population density is 820 pers/km².
- There are no high-rise buildings. 100% are private houses with access to a garden.
- Total waste per capita per year is 350 kg.
- The average income of local residents is above that of the EU.
- 3,000 people of additional workforce commute to the region daily and weekly from neighbouring foreign countries.
- The regional government has a contract with a private waste management company to perform all municipality-driven decisions.
- There is some separate collection for mixed recyclables. No biowaste is collected.
- Mixed restwaste is disposed of in a landfill with a gate fee of 200 euros/ton.
- There is no central drop off location for hazardous and bulky waste; the service is available only on demand twice a year.
- Currently, residents pay a fixed rate for mixed waste and 50% less for recyclables.

What are the key factors about waste collection that you take into account?
What kind of waste streams/materials do you plan to collect? Why so?
How would you justify or explain your choices for the waste collection set up?

After making your plan, continue reading the chapter and see if it gives you further ideas.

Waste collection is an **organisational step:**

- Between those who generate waste and those who run the waste management system. In typical contexts, collection of municipal solid waste (MSW) is organised and managed by local municipalities. Proper collection avoids uncontrolled dumping and littering. The alternative option is that collection of MSW is organised by local municipalities, but work is done by private companies, based on public procurement.

Waste collection is a **technical step:**

- Between the place where waste is generated and the place where waste is treated. Collection technology determines which treatment technologies may be feasible in the further processing of the waste. Waste collection often accounts for ⅔ of all the cost involved in waste management and therefore has to be cost-effective and optimised.

There are many technical and organisational issues to consider when designing a waste collection system:

- Containers for the waste and recyclables,
- Collection vehicles,
- Collection frequency,
- Collection routes,
- The fee scheme for citizens and businesses.

Whatever you suggest, you have to **communicate it to citizens** because proper communication is essential.

Collection and transport of waste is the most important part of the waste management system for many reasons which we'll discuss in this chapter.

COLLECTION SYSTEM LOGISTICS

Separate collection is the cornerstone of high-quality recycling.

Why is it so important?

It is important to decide how the residents give source-separated recyclables to the waste company. It can be organised in a way that they **bring** it to the designated recycling spot (recycling centre) or the waste company **takes** it from each doorstep where waste was generated (door-to-door or kerbside/curbside system).

Door-to-door collection is proven to be the most effective model for those wanting to have better quality of materials, but is more expensive initially to arrange and run. Kerbside (door-to-door) collections are common in many countries such as Italy, Germany, Austria, Belgium. Collection is commonly weekly or bi-weekly. When you separate key recyclables, including, most importantly, the organics as these are the most fermentable and therefore require more frequent collection rounds, you can reduce the frequency of residual waste collection to once a fortnight, given it will include mostly lightweight packaging.

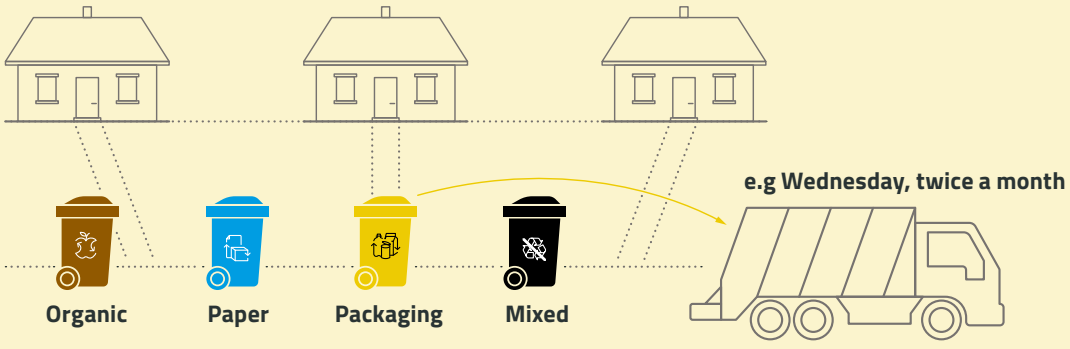
In the most intensive kerbside schemes, such as in Italy, a capture rate[2] of 80-100 kg/capita per year of just food waste is commonly achieved, equating to a participation rate of around 80%, with less than 5% impurities (waste other than organic). The capture rate with public bins (bring-system) is typically lower than for kerbside collection, around 20-50 kg/capita per year, and impurities are considerably higher, reaching averages of 10-15% in many cases.

[2] Capture rate is the % of the recyclables captured from separate collection. It is calculated by dividing the weight of recyclable material collected for recycling by the weight of all recyclables in the waste stream.

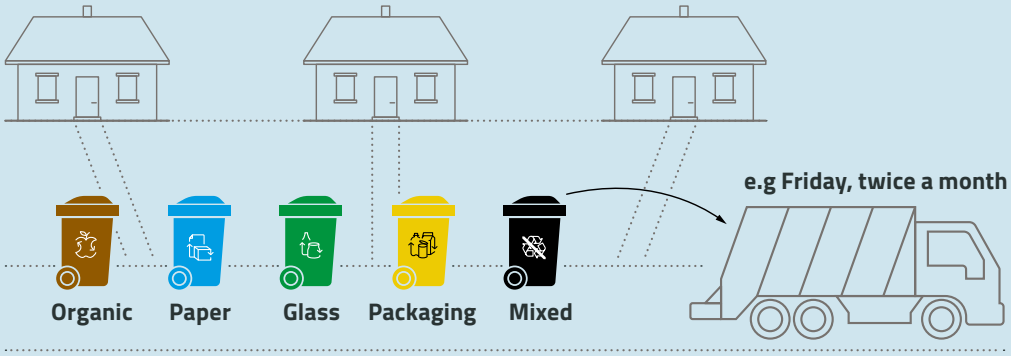
Examples of kerbside schemes

3 streams

4 streams



5 streams



Collection days and frequencies vary across the world. In hot cimates collection is organised more often, above all for organics and residual waste.
The colours of the containers for different waste streams may vary grom country to country.

Bring-systems (where people have to bring their waste to dedicated points) rely on sparsely placed waste bins or recycling centres. They are anonymous; therefore, the quality of materials is lower.

In developing countries, the informal collection system offers a living for many waste pickers, however, it is preferred to incorporate them into some kind of official network to protect their health and rights. One example of such local community cooperative can be found in Tanzania.

Waste fractions and streams

Separate collection of waste

The activity where waste is kept separately by type and nature to facilitate further handling. The decision on how to separate waste and into which fractions, is a matter of local legislation.

The list of waste fractions which are source-separated could include:

- **Waste paper.** Usually newsprint, office paper and paper packages are collected together, including corrugated cardboard.
- **Mixed packages.** In some countries soft plastic and hard plastic are collected separately, often referred to as PMD (Plastics, Metals and Drinking containers) given their similar characteristics and ease of sorting.
- **Glass bottles.** In some countries glass is separated according to colours: transparent, green, brown; but in some countries mixed colours are collected and later sorted by sensor-sorting system.
- **Organic waste.** The main objective would be receiving food waste from households. Food waste should be collected at least once a week due to its fermentability and smell.
- **Others.** PET bottles without deposit, batteries, textiles, shoes, cooking oil and many other site-specific fractions are collected as well.

Why do you think these waste fractions are collected separately most commonly? Why, for example, would metals not be collected separately?

Bins are marked by colour to simplify collection. Unfortunately, no uniform EU-wise colour coding exists. However, there are some initiatives for standardising colour coding.

An example:

Why would it be good to have the same colour coding for all waste fractions everywhere? Why do you think it isn't so already?

Organic or biowaste is the sum of two fractions of biodegradable waste:

- Park and garden waste (green waste), and
- Household kitchen waste (food waste).

The main output of the recycling of biowaste is a stabilised and sanitised organic material. Depending on the recycling process, the material can be digestate (anaerobic process) or compost (aerobic process), which are both excellent soil improvers. Although many countries claim to collect biowaste, they organise only the separate collection of green waste and do not provide any solution for citizens' food waste.

This will change: kitchen waste has to be collected separately in the EU no later than from 1st January 2024. The composition of collected biowaste relates to cultural and social factors. In areas with single-family houses, green waste is often the main fraction found in the waste bins – particularly in spring and autumn – whereas in regions with many high-rise apartment buildings, food waste is the main fraction throughout the year. This has to be taken into account when designing the collection system.

Centralised 'brown bin' collection of organics may also be replaced or combined by community composting and home composting. This helps save municipal costs with less collection needed whilst also connecting households with a more natural-based solution for managing their food scraps.

Why does organic waste need special attention in waste collection?

Collection frequency

What is the frequency of waste collection, what should be the schedule?

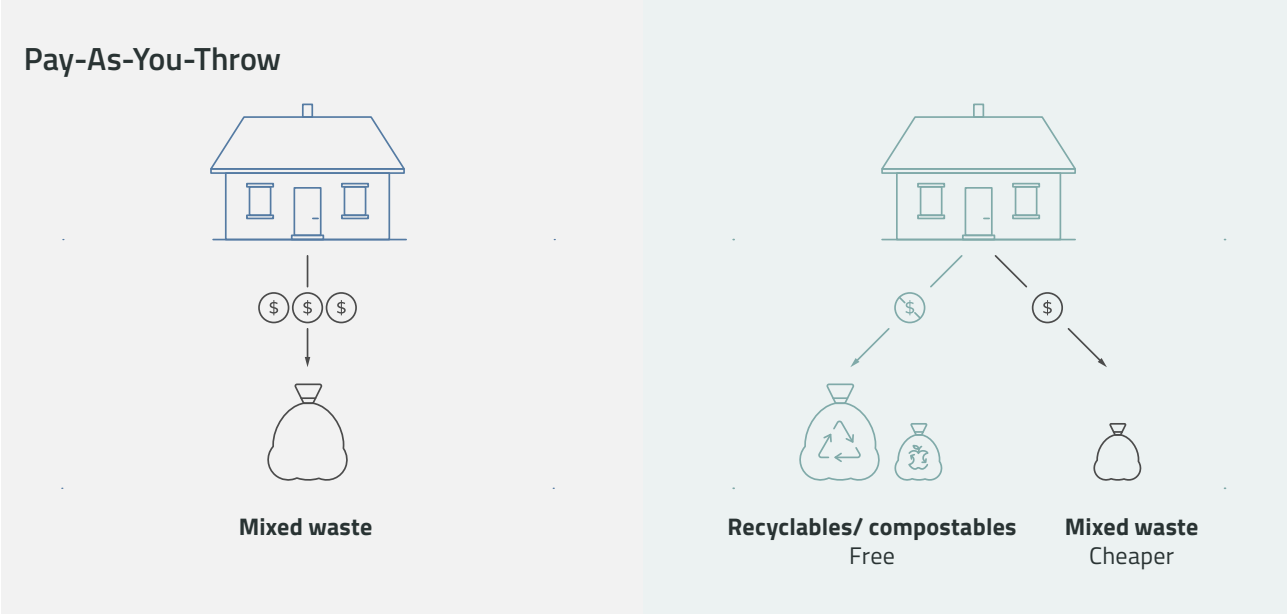
Collection frequency is usually higher in hot climates and lower in cold climates. Where food waste is collected more frequently, both acceptance of the system and participation are usually high, since nuisance odours are avoided. Food waste has to be collected even if the container is not full, given the odours it produces. Whereas glass, packaging, paper and residual waste can all be collected less frequently as they can sit in a bin for a long period of time with no big negative effects.

The fee system

What are the costs of waste collection for the citizens?

The fee system is important to foster participation in the separate collection schemes. **A Pay-As-You-Throw (PAYT)**[3] fee includes a fixed part (preferably 60-75%) covering the costs of collection and a variable part rewarding good separation, and preventing and penalising the generation of poorly separated waste. Other flexible fees can be applied through bag purchases (bags with municipality logos or stickers, indicating which waste is collected) or the purchase of differently sized bins (one bin for each type of waste). PAYT schemes should incentivise lower residual waste generation, often achieved by better sorting but also importantly via less consumption of waste.

A simplified image on Pay-As-You-Throw (PAYT) system:



Bins and containers

What does it matter what kind of containers do we have?

The way waste is stored tries to find a compromise between being cheap and nice for waste owners whilst also offering reduced workload for waste collectors, helping optimise collection rounds:

- **Manually handled receptacles.** Paper or plastic sacks and plastic or metal bins offer flexibility in collection waste at the source. They are manually handled and carried to the collection vehicle. A problem with bags is the vulnerability to sharp items. Spilled waste from broken bags creates littering but sharp objects may also injure workers.

[3] More info from: Pay-as-you-throw, European Commission

- **Containers.** Plastic wheeled bins were taken into use to increase workers productivity and reduce workload because wheeled bins are easier compared to no-wheeled metal bins. Wheeled plastic bins are used worldwide, not only for residential waste but also for commercial, light industrial waste as well as source-separated materials. In Europe, standards exist for both two- and four-wheels bins.
- **Large containers.** Larger containers have a volume of 1,5-12 m^3. They are emptied into a collection vehicle on-site; or transported individually to the treatment or disposal facility, and back.
- **Underground receptacles.** In cities with narrow streets, it is difficult to find space for bins. Cities try to overcome this problem by placing waste containers in underground pits. These are emptied by a small crane. Underground automated waste conveying systems along with robotic sorting systems will become typical in highly developed and densely populated areas.
- **Plastic bag instead of bin.** Sometimes there is no space for bins, or bins just turn out to be too expensive. Alternative would be collecting waste in plastic bags. If waste is light then picking a bag is faster than rolling a bin.

Containers may have personalised electronic locker systems. Dedicated electronic keys or cards are measures, which intend to reduce and prevent contamination with other materials; or prevent using the container by non-residents of the particular area. The last one is a question of funding the collection, which is often from local taxpayers' money.

WASTE TRANSPORT

Waste transport

The shipment of waste from the place of origin to the place of destination. It also includes the loading and unloading of waste into the collection truck.

If the transportation distance is long then waste may be loaded into larger trucks in transfer stations. A transporter of waste does not become the owner of the waste if its only task is to convey the waste shipment to the point of destination, unless otherwise agreed by the contract. The proximity between the collection round and the destination of the waste is an important factor to consider when designing a collection system, as this can have a big impact on GhG emissions.

Waste collection vehicles

Transportation of waste is expensive. One would suggest optimising it by offering service with bigger and heavier trucks, however, it is limited to how much waste a collection truck may legally contain. EU Directives limit the truck weight to trucks, one example. It has become important to compact the waste thus reducing the air-filled space and increasing the specific weight.

The trucks that are handling very large containers load them by rolling on and off (multilift-type) by using hooks or winches; or lifting them (lift dumper-type) by using chains and booms. Multilift systems are most comfortable because they do not require the driver to leave the cabin.

Multi-compartment trucks enable collecting several waste fractions in one go. A problem in this kind of collection is that when one of the compartments fills up, then the vehicle needs to be unloaded, even if the other compartments remain empty. This can be optimised however by having good data on waste generation by local citizens over a recent period of time.

Now check your initial waste collection proposal again and if needed, redesign according to knowledge from this chapter.

Based on your plan, what kind of communication would you design for households (how do you ask households to act and why) on these points:

- Waste fractions you suggest to collect
- Types of bins and how they are labelled
- Collection rounds frequency
- Fee system

What do they need to know about their waste collection? For example, how do they learn and remember the schedule?

For communications' planning, you can also check the *Communication and storytelling* chapter.

Additional reading on separate collection:

Guidance for separate collection of municipal waste

Guidance on Separate Collection - focus on biowaste collection

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?
- What kind of changes would you make in the waste collection system in your municipality? What do you think is the key challenge for your municipality?
- 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?

WASTE TREATMENT METHODS

Opening questions for the reader before reading:

- Why is it important to know about waste treatment methods as a Zero Waste Ambassador?
- How do you think a municipality or waste company thinks about waste? Is it the same as you?
- What kind of waste treatment methods do you know?
- What are the main arguments that determine which waste treatment method is selected/proposed?
- What kind of waste treatment methods are in use in your municipality?
- What do you think makes a waste treatment method good or bad?

We are not placing zero waste into an empty space, but in an already existing infrastructure. A Zero Waste Ambassador should know the basics of waste management, e.g. waste hierarchy and technologies which are described in it. It's important to know the global, EU and national target values, to be informed about the roadmap of waste management and circular economy. It is necessary to link waste management with other sectors, be it transport, energy or construction. Municipalities, but also producers of our consumables have obligations and responsibilities which are set by law. Zero waste has to contribute to the legal responsibilities for municipalities or waste companies, zero waste has to become beneficial!

Before reading more into this chapter, think about why your municipality has selected the waste treatment options it has. What do you think were the reasons?

Future perspectives in Waste Management

Typical driving forces in waste management are:

- Public sanitation;
- Prevention of littering and illegal dumping on land and sea;
- Material and energy recovery;
- Savings and economic incentives;
- Producer responsibility;
- Need for remediation;
- Urbanisation.

Some of the new challenges:

- Achieving Sustainable Development Goals (SDGs) – these 17 UN-defined global goals are fundamental for mankind to preserve opportunities to live in dignity and prosperity across generations. The goals cover ecological, economic and social sectors.
- Lack of resources and secure supply chains – we are running out of metals which could actually be harvested from waste.
- Resource efficiency – we must improve utilisation of resources through smart products and eco-design.
- Climate change – proper management of biowaste and reduction of CO_2 and CH_4 will help to slow down the speed of climate change.
- Alternative energy sources – energy-rich waste fractions provide electricity and hot water in urban areas, and they replace fossil fuels.
- New waste streams – e-devices, flat screens and IT-equipment, smart clothes and houses, internet of things, nanomaterials etc., will require treatment methods which did not exist before.
- Globalisation – we need to learn the treatment of materials which do not exist in each of our countries.
- Ageing population – elderly people have different patterns of consumption.

- Circular economy, life-cycle thinking, and green jobs – to replace the linear production and consumption routes.
- Extended Producer Responsibility – to finance collection and treatment of particular waste streams.
- Artificial intelligence and robotics – to allow automated waste processing.
- Crisis waste management – permanent or temporary waste collection systems, e.g. for refugee camps or in war zones.
- Zero waste – to manage waste in a manner that there is no need for discarding wastes.
- Urban mining – to handle our entire urban environment as a future quarry of new materials, etc.
- Improving treatment plants facilities.
- Decreasing the gap between policy makers and citizens to avoid conflicts when taking important decisions (for example a new anaerobic treatment plant) – public debate.
- Avoiding "waste tourism" (waste made in a place but treated somewhere else because of the lack of treatment facilities).
- Bureaucracy.
- Non technological obstacles (laws and regulations).

Increased GDP will affect the amount of food waste along its production chain, and leftovers at homes. The organic fraction will be more dominant in municipal solid waste (MSW), and the greenhouse gas (GhG) challenge has to be faced. Sustainable and cost effective treatment of biowaste will be a combination of composting and anaerobic digestion (waste-to-bioenergy), and nutrient recycling will offer the best solution. Bio-refinement of functional compounds from organic wastes will boost, but it will take ages to incorporate it into the waste management system on a large scale. Cross-border transportation of waste materials will become inevitable and should be seen as everyday practice, provided that it is well controlled by authorities.

Integrated waste management

Integrated solid waste management means the strategic approach to sustainable management of solid wastes covering all sources and all aspects, like:

- Pattern of waste generation,
- Source separation and waste segregation,
- Collection and transfer,
- Secondary sorting,
- Treatment,
- Recovery and disposal in a combined way,
- Production of secondary raw materials with an emphasis on maximising resource use efficiency.

Waste is separated into several fractions and not one; quality is evaluated and upgraded whenever possible; and waste is used as material, rather than disposed of in landfills. Integrated waste management employs several waste control and disposal methods such as source reduction, recycling, reuse, energy recovery or just incineration; and finally sanitary landfilling, to minimise the environmental impact of waste streams.

WASTE TREATMENT

Waste treatment refers to any activity that enables material recovery.[1] The waste sector prepares waste for recovery or disposal by using mechanical, thermal, chemical or biological processes on waste. This also includes sorting and packaging of waste for transport.

By treatment we aim to make waste more easily manageable by:

- Reducing the quantity of the waste,
- Reducing the hazardousness of waste,
- Improving the amount and quality of recovered materials,
- Facilitating its management or disposal.

Reduction of volume is achieved by crushing, shredding, and compacting the waste.

Sorting into individual fractions takes place by:

- **Hand sorting** (hand-picking, manual sorting). It is widely practised, but slow, dirty, unpleasant, unefficient. However, it is flexible and easy to organise.
- **Mechanical sorting.** Sensor-based sorting in the near infrared spectrum (NIR) is well established in Europe.

Properties of waste can be altered by washing, moistening, drying (thermal, biological), melting and granulating. Baling and storing is required for logistic purposes. Baling includes compacting into uniform shapes, and wrapping to avoid quality loss during storage and transportation.

Waste treatment is not a goal by itself, but rather a preparation step that enables further mechanical treatment.

When reading about different waste treatment methods below, try to think about their advantages and disadvantages first yourself, before looking at the lists.

Every method has them, they might be advantages or disadvantages just from someone else's perspective (like an elected politician or the owner of a waste company).

[1] For waste management terminology, check the *Zero waste basics* chapter of this handbook.

BIOTREATMENT

Organic wastes are materials originating from living sources like plants, animals, and microorganisms that are biodegradable and can be broken down into simpler organic molecules. This happens in natural cycles in our environment. In urban areas, however, we cannot rely on natural processes and have to use technology. Organic waste recycling is the process in waste management where organic wastes are recycled into useful products.

Composting on a municipal scale requires segregating the organic waste from other waste materials to ensure a high-quality end product – compost.

Composting is the process of decomposition of organics by soil organisms resulting in the recycling of nitrogen, phosphorus, and other soil nutrients into humus-rich components.

Composting differs from the natural degradation process because input of oxygen and moisture, temperature, and degradation process as such is monitored and controlled by the operator. There are quality standards for the compost, and the facility has to meet the emission limits which are set by legislation. Compost is used as a fertiliser and soil improver, because it enriches soils with nitrogen, phosphorus, organic carbon, and microorganisms.

Several composting technologies are practised depending on the space, the volume of organic material to be composted, budget, climate etc:

- Windrow composting is the cheapest and simplest, where organic waste is placed in a large pile known as a windrow and periodically mixed to introduce oxygen and promote microbial activity.
- More sophisticated windrow systems rely on force aeration, and covering the pile against weather conditions.
- Another method is in-vessel composting, where the process is controlled by a composting chamber.
- Enclosed systems are much more expensive than windrow systems, but they require less land because of the faster processing time and better control over odours.

It is important to consider:

- Quality, types and availability of input materials (the biowaste).
- Siting and sizing of a composting facility.
- Technical issues, stormwater and odour management, climate considerations, birds and vermins.
- Benefits from composting for waste producers, and fee system.
- Market for compost and product certification.

Anaerobic digestion (AD) is a biological process of converting organic waste into two usable products – biogas and digestate, a semi-solid fertilizer.

The digestate can be used for agricultural purposes and the methane-rich biogas can be used to generate electricity and heat. Organics are placed in closed reactors where oxygen-free conditions are maintained. Anaerobic microorganisms convert biomass into biogas and nutrient-rich residue which is called digestate. Biogas produced by anaerobic digestion is a mixture of CH_4, CO_2, and small amounts of H_2 and H_2S. Usually, the process requires two to three weeks.

When to use composting, when anaerobic digestion?

Small scale composting can be easily applied everywhere, by anyone, and it can be practised anywhere. It is a perfect opportunity to start with treating organic waste. Windrow composting of garden waste in open air is common for beginners. To become economic, the scale of composting has to grow beyond 10,000 t/y throughout. Large scale composting requires equipment and space. Air treatment is a must in case of reactor composting.

Anaerobic digestion (AD) requires special heated reactors and relatively high and a steady flow of waste. The revenues depend on the gate fee[2] of input material, price of biomethane, and ease of utilising digestate. It requires skilled personnel and strict safety measures, because methane is explosive gas. To become economic, the scale of AD has to grow beyond 20,000 t/y throughput. Both liquid and solid state AD are widely used. Home-size AD reactors are not possible. Along with AD treatment, the mass of waste does not change significantly. It means that the treatment residues, the digestate, have to be further treated. Quite often it is dewatered and post-composted. After that it can be used as common compost.

Advantages of biotreatment:

- Separate collection and treatment of organic waste reduces GhG emissions from landfills.
- If organic waste is separated from waste stream, then the remaining material (e.g. packages) are cleaner, making material recovery easier.
- The end product of biotreatment (both compost or digestate) are fertilisers, and also are improving quality of soil.
- AD produces biogas, which is an alternative to fossil fuels and is easily marketed.
- Compost reduces demand of mineral fertilisers.
- Locally organised biotreatment creates jobs.

Disadvantages of biotreatment:

- Treatment of organic waste is costly.
- It requires equipment.
- It requires odour and leachate purification.
- There can be some difficulties in marketing compost/digestate.

[2] 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

- Regardless of the quality, the compost or digestate is still considered waste, and has to be marketed under waste regulations.
- Process, if in open air, is weather-dependent.
- AD requires highly skilled personnel, because the process is sensitive, and the biogas is explosive. Gas requires additional cleaning.

MECHANICAL-BIOLOGICAL TREATMENT

As the name suggests, **Mechanical-Biological Treatment (MBT)** contains elements of mechanical treatment of waste, and then biological treatment of the finest part of it, which is rich in organics. An MBT plant is a type of waste processing facility that combines a sorting facility with a form of biological treatment such as composting or anaerobic digestion.

MBT plants are designed to **process unsorted mixed household waste**. MBT systems enable the recovery of materials contained within the mixed waste and facilitate the stabilisation of the biodegradable component of the material. This component is either configured to recover the individual elements of the waste or produce a refuse-derived fuel that can be used for the generation of power. The main idea of MBT treatment is to degrade organic material in a well controlled environment to avoid GhG emissions. Compared to similar degradation processes which take place in landfill, emissions are better controlled. After the organic fraction is composted or anaerobically digested, it should be disposed of to landfill. The concept of MBT was developed in the late 80ies to offer an alternative to waste incineration of unsorted wastes.

Why is MBT used?

MBT was developed to treat unsorted waste. It required no change in collection, therefore it was attempted for less responsible municipalities.

Advantages:

- Robust technology, well automated.
- Organics degrade – less GhG emissions.
- Anaerobic degradation is possible too – CH_4 can be captured and used for energy.
- Plastic-rich fraction can be converted to refuse-derived fuel (RDF).
- The finest soil-like fraction is stabilised and it emits no GhG, so it can be landfilled under current regulations.
- MBT aims to minimise the need for landfilling and incineration.
- Available on a very large scale.
- Technology may be upgraded to handle sorted organic waste – once source-separation replaces mixed waste collection.

Disadvantages:

- No sorting is demoralising for society, incorrectly signalling that do-nothing is acceptable.
- In the case of MBT (as in the case of having an incinerator or a landfill) the policy makers feel no push to change waste into recycling.
- Large investments.
- Equipment is not long-lasting.
- No straightforward end use for fine fraction other than landfilling.
- Soil-like fine fraction is not equal to quality compost and cannot be used in agriculture.
- MBT cannot be considered as recovery of waste from 2027 in the EU.

Material recovery, biological treatment (MRBT) is an advanced modification of MBT, where focus is not just processing plastics and other combustibles to waste fuels, but separating waste stream to individual waste materials like plastic, paper, glass, wood etc. The remaining organic-rich part is still subject for biological treatment. For more information check Zero Waste Europe's policy briefing on MRBT.

WASTE-TO-ENERGY

Wastes have been burned throughout the history of mankind. The incineration technology has developed dramatically since then. Even though there is no room for waste-to-energy in the Zero Waste hierarchy, it is currently still a reality in many places in Europe and elsewhere and when addressing this reality, we need to know what it is.

The most common technology is mass-burn. No pre-treatment is required and large volumes are incinerated 'as received'. Alternative to mass burning is incineration in rotary kiln and fluidized bed systems. One of the most important parameters is temperature: minimum for municipal waste is 850°C and for hazardous waste is 1100°C. The flue gas (gas from burning of waste) contains a wide range of particulate and gaseous contaminants and must be cleaned before released to the atmosphere. This is the most expensive part of waste incineration.

Incineration is not waste-free, because **ash is generated**. Typically ash makes up 25% of input waste. There is bottom ash and fly ash:

- The **bottom ash** is 90% of total ash content. It consists of non-combustible materials, such as sand, stones, glass, porcelain, metals, and traces of unburnt organics. Bottom ash makes 150 to 300 kg per 1 ton of waste incinerated.
- The amount of **fly ash** is 10% of total ash content. Fly ash is considered hazardous, and cannot be landfilled in municipal landfills.

Advantages:

- The process results in a significant reduction of the mass (up to 75-80%) and volume (up to 90%) of the waste, reducing the need for landfilling.
- Waste is sanitised and stabilised in minutes.
- Organic content of wastes reduces to minimum.
- Energy (heat and electric power) production is of priority.
- Waste incineration also contributes to savings in fossil fuel consumption, whereas restwaste from recycling can be incinerated.

Waste incineration is always a large-scale technology, which is both good and bad.

Disadvantages:

- Incineration seriously affects separate waste collection and other waste management technologies.
- Materials are lost for recycling, and organic carbon cannot be utilised in soils.
- Incineration is a major contributor to air pollution and a risk to public health.
- An incinerator is costly to build and maintain and once it exists, it has to work: it's not possible to switch on and off whenever we want.
- It's not an alternative to landfill (the result of the incineration goes to landfill in any case).

The combustible fractions of waste are food and green waste, paper, cardboard, plastics, rubber, wood – all well-recyclable materials. This is why incineration should not be an option unless other recycling methods have been exploited.

WASTE FUELS

Refuse-derived fuel (RDF) is a fuel produced by shredding and drying municipal solid waste, commercial and industrial waste.

RDF consists largely of combustible components of municipal waste such as plastics, wood, rubber, textile, but also some biodegradable waste. Inert mineral fraction (like construction and demolition waste) is removed; as well as most parts of wet organic fraction. Reject waste is disposed of in landfills, or further processed.

Advantages of RDF compared to incineration of unprocessed fuel:

- It is homogenous, its calorific value is high, moisture and ash content are low.
- It is possible to prepare waste fuels 'on demand' according to market requirements.
- Waste fuels can be produced everywhere, also in small quantities; it is storable and easy to transport, and it is also exportable.
- Standard for solid recovered fuels exist, significantly broadening its marketing possibilities.

Disadvantages of RDF:

- Its production is costly.
- Material is lost for recycling.
- Rejected fine fraction still requires disposal or further treatment.
- Any fuel which is made of waste is considered as waste, and rules for waste incineration apply – flue gases are still harmful to the environment.
- Storage requires great care, as organic-rich material is a subject for self-ignition.

Ferrous metals, aluminium and some individual plastic fractions may be removed for material recycling. Sometimes optional biodrying is applied to benefit from drying organic fraction, which should otherwise have been disposed of. **Biodrying** is a technology using heat produced in the initial stage of composting of biodegradable waste for augmenting its drying rate, whereas moist air is removed by ventilators. Excavated landfill plastic rarely requires biodrying as organic fraction has already been degraded. The number and the kind of processing steps correlate to the waste composition and the desired product quality.

Another type of RDF is **SRF – Solid recovered fuel.** SRF is distinguished from RDF as it is produced to meet a standard – the classification and specification requirements laid down in EN15359 (Standard from the European Standardisation Committee), CEN/343.

RDF is primarily utilised for energy production in incineration and co-incineration plants. SRF is typically used in the cement industry.

PLASTIC TO OIL AND GAS

Pyrolysis is thermochemical decomposition of organic material at high temperatures in the complete absence of air (or oxygen). Pyrolysis leads to synthetic liquid fuel similar to crude oil and by-products as solid carbon and combustible synthetic gases. Liquid products can be mixed with natural crude oil and further refined to gasoline and other petroleum products.

Gasification occurs in the presence of limited amounts of air that allows partial combustion of the material. Gasification leads to flammable synthesis gas (syngas), which is a mixture consisting primarily of hydrogen, carbon monoxide, and some carbon dioxide.

Syngas is a valuable commercial product, which can be used as an intermediate to create synthetic natural gas, methane, methanol, dimethyl ether and other chemicals. It can also be used directly to produce energy as a substitute to natural gas.

Synthetic oil and gas can be used as raw material for producing new plastics. Then it is called chemical recycling of plastics.

Advantages of pyrolysis:

- Energy can be obtained in a cleaner way than from conventional MSW incineration plants because of lower amounts of nitrogen oxides (NO_x) and sulphur oxides (SO_2) in flue gases.
- Most of pyrolysis' products – solid, liquid and gaseous – are energy-rich.
- The scale of pyrolysis' plant is more flexible than in case of mass-burn of wastes. Smaller volume is associated with smaller gas cleaning devices, which reduces investment and operation costs.
- Compared to solid waste or RDF, pyrolysis oil has high calorific value, it is well storable, easy to transport, and the potential market is worldwide.
- Oil can be further processed to other products too.

Disadvantages of pyrolysis:

- Its complexity and high energy demand.
- Equipment is sophisticated, costly.
- The result depends on the quality of waste. Municipal waste, however, is heterogeneous in composition and size.
- There are some environmental and safety risks too!

MUNICIPAL LANDFILL AS AN ENVIRONMENTAL PROBLEM

Landfilling has many negative environmental effects during its active operational phase and even after it has been closed. One should reduce disposal as much as possible, but we cannot totally avoid landfilling in the future. Ultimate recycling of waste is not possible due to economic, technical, environmental and health reasons. Therefore, we should improve the environmental performance of landfills and build sanitary landfills. Sanitary landfills are those where waste is isolated from the environment until it is safe.[3]

Additional reading about the environmental effects of landfills and basics of safe landfills:

"Landfill basics" chapter from The Keep It Clean Plan by Let's Do It Foundation.

[3] Landfill Directive 1999/31/EC (amended by the Directive 2018/850/EC) and the Council Decision 2003/33/EC on acceptance criteria (WAC) set standards for the authorisation, design, operation, closure and aftercare of landfills.

LAST BUT NOT LEAST – RECYCLING

Recycling of waste is defined in the EU's Waste Framework Directive as "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes."

This includes the reprocessing (composting) of organics but importantly does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations. Often recycling is split into 2 categories:

1. Material recycling for materials such as paper, metals, plastics etc.
2. Recycling of organics via composting and digestion.

The issue of recycling and the role it plays within local zero waste programmes is much debated and one that we must tread carefully as Zero Waste Ambassadors. Therefore we have decided not to go into detail on the recycling process itself here, but rather focus on the different aspects of this debate. This is also because the necessary space and literature it would take to describe the recycling process of each material is far too long. However, we have included some links at the end of this chapter which can be useful to get to know the recycling processes for the key materials found within municipal solid waste.

At its core, true recycling is the foundation of a circular economy, which is why we advocate for effective separate collection systems so much. Effective separate collection, often done via the door-to-door system, is the best method for achieving high recycling rates, given that they result in more quantity of recyclables captured in better quality, therefore being easier to recycle.

With an increasing number of targets set by governments for the percentage of recycled content in products, and commitments by businesses to include a set % of recycled content in their own materials, it is clear that there needs to be a flow of high volume and quantity of recycled materials within the European market today.

> **So as Zero Waste Ambassadors, we must advocate for separate collection systems at the local level as this is the greatest way to improve recycling and reduce residual waste. This is most commonly our entry point into discussions on zero waste.**

Of course though, recycling alone is not enough. Our work on increasing recycling must always be supported by advocacy on policies that prioritise the prevention of waste – tackling consumption and production patterns so that we reuse more materials in a circular manner.

Yet on the topic of recycling itself, what is clear today is that the **recycling system in Europe is not working.** It's not working for citizens, for municipalities, for recycling companies, for national governments, and – most importantly – it's not addressing the environmental problems we need to so urgently fix. This is particularly evident and important when discussing plastic recycling. In theory, all different types of plastics can be used again. The reality is vastly different though, with estimates suggesting that **only 9% of all plastic** ever generated worldwide has been recycled.

Why do you think so little of plastics gets recycled?

There are several reasons for that.

1. True recycling is not often what happens. Materials collected for recycling, especially plastics, often have the potential for one or two more lives before they end up as waste. For example, plastic bottles being recycled into socks or garden furniture – this is **downcycling**, meaning the quality of the end material is worse than that of new material and further recycling eventually becomes impossible. In most scenarios, they still also require a certain amount of virgin material – the material being used for the first time since its extraction and manufacturing – as well as an intensive amount of energy to be remade. Worse, there is an increasing trend to burn plastics for fuel and call this "chemical recycling." When in fact this is just embedding an unsustainable treatment method within the system.
2. There is also a particular concern for recycled materials which come into contact with the foods we consume, such as plastic packaging. If recycled content is put into plastic packaging for what is called **"food contact materials"**, there is very little knowledge or regulation on where this recycled content came from and therefore the potential hazardous chemicals which may exist in this recycled material – which we then subsequently put into our bodies. There needs to be new regulation, ideally from the EU, that ensures all products and packaging, including those in contact with food, are durable, reusable, toxic-free and recyclable at the end of life, allowing to achieve a toxic-free circular economy.
3. European municipalities still use **different calculation methods for recycling**, even within one country, so the data gathered on recycling cannot be accurately compared from one country to another. Some include the discards from recycling as they were at least collected for recycling, even if they didn't end up being recycled, whilst other reporting methodologies include fuel made from burning waste. As mentioned in the *Waste policy and advocacy* chapter, the EU has introduced new legislation (2020) to enforce a harmonised calculation methodology across Member States to help overcome this issue, although we won't see the results of this bearing fruit for a couple of more years.
4. European countries still **export vast quantities of our waste to non-European countries.** This is often classified as recyclable materials but the reality is that it is dirty and unusable materials that European recycling companies and waste handlers do not want. Many of the countries who receive this waste, whether legally or too often illegally, have poor waste management infrastructure themselves and therefore are not able to treat the waste properly. This results in tonnes of plastic and other dirty types of waste being burnt, landfilled or dumped – damaging local communities and biodiversity in regions far away from Europe where the waste was initially generated.
5. Finally, there remains an issue with the **definition of recyclability** – or the lack of one. For example, if a product claims it is 100% recyclable, that does not mean it will of course be 100% recycled in the area where that product has been consumed. Due to a

lack of a harmonised definition of recyclability, recyclability claims are not necessarily based on real life conditions such as the availability of recycling infrastructure, market conditions and the financial viability of recycling operations. While waste prevention and reuse efforts must be prioritised, we cannot achieve a circular economy, as outlined in the Circular Economy Action Plan, without closing this huge gap between recyclability potential, actual collection and sorting, and final recycling. This requires European-level action to establish a clear harmonised definition of recyclability, to strengthen the enforcement of existing requirements in key EU legislation, such as the Packaging and Packaging Waste Directive, revised, which would help ensure that ambitious sector or product level standards for recyclability are established.

FINAL REMARKS

By knowing the pros and cons of every waste treatment method, you as the Zero Waste Ambassador can easily discuss the possible transformation of a municipality to a Zero Waste one. You just have to avoid a costly and outdated mindset. Recycling is a debatable issue but it remains a core part of the circular economy and is often the best entry point to focus on in initial discussions with municipalities. The limitations and failures of our current recycling system must be known and recognised within our work. As a result, focus more attention on the upper end of the waste hierarchy, and minimise landfilling and energy use. You cannot just reject – you have to replace these methods by offering viable solutions.

Additional reading and links on waste treatment and recycling:

Decision Maker's Guides for Solid Waste Management Technologies

Mechanical-Biological Treatment: A guide for Decision Makers

European Biogas Association

European Composting Network, in particular its factsheets

The European Recycling Industries' Confederation (EURIC) factsheets

European Environment Agency's advocacy work on recycling

Plastics recycling

Paper/cardboard recycling

Glass recycling

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?
- What would be the most important arguments for you when suggesting/selecting a waste treatment method?
- What waste treatment methods would you recommend to your municipality? Why?
- What are the main challenges around recycling in your municipality/region/country?
- 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?

WASTE POLICY AND ADVOCACY

Opening questions for the reader before reading:

- Do you think policies on waste affect our everyday lives? If yes, how?
- Do you know what waste policies/legislation are relevant in your municipality?
- Do you know what waste policies/legislation are relevant in your country?
- Do you know the relevant European waste policies and legislation?
- How do the different levels (local, regional, national, European) of policy-making connect to one another?
- What is the process of national and local level policy making in your country?

WHAT ARE WASTE POLICIES FOR?

The term policy is defined as the deliberate action, or set of actions, instigated by an institution, organisation or individual. As Zero Waste Ambassadors, we engage with policies on a daily basis within our work. Policies most notably come from government institutions, ranging from the European to local level, but they also importantly come from businesses – for example, their policy on how much recycled material they include in a certain product design.

For the majority of this chapter, we will refer to policy as **public policy** – the actions and decisions taken by publicly elected officials and public institutions related to how waste management and prevention systems are enacted.

Knowledge about how public policy on waste and resources is created is invaluable for Zero Waste Ambassadors and organisations working on this topic. **They set the framework for action** from which all other stakeholders must work within. Knowing how these policies get designed and then put into force, how these policies affect local waste management systems and how different levels of policy-making interact with one another will bring so many benefits to Zero Waste Ambassadors and help you achieve your goals.

Imagine this task:

You are a zero waste activist and want more people to start using reusable takeaway cups.

What would be your action plan?
How many people could you affect with it?

Many of the starting activists would try to convince their friends and acquaintances to bring their own mugs to cafes and tell people about the pollution caused by single-use cups, but this type of action doesn't reach many people. While it is still important to raise awareness about the issue and support individual action, more effective action in the long term would be to influence the regulatory system around takeaway drinks.

To showcase this, let us use one recent example from Germany. As we will discuss later in this chapter, the EU legislation on reuse currently is not as strong as it should be. Activists in Germany have been pushing hard for several years to get legislation that will support reuse business models, such as a national Deposit Return Scheme for beer bottles. Legislation passed at the federal level in Germany in the early 2020s, part of the country's transposition of the EU Single-Use Plastics (SUP) Directive, made it a requirement for businesses over 80 m² and with more than 5 employees to offer reusable options for cutlery and food/beverage containers that will be consumed immediately. Many local groups started using this new federal law to support their cities and local businesses to enact this law, as well as going a step further by removing the single-use option as well.

This one short example shows how the different levers of policy-making interact (for better or worse) with one another, and they all must be considered when working on local zero waste strategies.

Being an effective Zero Waste Ambassador requires:

- a strong understanding of **how policies are made** and
- an ability to **effectively advocate** on behalf of zero waste strategies.

We are going to tackle these two interlinked but complex topics, policy and advocacy, together in this chapter due to the fact they are complementary to one another.

The EU has set an ambitious framework for waste and the circular economy. However, the details of how waste is managed and who is responsible for the numerous policies associated with the circular economy differ greatly from country to country, in and outside of the EU. Therefore, understanding the policy landscape is absolutely critical for any Zero Waste Ambassador who wishes to suggest realistic but also ambitious policy changes to their local municipality.

For Zero Waste Ambassadors living in EU Member States, there is a guiding framework set at the European level for collection, recycling, pre-treatment of waste and increasingly, on reuse and prevention.

KEY EU WASTE POLICIES

A key revision of the main EU legislation on waste was approved in May 2018 and it aimed at taking Europe towards a circular economy. These revised pieces of legislation include:

Directive on Waste (2008/98/EC) (also known as the Waste Framework Directive)

Directive on Packaging and Packaging Waste (1994/62/EC)

Directive on the Landfill of Waste (1999/31/EC)

Key elements of the revised Waste Framework Directive include:

- A common EU target for recycling 65% of municipal waste by 2035.
- A common EU target for recycling 70% of packaging waste by 2030.
- Recycling targets for specific packaging materials (see table on the next page)
- A binding target to reduce landfill to a maximum of 10% of municipal waste by 2035 (see table on the next page)

Overview of new required goals for EU Member States in the field of waste management

	2025	2030	2035
Minimum recycling & preparation for reuse of municipal waste	55%	60%	65%
Maximum landfilling of municipal waste			10%
Minimum recycling of packaging waste	65%	70%	–
Plastic	50%	55%	–
Wood	25%	30%	–
Ferrous metals	70%	80%	–
Aluminium	50%	60%	–
Glass	70%	75%	–
Paper and cardboard	75%	85%	–

- Separate collection obligations extended to include hazardous household waste (by end of 2022), biowaste (by end of 2023), textiles (by end of 2025).
- Minimum requirements for Extended Producer Responsibility (EPR) schemes to improve their governance and cost efficiency.
- Reinforcement of prevention objectives in particular, requiring Member States to take specific measures to tackle food waste and marine litter as a contribution to achieve EU commitments to the UN's SDGs.

> **The Waste Framework Directive and the Directive on Packaging and Packaging Waste will also be reviewed and likely amended in 2023. This will mean new targets, definitions and requirements for the collection, recycling and preparation for reuse of materials by local municipalities.**

The current European Commission (as of 2022) introduced a second Circular Economy Action Plan when it first took office in 2019, building on the first action plan that was introduced in 2015. Therefore, the "circular economy" is a relatively new term and package of legislation for EU Member States. Nonetheless, with the second Circular Economy Action Plan from the EU, we should expect more directives in the future that aim to tackle issues ranging from greenwashing to the reuse of textiles, eco-design, reuse and the definition of recycling – all of which will have a huge impact on local zero waste strategies within the EU.

Furthermore, 2019 marked the adoption of a landmark piece of legislation to stem the flow of plastics into our environment and oceans by the EU. The Single-Use Plastics (SUP) Directive, a key component of the European Strategy for Plastics in a Circular Economy (2018), aimed to prevent and tackle plastic waste by, among other things, phasing out unnecessary single-use plastics, introducing economic incentives to reduce consumption and help the transition to reusable systems, and establishing high collection rates and **Extended Producer Responsibility (EPR) schemes**.

EPR schemes are a policy instrument available to governments. They apply the 'polluter pays principle' by placing the responsibility of a product's entire life-cycle – from designing environment friendly and low-impact products to managing their end-of-life – onto the producers themselves. Their design and implementation (and subsequent performance) differ greatly from country to country within Europe, but the general principle remains the same – the producers of materials which are placed onto the market should be responsible (financially) for ensuring they are properly managed.

Most common product types covered by EPR schemes include (plastic) packaging, WEEE (Waste from Electrical and Electronic Equipment), tyres, mattresses and more, but again this differs on a country-by-country basis.

For a deeper dive into the SUP Directive, check out this briefing by the Rethink Plastic Alliance.

For Zero Waste Ambassadors from non-EU countries, whether your municipality and national government has to follow these rules largely depends on the agreement between the country and the EU. Those willing to join the EU will sooner or later be bound by these directives, but, for as long as negotiations on environmental issues have not started, a country isn't formally compelled to follow the legislation, which is the case of most candidate countries. Countries like Switzerland are bound to EU directives to a certain extent, particularly with regards to single market rules. In the case of the UK, the Brexit deal has separated UK and EU legislation and now the UK is creating its own framework for waste and the circular economy.

NATIONAL LEVEL POLICY

It's important to know the specific relationship for policy-making, reporting and data collection between the local – regional – national levels of government within your country.

For those working within EU Member States, the targets listed above are applied and are the immediate responsibility of national governments to achieve. In most cases, waste policies are delegated from national to the local or regional level of government, where the responsibility for having the capacity, choosing the methods and finding the funding to achieve the EU goals listed above become a key issue in actually meeting these targets.

We as Zero Waste Ambassadors should not only know what the relevant EU policies are, but also what important circular economy related policies remain within the jurisdiction of national governments.

Possible differences between countries:

- Municipalities have full competency over waste management.
- Collection is a local authority competency but fee charging may be a regional-level competency.
- Decisions over what can be collected, how much is charged for it and how the waste is treated sit fully at the national level.

Each country, sometimes also specific subregions within the country, will have public bodies responsible for the collection of data on waste related indicators. Examples of national waste authorities and their data collection:

England	Northern Ireland	Germany
Wales	Italy	Portugal
Scotland	Spain	Croatia

This of course is not an exhaustive list of statistical sites, but rather a list to showcase just a small sample of examples of governmental bodies responsible for collecting data on waste.

Additional reading and key links:

Eurostat municipal waste data

Eurostat recycling data

Eurostat biowaste data

The map from Seas at Risk – best plastic prevention policies from across Europe

Achieving the EU's Waste Targets: Zero Waste Cities showcasing how to go above and beyond what is required

Unfolding the Single-Use Plastics Directive – a comprehensive briefing outlining what's in the SUP Directive, including specific goals and requirements of EU Member States

Why do calculation methods matter?

Something important for all Zero Waste Ambassadors to acknowledge – Eurostat data, whilst it is the most comprehensive overview of waste data across the EU and its close neighbours (hence why it is included in this handbook), cannot be seen as 100% verifiable or accurate. This is not in any fault due to the work of Eurostat. Varying degrees of quality data collection and different calculation methodologies exist at the member state level, which means they are hard to compare with each other. As Zero Waste Ambassadors, we should be advocating for harmonised data collection across the EU, in all Member States, which can be replicated by other European countries. This would include matching and adopting the new EU calculation methodology for recycling, as well as the key indicators used to measure waste, such as what is outlined in the Zero Waste Cities Certification framework.

New measurement and calculation rules have been introduced by the EU for Member States in recent years which will likely reduce the actual recycling figures.

Why would the harmonised calculation rules reduce some national recycling figures?

What does the *Waste data basics* chapter say about this?

Previously, Member States could include all the recyclable materials that were collected at a sorting facility and via collection methods in their reporting. Yet in most cases, a small percentage of these materials are too contaminated and too low quality to be considered for recycling. They end up being discarded and sent for landfill or incineration – meaning they make the statistics look better than the reality.

The new EU recycling methodology will now only count what officially goes into the recycling process. This methodology will be required to be put into use for the next round of EU targets, so 2025 at the latest, meaning the first results will likely be available in early/mid 2027 (the normal delay for reporting such figures).

Why isn't there more EU policy on reuse and prevention?

Ultimately, as Zero Waste Ambassadors we should always be prioritising and advocating for policies that prevent resources from becoming waste. Recycling is not enough to get us out of the crisis we face today – more action is needed to embed reusable products, materials and systems into our everyday lives.

As discussed in the *Zero Waste Cities model* and *Zero waste basics* chapters, local municipalities commonly have the responsibility for the collection and disposal of municipal solid waste. Quite often, local authorities can also decide the structure of the waste fee that citizens pay, creating systems that discourage waste generation.

Yet as we move up the waste hierarchy to focus more on reuse, repair and redesign, the role of local municipalities becomes slightly more opaque, as a range of other actors and legislative factors come into play. These actors include businesses such as restaurants, hotels, bars etc, whilst the legislative picture looks different for reuse and prevention, as it requires broader action at the regional, national and European levels to have a significant impact outside of just a city's borders.

Examples of waste prevention initiatives relevant to local authorities:

- Deposit Return Schemes for several product categories (beverage containers to food packaging)
- Repair and reuse centres for bulky and electronic items
- Packaging free shops
- Washing and delivery of reusable nappies
- Foodsharing platforms and apps
- Flea-markets where second-hand items of all kinds can be sold, but textiles are most common

Deposit Return Schemes and the limitations of city-wide prevention policies

For example, let us take a look at one key reuse policy – Deposit Return Schemes (DRS). DRS place a small deposit on the price of a product or item, that can be returned back to the consumer when they return the reusable product or item to another participating service provider. For example, you buy your favourite bottle of beer as part of your weekly shop, and pay an additional 10 cent to the price of the beer. When you go back to the supermarket for your next weekly shop, you either return the beer bottle to the cashier or drop it into a machine that identifies the bottle and collects it. Both options give you your 10 cent deposit back.

Image from We Choose Reuse campaign

It's relatively simple and such policies are increasing in countries across Europe. However, this one example of DRS is being noted here as such schemes also show the limitations that city-wide initiatives can have. To have a big impact and provide citizens with clarity on where the DRS apply, these systems should be applied either regionally or nationally. A

national DRS is important as it should also set harmonised design criteria for reusable products. For the example of beer bottles, in a national DRS, the system should uphold certain design and manufacturing requirements that all beer manufacturers must follow. This allows the bottles to be easily cleaned and prepared for reuse, whilst also creating a level playing field for all those involved in the DRS for beer bottles in this example – ranging from the producers of beers to the shops selling the bottles.

Whereas if the DRS is applied in one city but not its neighbour, manufacturers will not have the confidence they need to transition over to the system, whilst citizens cannot be sure where the deposit can and cannot be accepted.

> **One important note – this is not to say at all that DRS should not be tried and pursued by cities. In situations where national legislation does not mandate for DRS or other reusable pooling models, cities can play very important roles in piloting and implementing city-wide reuse initiatives.**

Companies such as Recup, reCIRCLE and many more are expanding rapidly in Europe, as they work with cities to install pooling systems for reusable coffee cups and takeaway food containers. Companies such as Uzaje in France are installing centralised cleaning infrastructure to help the expansion of reusable packaging by providing businesses with a safe and easy method for preparing products for their reuse.

When advocating for DRS within an EU member state, it's important to know that the Single-Use Plastics Directive sets targets for the collection of plastic beverage bottles of 77% by 2025 and 90% by 2029. This target **cannot be achieved via standard separate collection models alone**, and therefore requires DRS, as these systems are proven to achieve such impressive results. Once a DRS has been established within a city and is working well for such items such as glass bottles or aluminium cans, we as Zero Waste Ambassadors should use this to show municipalities where DRS could also work for other product types, such as e-commerce packaging, to truly help catalyse action towards a circular economy.

Of course, DRS are just one of several different tools/policies that can help prevent waste. There is a broad range of policies available that differ depending on the target material/product for prevention. For example, repair cafes and reuse centres – where citizens can bring products or materials, ranging from bikes to furniture and electronics, that are repaired and prepared for resale – are commonplace in Zero Waste Cities. Increasingly, businesses are also using digital technology to scale up reuse systems, such as eReuse in Catalonia which uses blockchain to create an open-source map of electronic products that have been repaired and reused in the region.

What to ask of cities on reuse and prevention?

What would you ask, based on what you have read so far?

Thinking of the activist who wanted to reduce use of single-use cups in the city, what kind of policies could he/she propose for the municipality (and the national government)?

Due to the increased number of actors needed to be involved in citywide prevention policies, some municipalities will be hesitant to take ambitious action or will not see it as a priority. In many cases, you as Zero Waste Ambassador may have a strong relationship with city officials working on waste management but for the topic of reuse and repair, the relevant city official with such competencies in their job will sit in a different team or department.

Nonetheless, there are still many initiatives and actions that municipalities can take which can have a significant and quick impact on waste generation locally. ZWE's briefing on how municipalities can create effective reuse strategies outlines **4 main priority areas:**

- Establish reuse and prevention targets.
- Adopt environmental and social public procurement criteria that prioritise reuse.
- Invest in and create quality collection points.
- Create a reuse culture locally with the community.

This section is by no means exhaustive in the slightest. The topic of reuse and prevention is huge, with huge volumes of resources already dedicated to these topics and many more will continue to be in the future, as we urgently push the solutions we need to transition towards a circular economy.

However, the purpose of this section is to introduce some of the details that we most commonly face when advocating for reuse and prevention at the local level. Zero Waste Ambassadors should focus on two main spheres when working with their local authorities to prevent waste:

- What is in the municipality's **direct** sphere of control – e.g. making reusable items mandatory in all public events, spaces, buildings and embedding prevention criteria within public procurement tenders.
- What is in the municipality's **indirect** sphere of control – e.g. supporting the growth of packaging-free shops, local enterprises which operate reuse models, connecting local businesses with existing reuse companies (to name just a few!).

EU waste policies and targets are the most ambitious in the world. However, at the local level we have seen significantly **better achievements thanks to strategic action taken with the help of Zero Waste Ambassadors such as you**. All of these examples have one thing in common: prioritising waste reduction and reuse. Since policies and targets are not yet very illustrative on how to achieve this, it is perhaps the hardest and most rewarding advocacy part in the ambassador's work. Collaboration and sharing best practices is crucial for this.

Additional reading:

Local guidance on creating reuse strategies – a briefing outlining 4 main policies for municipalities to adopt to help create a local reuse culture.

Reducing food waste at the local level – a briefing outlining several steps that municipalities should adopt to prevent the volume of food waste they generate.

DRS Manifesto – a short briefing outlining how DRS should be established.

ReLoop's DRS factsheets – a set of very useful documents outlining the key factors and benefits of DRS.

Reusable vs single-use packaging: a review of environmental impact – a comparison of reuse vs single-use packaging and their environmental impacts, which showcases the benefits of reusable packaging.

The story of ReWine – a case study on establishing reuse system for wine in Catalonia.

The story of Halle 2 – a case study on Munich's reuse and repair hub.

RREUSE's factsheet on why reuse targets matter and what they should be – a briefing outlining why targets on reuse are so important and guidance for you on what they should be.

ADVOCACY

Of course, knowing the policy landscape is just one part of being an effective Zero Waste Ambassador. To perfectly supplement this knowledge, developing our **advocacy** skills, in order to be confident communicators of zero waste policies and messages, is also critically important to achieve meaningful change.

The term "advocacy" includes a wide range of activities that all intend to influence public policy. **Advocacy** can include:

- Conducting research.
- Educating the public through awareness campaigns.
- Meeting with politicians.
- Organising social media campaigns.

Advocacy tactics and activities are the most important way a Zero Waste Ambassador can help push for **systemic change**. Often, advocacy and lobbying are used interchangeably, yet lobbying is more associated with specific efforts to influence pieces of legislation, whilst advocacy encompasses a much broader range of educational and awareness-raising activities.

The best advocacy campaigns and initiatives are those which have a clear goal, know the system and how to work it to their advantage. Therefore, planning and preparation is absolutely critical when conducting advocacy activities. There are several important steps to follow to plan your advocacy:

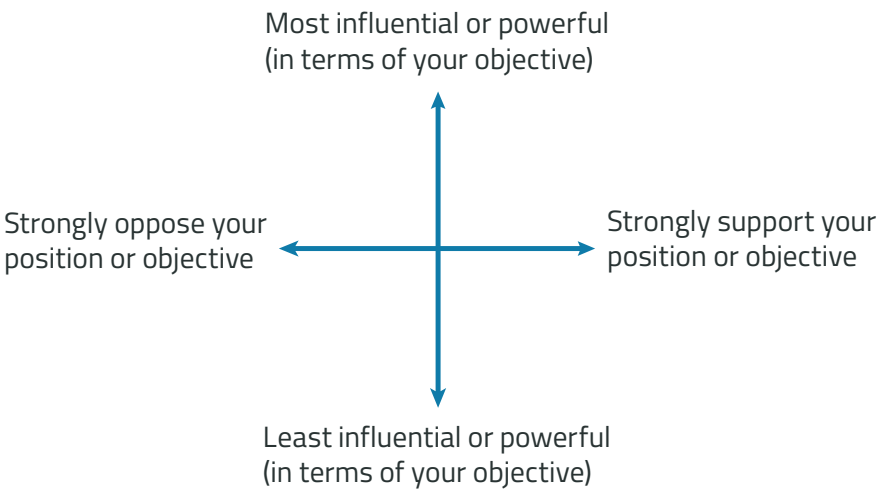
Understand

- You must understand your issue first. You need to define what success looks like, what the causes of the problem you're trying to solve are. You need to know who you require on your side to achieve success and who may oppose what you are trying to do.
- PEST (political, economic, social and technological) and SWOT (strengths, weaknesses, opportunities and threats) analysis tools are very helpful at this stage, as well as problem trees to help you dig deeper into the root causes of the problem.

Plan

- You need to break down and identify different steps on the way to achieving your overarching goal. Identifying what needs to happen each year, month or week, for example, will really help paint the full picture of how you can achieve your success and what you need to do by when.
- You should also be able to identify the key targets and plan your key messages – what are you going to say to get people to act and who do you need to be saying these things to.
- Identifying key stakeholders by mapping them on the chart below where the two axis are their willingness to engage and power to change things, is a very useful tool to help during this process. Just identifying the key stakeholders is not enough though. On top of this, consider what power they have to bring about change, how willing they are to act in support of your goals and start to detail the specific activities that each stakeholder could take to help your mission.[1]

An example of the power mapping chart, which can be seen in more detail here:



[1] A good additional resource especially on power mapping: Burfield, E. (2018). *Regulatory Hacking: A Playbook for Startups.*

Act

- This just involves implementing the planned actions you identified previously, as well as evaluating your impact throughout the process, being open to changing plans, tactics or messaging where needed, if it will help increase your impact.
- The "act" phase can involve several different "actions" – meeting with policy-makers, campaigning in public, capacity building of volunteers, collecting petition signatures, sharing digital content in a targeted way, engaging with the media etc. Anything that will help get the people who you want to act do so in the way that you want them to, which may be individuals sorting their waste better at home or a politician proposing new wording to a key piece of legislation.

Advocacy may seem daunting to some, or it may come naturally to you, but either way it is a fundamental and necessary part of our work as Zero Waste Ambassadors. However, there are several different tools out there to help make your advocacy work as impactful as possible, helping to really specify what your objectives are, how you will reach your objectives and who you will need to help you in this process. Furthermore, a large part of advocacy is the ability to communicate – either in written or oral format. Communication skills can be worked on and developed, but **being a confident communicator often comes from having prepared sufficiently.** Knowing your key messages, who your audience is, what their motivations are and what you clearly want them to do after reading/listening to your communications are all critical to effective advocacy. However, it's good to always know and be comforted by the fact that plans very rarely ever go as they were 100% designed to. They can fail or exceed your expectations. Having a plan will help assess the outcome, good or bad, and will provide you with invaluable guidance on where to go next. For more information about effective communication, check the *Communication and storytelling* chapter. There you will also find more information on how the power mapping chart can be further used.

FREQUENTLY ASKED QUESTIONS

Before reading the answers, think to yourself: **how would you answer them?**

1. Where should I go to find out the relevant policies on waste and the circular economy for my community?
2. What are the best examples of policies that help zero waste?
3. Why shouldn't we just ban all problematic materials?

1. Where should I go to find out the relevant policies on waste and the circular economy for my community?

This will differ depending on the region and country you live in. Eurostat provides the best overview of the European picture. Then for the national level, or even regional level within a country, you should research who is responsible for waste management and where they publicise the data they collect. Each municipality you work with should know who they must report their waste data figures to.

2. What are the best examples of policies that help zero waste?

Any policy that follows the framework of a Zero Waste City is beneficial and should be encouraged by all Zero Waste Ambassadors. These range from the introduction of separate collection systems to PAYT systems and targets on the volume of material reused per year. Whilst some of these policies are designed and implemented at the local level, national and regional policies are key to help enable municipalities to take ambitious action. For example, national laws that mandate the separate collection of organics, as was the case in Slovenia in the 2000s, or the recent French national law compelling supermarkets to donate leftover food waste.

3. Why shouldn't we just ban all problematic materials?

In theory, this would work and we could single-handedly prevent all of our most problematic materials from entering the market. In reality though, we must create a transitional strategy away from our current economic models. Businesses and citizens must be supported and guided to switch to reusable, safer materials during their everyday lives. Of course, we advocate for bans but these bans must be accompanied by alternative solutions and an ambitious but realistic timeline that allows all the relevant stakeholders to sufficiently adapt before the ban is enforced.

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?
- Who are the main actors that you need to work with within your community on waste prevention policies?
- Why do you think policy-making feels scary or boring to some people? And why do some people find it fascinating?
- What skills do you already possess that makes you a good advocate? What do you feel you can improve on?
- What tools and methods do you have to help you with your advocacy?
- 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?

COMMUNICATION AND STORYTELLING

Opening questions for the reader before reading:

- Have you thought about what does zero waste means to you?
- What kind of messages on zero waste do you want to share/spread?
- Who is the target audience of your message? What could zero waste mean to them?
- How do you usually explain zero waste to people? Is it difficult or easy to do? Why?
- How do you feel when you are challenged with a question or counter-argument?
- What is the role of your audience in zero waste?

Once we have discovered the world of zero waste, it becomes the only right thing to do in our minds. Unfortunately not everyone thinks like this. Sometimes they just don't know enough about it, they don't understand what "zero waste" means, they have misconceptions around it or they simply think it doesn't concern them (even if it really does) and they are not interested.

We may wish to grow our audience or influence our target groups to take certain action. Sometimes our role is only to raise awareness – the need arises from lack of knowledge in the society. In other times, our job is much more complex, with the need to address false information that translates into wrong behaviours and attitudes. In any case, our challenge is to find a way to get people to care about zero waste in order to get them on board with us.

BASICS OF COMMUNICATION – THE THREE PSYCHOLOGICAL NEEDS

The first thing to remember is that every person needs motivation in order to do something. In the *Learning motivation* chapter we have distinguished between trash and quality motivation. For deeper understanding and long term commitment we want to support quality motivation and that comes through supporting the three basic psychological needs of the person we are communicating with. This means supporting:

- **Relatedness** – showing genuine interest and understanding in the thoughts and opinions of other people, recognising their feelings, responding without judgement, making them feel that their contribution is valued and they are a part of a group.

- **Competence** – speaking with people on the level understandable to them, not using field-specific words with a non-expert, helping to understand what is expected of them, what should be done to solve the problem at hand and if needed, helping to do it, at the same time treating them like thinking and capable beings who can take up a challenge.

- **Autonomy** – not forcing your own thoughts and ideas on to people, allowing them to find their own meaning and purpose in the topic, solve posed questions-problems themselves and in their own pace, giving them a choice to make a decision on their own; not letting them feel guilty, controlled, or forced to think, feel or behave in certain way.

One of the easiest ways to put this into practice is asking questions from people about their views and understandings and **truly listening**, before offering our own (expert) perspective, stating our own proposals and explanations. This also means genuinely being interested in their answers and not bombarding them with questions in an interrogative manner, but rather showing an **open curiosity**. You can read more in-depth about supporting the basic psychological needs from the *Learning motivation* chapter.

Asking questions is also a good way to approach people who hold some zero waste myths or misconceptions. In order to truly correct someone's misconceptions, they need to reach the understanding themselves that they have a misconception, which is also connected to supporting their three basic needs. Just stating our correct information to people often does not change their mind. Different methods for correcting people's misconceptions can be found in the *Misconceptions* chapter.

The reason we need to explore how to communicate is because we are talking to people who do not yet share zero waste values or don't have the same knowledge as us. And this compromises our own three basic needs, e.g. we feel that our concerns are not being taken seriously. The tough thing about being openly curious and listening is that, as Zero Waste Ambassadors, you do not talk to people about easy things such as how they decided to get a dog or learn a new language. You are faced with people who make daily decisions that jeopordise the environment and human health – the world that you live in and that you care about deeply. It is a natural response to become defensive and irritated.

Perhaps the most helpful way to make it simpler to support the three basic needs of your counterpart without compromising your own is: understanding another's point of view does not mean agreeing with it.

> **Be humble, respect the other person's point of view, try to put yourself in their shoes, but if you can't, be mindful that another person's shoes are still theirs.**

You cannot force your ideas on anyone just like you cannot force them to wear shoes you like. It is the key to any communication, regardless of whether you are writing an e-mail, designing a poster or attending a meeting. It needs training and is not always easy. However, there are people negotiating with terrorists, not losing their calm and even reaching agreements.[1] It is inspiring to believe that it is possible for us to overcome disagreements or lack of interest about zero waste.

COMMUNICATION AND VALUES

There is almost **no neutral human interaction or communication**, as we don't sense the world neutrally. It always comes through a filter of pre-knowledge, experiences, opinions, values – it's part of being human. Even the things we call neutral, in their deep essence mostly are not so. Our sense of rationality is often just our skill of finding rational explanations to our irrational behaviours. But that's another story.[2] What is important to remember is that both the sender and receiver of messages see things subjectively, carried by some assumptions and attitudes connected to our values and bigger life goals. In very broad terms our thinking, communication and in turn our actions are carried by either intrinsic or extrinsic values.

---

[1] Recommended reading for anyone wishing to improve their negotiation skills and learn about how to deal with emotionally difficult counterparts: Voss, C. (2016). *Never Split the Difference: Negotiating As If Your Life Depended On It*

[2] If you are interested in the deep irrationality of human nature, read: Ariely, D. (2010). *Predictably Irrational.*

- **Intrinsic values** – creating and keeping close relationships, personal growth, contributing to your community.
- **Extrinsic values** – power and economic success, having material wealth, fame, being popular, looking attractive.

As written in the *Zero waste, wellbeing and values* chapter, zero waste solutions are closely connected to intrinsic values. These values are also something we want to support in our communication and we can use them as a source of inspiration on how to talk and what to talk about with our audience. It starts even with the words we use. For example, the same thing can be referred to in two different ways:

- Taxpayer's money – stressing individualistic, extrinsic values.
- Public investment – stressing common good, intrinsic values.

When we talk about money, we can talk more about what we need this money for, what kind of life quality it can bring to the wider community, so we shift the focus from extrinsic to intrinsic values. An obvious way to support values is to talk directly about them. For example how zero waste solutions like food sharing initiatives or repair centres help to support a sense of community between citizens. As an effective communicator, you would also know and be forever curious to learn about other initiatives supporting intrinsic goals and which other benefits are associated with them. This is all about knowing what makes your audience tick and offering them, in return, information/expertise about what they value the most.

Let's explore a few examples on how zero waste benefits can be introduced through different angles to intrinsic values, which may not be the ones that matter most to you. Who do you think could be motivated by these arguments?

Example 1: Zero waste boosts care of place.[3] Better maintained, cleaner and greener neighbourhoods often have lower rates of theft and break-ins and discourage potential crimes.[4]

Example 2: Negative brand association. A study has shown that people are unwilling to pay the usual price on a product if its packaging is frequently seen as litter, it is seen worth less and that could lead to a 2% drop in a company's turnover.[5]

For more explanations and guidance on how to work with values and how to support the intrinsic values in our communication, a good resource is the Common Cause Handbook.

[3] Read examples of behavioural intervention methods and their effectiveness from: Spehr, K., Curnow, R. (2015). *Litterology*

[4] How Surprising Neighbourhood Factors Like Trees & Trash Impact Crime Rates, EzLandLordForms (2015)

[5] Litter: its impact on local communities, Brailsford Parish Council (2021)

PLANNING YOUR COMMUNICATION

Planning communication is in essence a set of actions to ensure that your message reaches the right people in order to have impact. With the limited time and resources we have, it is better to know that we are doing the most important things and talking to the most important people.[6]

If you are in doubt on whether you are talking to the right people or telling them the right things, you can start by asking yourself three key questions:

1. Who are you talking to? Do you know your target group (who they are, what they know, how they think, why they do the things they do)?
2. What do you need them to know?
3. What do you need them to do?

> **To take the stress off:**
> **"No, you can not reach everyone and you cannot communicate everything".**

Put out of your mind the latest viral campaign that the 'whole world' has heard of and get rid of the idea that everything you have learnt throughout your journey as Zero Waste Ambassador, can be piled onto anyone in an hour, with an e-mail or through a press release. If you can live with that, get to work and get to know your target audience well. The more specific you are, the better. That will allow you to craft the right message[7] and focus on the most effective channels. Sometimes there is that one key person you need to talk to. Often it is more people and it may happen that at first sight it is unclear who you really need to address or what you really need them to know/believe/understand in order for your desired change to happen.

[6] Usually taken for two reasons: for communication activities to match the organisation's strategic goals and to justify budget allocations, since communication is always a cost for an organisation.

[7] Simple and helpful guide to understanding why some messages stick and others not: Heath, C., Heath, D. (2006). *Made to stick.*

How to choose your messages

There are many tools to help craft the right messages. We suggest here the micro targeted audience analysis. You can start by writing down a simple question you have about a behaviour using the formula:

WHY + COMMUNITY/AUDIENCE + BEHAVIOUR

Exercise:

Imagine your goal is to help the city transfer to reuse dishes at public events, but the current situation is that they have opted for biodegradable ones. Your question could be: **"Why does the city allow biodegradable dishes at public events?"**. The more specific about the question you are, the easier it will be to take the next steps. City may mean city council or its officers.

Continue by examining:

4. Who influences your chosen target group? Try to stretch your list to more than the usual suspects. The more detailed you are, the more opportunities it will give you.
5. What are the beliefs and the **emotional drivers** behind the target group's behaviour?
6. What does the target group get from this behaviour (their **emotional payoffs**)?

Try matching the belief with the chosen influencer. If the city council notices that other similar cities (influencers) are being highlighted in the media for transferring to biodegradables they wish to follow suit (emotional driver). If the public officers are influenced by what is stipulated in the law (influencer) where biodegradable is considered as an alternative to single-use plastic and nothing is mentioned of reuse, they will do the dutiful thing (emotional driver) of following what is written.

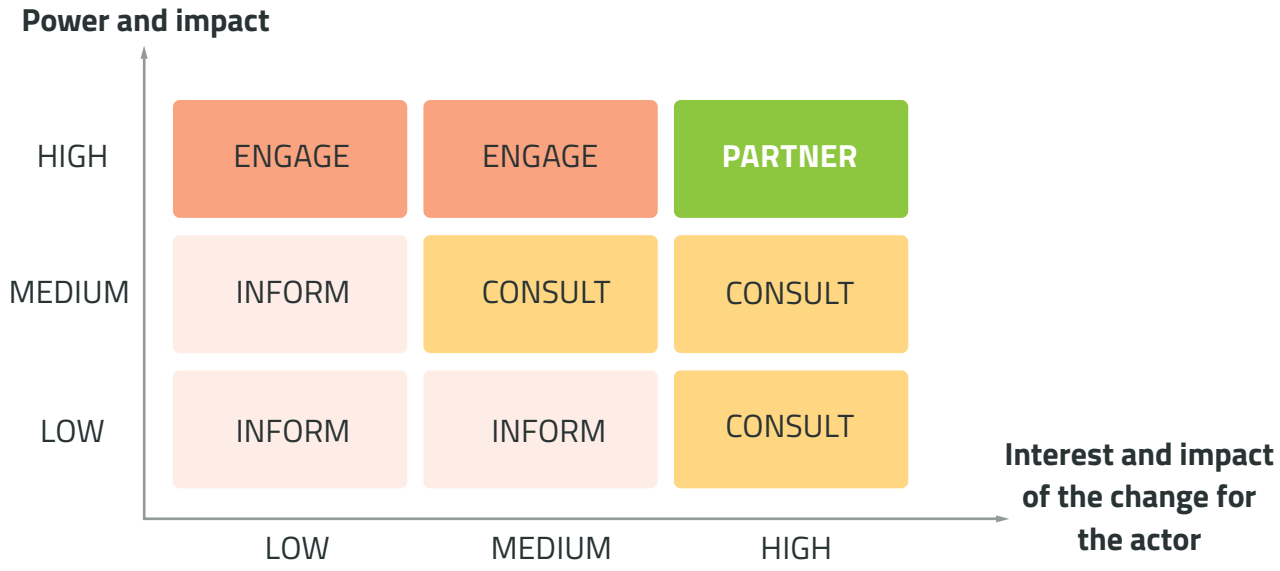
Then look into the target group's (in this case the city officer) emotional payoffs. How would our hypothetical city officer feel? Possible payoffs: a confirmation of a job well done, feeling safe for doing the right and agreeable thing in the eyes of the employer, pride for putting the city in the spotlight for making a green decision.

Why is it important **how they feel**? Because emotions help us understand what is important to people, where they feel confident, where they are insecure. Emotions can give us information on what they know and believe in. Refer back to the *Learning motivation* chapter to distinguish between trash and quality motivation, to help you work with people's pre-knowledge and feelings for a meaningful and long-lasting impact. Imagine if you are promoting reuse as an alternative that has not been proven to work, has not received acceptance in the eye of the public and is not prescribed in the law. Your offer to them is provoking insecurity, risk of failure and becoming a bad example. How do you think this affects their three basic needs?

How to choose your audience

If you are unclear who the right target audience is, the only real way to find out is by listing your assumptions and then testing them by really talking to people. By identifying your key stakeholders, you can also identify the key audiences. The power-interest grid allows you to understand who is important, where to allocate your energy but also to avoid frustration from overwhelming engagement from those who do not need to attend every decision- making process or the feeling of being left out by those who feel that their opinions should be taken into account.

The power-interest grid:



The types of communication with different stakeholders:

- **Inform** – to provide balanced and objective information in order to assist in understanding the problem, alternatives, opportunities and/or solutions.
- **Consult** – to obtain feedback on analysis, alternatives and/or decisions.
- **Engage** – to work together to ensure that this stakeholder group's concerns and aspirations are directly reflected in the alternatives developed and they are provided feedback on how their input influenced the decision.
- **Partner** – to work together to formulate solutions and incorporate their advice and recommendations into the decisions to the maximum extent possible.

Example:

You are advocating for a nation-wide reuse system to be supported with regulation:

- Your **partner** is the ministry drafting the law.
- You should **engage** with the companies and associations who are directly impacted by the law and who are in consultative status with the ministry.

- You should **consult** users or alternative service providers who are impacted by the change but who do not dictate the dominating narrative yet, such as reuse system providers, supervising agencies who determine what alternatives can operate and shops, cafeterias and other user groups to understand their needs for adjusting to new systems.
- You should **inform** the general public who is the end user of reuse packaging. They are the ones whose behaviour and attitudes do not affect the law directly, but who can have a direct impact on influencing the process and discourse of the legislative process.

STORYTELLING

The world around us consists of stories and narratives. And storytelling is perhaps the most powerful tool for any message to come through. We can use it as an educational tool so target groups can easily relate to zero waste topics.

A **story** is one single tale with a beginning and an end and with an **underlying moral.**

A **narrative** is a collection of these stories. It can influence the way people generally think of a certain topic, organisation or a person.

Most often, our job is to shift the whole social narrative around waste. That may mean anything from littering behaviour to designing national zero waste strategies. In order for a narrative to change, we can use stories as tools everywhere: in social media posts, blogs, articles, researches, campaigns and meetings.

Exercise:

The dominating narrative – *single-use plastic is normal, littering is bad.*[8] *The solution in the majority's mind is to educate people to separate waste and not litter.*

What do we do to challenge this narrative?

One option could be to sway the narrative to this direction:

Single-use of any durable material is a waste. The companies producing plastic packaging should rethink what options they are putting on the market and take responsibility for the damage it ends up doing in the environment. Single-use plastics have only been around for some decades and they are avoidable in most cases. Despite separate collection, most of the waste ends up incinerated or landfilled, because single-use materials often have no value on the secondary market or they are not recyclable altogether.

[8] Notice, who is doing the wrong thing in this narrative? Who or what should change? How does that sway your attention?

What has been done for this: first, civil society organisations started to make public transparency requests to corporations about their strategies to tackle waste problems as a part of their producer responsibility. This opened the topic of "who creates and can solve single-use plastic problems". Over time, more and more initiatives, such as the Brand Audits, have challenged the dominating narrative. Thus educating the public and triggering change.

The better we understand the narrative frame we operate in, the more successful we are in achieving our goal. Just make sure that when you are telling your story, your audience is the good guy. It is best if they are the hero in your story, but you may attribute other positive roles (such as a fairy godmother, a mentor or other similar character who has a key role in allowing the hero to succeed). Storytelling is an art in itself, but the easiest for anyone to get started with it, is choosing a story you like and know best and start investigating the dynamics of the characters and playing around with your role and the role of your audience.[9]

Example 1. The hero story.

Most stories we hear and tell are hero stories. A good story consists of elements that each listener craves for and allows for your audience to follow and keep or lose interest. It doesn't matter if it is a 30-second pitch, a graph or a training session, the full story or a segment of it can be present in them all. What role have you assigned to your audience? Do you think it is an active or passive role? Is the audience a positive or negative character? How would you like your audience to identify themselves?

The hero story in practice:

Imagine you are presenting an idea of separate collection to your local municipality, using the example of Ljubljana since they are comparable in size and profile. It is good to get acquainted with the resources provided by Zero Waste Europe for these case studies. You want your audience to empathise with Ljubljana through the struggles they faced in the beginning and the success they are attributed after. You want Ljubljana to be the hero and your audience to feel inspired to be the hero too. Alternatively, imagine if you walked in the room like you are the saviour of the city and the municipality representatives (your audience) are the obstacle that keeps you from overcoming the evil. What reactions do you think this would provoke in your audience?

Example 2. The underdog story.

The story of someone who is most likely to lose. Think of Robin Hood or Cinderella. Are you in a position of most likely losing? Describe the apparent hopelessness of the situation. What are the lucky events or hidden talents that can turn the situation for the better. Who is the villain? The underdog stories can be very powerful in making the audience feel like you need them to succeed.

[9] Find inspiration to build your story: Amlani, A., Bertels, S., Hadler, T. (2016). Storytelling for Sustainability, Embedding Project

Underdog story in practice:

Imagine presenting the idea of becoming the first zero waste city to a municipality that has always been considered the worst. It is lagging behind economically, its residents are moving to other cities and due to low income, it is losing its attraction as a place to live. The story of using its industrial heritage for developing new circular business models and providing new services, playing on the "nothing to lose" position for trying out new things, and imagining the potential for creating new jobs and transforming the community into a green and attractive one, can be just the boost the municipality needs for a new found morale. As long as you know what motivates your audience, the worst place to start from might become the best reason to get started.

Struggle stories vs success stories

Often, in order to inspire others to follow the zero waste path or pursue anything really, we tell success stories of what others have achieved in this field. But studies[10] have shown that people find it easier to relate to the struggles within those stories rather than just the successes, and even get them more interested in the field. This means talking about and even putting the focus on the mistakes made and challenges met on that journey, and then how they were overcome and the success achieved. It's more about sharing the story of the process, dead-ends and eventual progress, not just the achievement. On every hero's journey, there is first the struggle with the way things are until there comes a 'change or die' moment that gives the hero the courage to take matters into their own hands and fight for a better new world. **The hero is just like us who makes mistakes and has doubts.** It is natural for a hero to not succeed at first try. If it were so, the movies we watch and books we read would be much shorter. At our training courses we also ask the people sharing local zero waste case studies to tell their struggle stories. It's the parts of their challenges and overcoming them, which are most captivating to listen to.

This is not to say that success stories are not good. There is a time and place for everything. Always look for the most valid examples or elements in any success story to spark your audience's interest. It may be a surprisingly high separate collection rate or lowest waste management fees in the country. But the rest is about making your audience believe that they can be just as good (or even better). More often than not, the struggle story is a tool to use with the target audience who actually has to make the change happen. They find comfort in knowing that others have faced the same challenges and that no one can know all and do everything perfectly at once. But it is the followers and supporters who want to be encouraged and given confidence that they are following and supporting a winner, unless you are certain that you can play out to be a great underdog :).[11] What do you think is the reason that successful crowdfunding campaigns kick off with an encouraging pre-agreed donation pool?

---

[10] Lin-Siegler, X., Ahn, J. N., Chen, J., Fang, F.-F. A., & Luna-Lucero, M. (2016). Even Einstein struggled: Effects of learning about great scientists' struggles on high school students' motivation to learn science. *Journal of Educational Psychology,* 108(3), 314–328.

[11] There is also charm in being an underdog. It is really about the way you are writing your story and which archetypes you believe will work out best for you. Further reading: Capitalizing on the Underdog Effect, Harvard Bussiness Review (2010)

How to tell a story?

Once you know your target group and you know what you want them to know, there are unlimited ways to convey your message. The first key element to success is obviously – you! Your passion, interest and understanding of the topic but also, what makes you most comfortable. If your super power is data, present that. If you are a highly sociable person, do just that. Always keep in mind to **support your audience's three basic needs.** Whether you are advocating a new policy, presenting data to illustrate your point or talking about the technicalities of waste treatment, you can always be mindful of your audience's need to make sense of things in a familiar way. Just because your graph[12] is correct doesn't make it automatically either interesting nor comprehendable. If you struggle making your data interesting, at least allow your audience to draw conclusions themselves from the information you present them. Regardless of whether they are wrong or right, a dialogue is better than just proving that you are right.

Also fight the urge to show all your slides or present all your data if your audience is showing obvious signs of not being interested. Well laid out plans, graphs and analysis that you have worked on so long and hard, only work for the purpose of building confidence and pride in you. Have comfort in having them to back you up but avoid overwhelming people with information. Always come back to reminding yourself, what was that one thing you needed them to know, understand and act upon? All the rest is supportive information to achieve the initially set goal. But the true success depends on whether and how well your audience **feels their concerns and questions** about the topic are being addressed.

For exploring, practicing and preparing how to approach and communicate with stakeholders, you can use this training video. Imagine, how would you feel in the shoes of the different parties in the video and look for possible exercises to go with it in the *Training video guide for Zero Waste Ambassadors.* What in the way people talk, look and behave support the three basic needs and what is in breach of them?

[12] It is not a coincidence that a graph is used here to illustrate a possible mistake in addressing your audience. A graph equals a slide that has too much text on it. If you want data to really make an impact, make sure the information you want the audience to know really stands out. And that is either one single point or three interesting finds the most. For some tips on how to present your data better, check the *Waste data basics* chapter.

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?
- What makes you listen to other people and get on board with their ideas?
- In your experience in talking about zero waste, what kind of questions, facts, stories have seemed to work the best?
- What are the most memorable stories on zero waste you have heard? Why are they memorable?
- 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?

TRAINING VIDEO GUIDE FOR ZERO WASTE AMBASSADORS

This training video (7 minutes) gives an example of how a Zero Waste Ambassador could approach her/his municipality officer, or actually any stakeholder. It can be used as a training tool to discuss how to best get stakeholders interested in zero waste.

In reality our meetings are of course longer and more time could be taken to discuss different topics and discuss them in more depth, however in this video we have tried to capture the essence of a good communication about zero waste.

An example exercise how this can be used in a training session.

1. **Give a task to learners to practice:**

You want to get your municipality to adopt some zero waste policies, firstly door-to-door collection. You know that they have only public recycling points, where people need to bring their source-separated waste. You have set up the meeting with the vice-mayor with the promise that your ideas could help to save some costs. How would you approach him/her to get him/her consider your ideas?

Extra-layer: *As you enter into a meeting with the vice-mayor, you see that the secretary brings in coffee in single-use cups.*

The task can be organised in several ways:

- **A.** Learners work in pairs, where they do role play: one is vice-mayor, the other is the Ambassador,
- **B.** Learners work in pairs, where they simply discuss what their approach would be OR
- **C.** Individual work, where learners write down their thoughts, which is then followed by discussion in smaller groups or in one big group.

2. **After the task, the video is shown. This is followed by another discussion, some possible guiding questions:**

- What did you notice in the video?
- What did the Ambassador do differently in the video than you would have? What could be the reasons for that? What would work better in reality?
- What was done well? What could be done better?
- What principles of communication can we deduct from here?
- What would be the next steps for the Ambassador after the meeting?

Some parts of the video can be shown again, or the video paused at certain moments, for example when the badly sorted waste bins are shown.

The expert reasoning for the Ambassador's approach in the video that can be shared in the end:

- The Ambassador resists the urge to start first talking about the single-use cups on the table, which probably would shift the focus from the bigger plan she wanted to propose. She also doesn't go into blaming why their office is using single-use cups. Blame is a form of control, which would suppress the vice-mayor's need for autonomy, which in turn would reduce his wish to truly listen to the Ambassador.
- The Ambassador doesn't start with her proposals, she asks the vice-mayor what he thinks about the situation (even though she already knows some things and has her own opinions) and is sincerely interested in how it looks from his perspective. She accepts the answers calmly, without judging, but rather being supportive, building the dialogue upon the vice-mayor's thoughts – supporting the need of autonomy and relatedness.
- The Ambassador mostly asks questions, trying to get the vice-mayor to get to the answers himself – helping him to construct the knowledge himself, and again supporting autonomy.
- The Ambassador also asks questions that need more in-depth answers than just yes or no, where the vice-mayor has to explain a bit more and open up his thinking.
- In moments when the vice-mayor seems a bit confused, because he probably hasn't asked these questions from himself and others from him, and takes time to respond, the Ambassador is patient and not rushing in with her knowledge – this is again helping the vice-mayor to think actively about this himself.
- Only after several questions the Ambassador starts presenting her case and examples of what could be done in their city too. By offering the vice-mayor options on how they could do things together, the Ambassador supports his need for competence.
- The Ambassador doesn't talk about the definition of zero waste, but shares the examples of what it means in practice for the zero waste cities. She focuses on the decisions the city governments have made, showing also how it has been a journey and making the connection how those cities were once in the similar state as this city is now.
- In the end, the Ambassador also doesn't just say that single-use cups are bad, but asks why they are used (thus, giving a question, not an answer, with the potential to the vice-mayor to find the answer himself) and simply proposes a possibility to discuss some better options next time.

Anything else that you noticed?

For the purpose of the video's length, the flow of the discussion in the video is a bit rushed and faster than in reality. In a real life situation, in what moments and how could the Ambassador act differently than shown in the video, following the same principles mentioned above?

ZERO WASTE CITY ROLE PLAY GAME

The Zero Waste City role play game was designed as a final activity in the Zero Waste Ambassador training event, in order to practice all the main competences needed for being a Zero Waste Ambassador. This gives the learners a life-like yet safe environment for testing the level of their skills and understanding.

These are the elements of the game:

- The main aim of the activity is to give the learners a random municipality case, which may be quite different from their own situation, to test if they are able to apply zero waste principles in different contexts.
- The two first stakeholders are the most common ones that Zero Waste Ambassadors need to work with – a municipality representative and a waste company worker.
- A disruption is built into the game, in order to practice adapting to changing circumstances which also often happen in real life.
- The final stakeholder in the game is a journalist, as communication and talking to the media is also part of spreading the zero waste message.

The game is played in groups, 4 people in a group is the ideal size for the learners. Groups could either be randomly formed or formed by learners themselves.

Here you will find:

- The general set up for the game;
- The municipality profiles and disruptions;
- The short descriptions of stakeholder personas.

The descriptions are meant for the trainers playing the stakeholders. Additionally, some short background information can be created about the personas to give to the groups, for example in the form of a short biography or CV.

For those acting as the stakeholders, you will need experts with enough background in waste management, zero waste policies, and real life situations (and ability to portray these personas with a sense of playfulness!). Besides the stakeholders, it's good to have a separate person to be the game host, who will keep the time and help with the general flow of the game.

Recommended timeframe is around 4 hours without breaks – these can be added where needed. Time for the groups to form is not included, but this can be done also the previous day or given as a task during lunch or some other option.

Timeframe of the role play game

Time	Activity
30 min	Municipality case is presented to groups, building their proposal(s)
15 min	Meeting with the first stakeholder
15 min	Meeting with the second stakeholder
20 min	Teams analyse the info from their meetings, make plan for next steps
20 min	The disruption is presented. Teams have time to adjust their plan and get ready to present to the new stakeholder
15 min	Meeting with the new stakeholder
20 min	Making final plan (at the same time, trainers decide on the media angle for each group based on what solution they are proposing for the municipality)
15 min	Introducing media role to groups, time to prep for the interview with the journalist
10 min	Two team members are interviewed by the local media persona, 5 min each
60-90 min	All teams back together, reflections and feedback to each group (~10 min per group to share their own reflections), all experts giving their view and solutions

After receiving the municipality profile in the beginning, if groups are struggling, they can be guided to ask themselves questions like these:

- Highlight in text what you think are the most important facts, when making the decision.
- What information is not that important?
- What additional information do you need to ask from the municipality and waste management company?

A commented version of one municipality profile can be found at the end of this chapter, which can be helpful to guide learners to read and interpret information given to them. At the end of each group info, we have also added short expert-opinions on what they would do in this situation.

Stakeholders' rotation

In our pilot training we had 4 groups and 4 trainers/experts. Each trainer met with each group once, in a different role.

An example meeting plan with stakeholders for the groups:

	Round 1	Round 2		Round 3	Round 4
Group 1	Municipality rep – **trainer 1**	Waste company – **trainer 3**	Disruption	New waste advisor at municipality – **trainer 4**	Local media – **trainer 2**
Group 2	Municipality rep – **trainer 2**	Waste company – **trainer 4**		New waste company – **trainer 1**	Local media – **trainer 3**
Group 3	Waste company – **trainer 3**	Municipality rep – **trainer 1**		Consultant for mayor in charge of overseeing budget cuts – **trainer 2**	Local media – **trainer 4**
Group 4	Waste company – **trainer 4**	Municipality rep – **trainer 2**		City's waste management team – **trainer 3**	Local media – **trainer 1**

We reference the below information by each group, so that the municipality profile, the disruption, and the stakeholder personas for one case can all be found together.

GROUP 1

Municipality profile

- The municipality is medium-sized (200,000 inhabitants) and is quite residential, with lots of high-rise buildings in densely populated areas and suburbs. Only 30% of the population have access to a garden.
- 200,000 inhabitants generate 550 kg of residual waste per capita per year, which includes a lot of waste coming from local cafes and restaurants which is included as MSW.
- The average income of local residents is below that of the EU. Most residents' income comes from the tourism and hospitality sectors.
- Challenge of language diversity: there are often 5 different languages spoken by residents throughout the town.
- The municipality partners with the local private waste management company, which is responsible for implementing the waste and separate collection systems. The municipality has an overall say and control over which company operates this programme, but the waste management company is realistically the only business who have the capacity and technical requirements to run this service within the local area.

- 35% separate collection rates in the municipality:
  - Glass: street container.
  - Door-to-door collection of residual waste + paper and cardboard.
  - Plastic bottles and metals: street containers.
  - No separate collection of organics.
- An incineration plant is used for the vast majority of residual waste and has a contract to run for the next five years. The incinerator services many towns and communities across the local region, charging high taxes due to there being little alternatives available for municipalities to manage their waste. The plant is 50 km away from the town, resulting in high transportation costs, too.
- There is one central drop-off location that citizens use for hazardous, bulky, garden, and organic food waste, which is currently 10 km outside of the town, with low usage rates of around 5-10% of the population.
- The municipality is interested in the possibility of introducing a PAYT scheme, with local businesses not opposed to the idea either, but no action has been taken yet due to a lack of capacity.
- Currently, residents pay a flat base rate of tax to the municipality for waste collection and management, which does not differ depending on the amount of waste they produce.
- One small and independent packaging-free shop has been established in the town within the last 12 months, but otherwise there remains little to no encouragement of reuse. There are no repair centres in the local area, although some businesses do offer the service but with a small fee.
- Educational posters have been spread around the town in the past to encourage the use of separate collection bins for residents and tourists, as well as some social media advertising paid by the municipality to try to get more younger people recycling and reusing.

Stakeholder personas

Municipality representative

You are responsible for the operational level of a municipality, including finances and project management. Being a small municipality, you need to handle many things at the same time – you hardly keep up with the overload of work and many responsibilities. You mainly deal with urgent things and don't leave much room for new things – such as innovative approaches like zero waste, although you think they might be useful for the municipality's development and better waste management. How to find capacity for this extra work and responsibility? You need to be approached by chance, not pushed, and provided with a simple plan of how and where to start without much support and expert knowledge. You desire the feeling of trust and reliability.

Waste management company owner

You are a person of obvious practical concerns: you are both stern, old school, and unfavourable to suggestions of soft and poorly defined measures. You think in people, trucks, tons, euros – not long-term visions and social innovations. It's all about waste management technology and performing the core services the company was founded for.

Disruption

Local elections were held and, although everyone assumed the same party would continue, surprisingly another party won and took office in city government. The new party is known for their conservative and business-as-usual mindset. They appoint a new waste advisor, who finds zero waste an utopian idea (and probably just doesn't know anything about it). Your next meeting is with them.

New stakeholder personas

New waste advisor for the municipality

You are self-confident. You know some basics about waste management, but lack the big picture and do not know the local situation. You are in favour of ready-made solutions: you are willing to build facilities that will take care of the waste, rather than modifying the separate collection system. Three jobs generated by the new incineration plant seem like a big win. The main argument is that sanitation is guaranteed, waste disappears, and energy is created. You clearly minimise the importance of target values that will be mandatory for municipalities in the future, e.g. amount of packages to be recycled.

Journalist

You work for a media outlet which is under-resourced, understaffed and yet needs "newsworthy" content as much as ever. Stories that are unique, have a local angle to them, provoke controversy or debate, link to what's happening at the European level, and meet the interest of the local population are all you are seeking. To get into the real "story", you need to dig deeper and ask sometimes challenging or provocative questions. This is exactly the kind of content that your editor will appreciate.

Expert comment on the municipality case

Advice for the group

- Focus on optimising the existing separate collection system, because with collection rates at only 35%, there's lots to work on. This would include implementing a door-to-door scheme for all residents. Showcase how, with some initial investment, the scheme is proven to deliver higher recycling rates and better quality recyclables which are able to be sold at a higher price. With reduced residual waste, door-to-door schemes are proven to save money for the municipality, too.
- Organics is the priority – collect it from households directly and encourage home/community composting throughout the municipality. Highlight the economic savings here, as well as obvious environmental benefits.
- Pilot PAYT locally to begin with, in a section of the municipality with the aim of having it implemented across 100% of the city after a couple of years of testing a gradual roll-out.
- Introduce reuse and repair centre(s) where possible with some municipal support, although ideally you would create an environment where social enterprises and businesses working on circular economy issues could flourish.

GROUP 2

Municipality profile

- The municipality is relatively small, with a population of 15,000. It is quite rural and geographically spread out. 90% of the population have access to a garden, with the municipality covering a 10 km area in total.
- Its 15,000 inhabitants are generating 280 kg of residual waste per capita per year.
- The average income of local residents is below that of the EU. Most residents' income comes from either agriculture or jobs that require travelling to the nearby big city.
- 60% of the local population are over the age of 50. It is an ageing population, with most younger people moving to bigger cities nearby.
- The municipality has a public waste management company, which it owns 100%. The company reports to the mayor and is responsible for the collection and treatment of waste.
- Door-to-door collection is currently only offered to a small area within the municipality, in the most densely populated area. Only 20% of residents have their waste collected at the doorstep. The rest are required to drop their waste at certain drop-off points with separate street bins.

- The average separate collection rate in the municipality is 37%, but this differs greatly between the areas which receive door-to-door separate collection and between those where people bring their waste to street bins:
  - Glass: street container for all.
  - Door-to-door collection of residual waste + paper and cardboard + plastics/metal/drinks containers (PMD).
  - Street bins for residuals + paper/cardboard.
  - No separate collection of organics but some of the population carry out their own composting activities, particularly those who have farms or farm animals.
- 75% of the residual waste is currently sent to a local landfill, but this is at 95% capacity, so it cannot continue for much longer in its current state.
- The remaining 25% of residual waste is sent to the neighbouring big city's incineration plant. The contract for this is up for renewal in 8 years and is based upon a fixed fee, rather than based upon the volume of waste that is sent.
- There is one central drop-off location that citizens use for hazardous, electronic, and bulky waste located within the city centre. The recyclable materials here are then transported to the larger recycling plant at the nearby big city, which is 30 km away.
- The municipality is interested in the possibility of introducing a PAYT scheme but worries about the older population not liking the changes.
- The main local business and economic sectors are HORECA and elderly health care.
- Currently, residents pay a flat base rate of tax to the municipality for waste collection and management, which does not differ depending on the amount of waste they produce.
- There has been very little encouragement of reuse locally but many of the inhabitants would support actions on this, as they are aware that the landfill is close to being full and of the environmental risks this poses. There are no repair centres in the local area, although some individual tradesmen offer the service themselves, but this is unorganised and irregular.
- Leaflets have been shared with each household about the importance of recycling and on how to separate their waste. The municipality sees the good results of its door-to-door collection in the densely populated area, but it is worried about extending this to the whole population as they fear people will not have the space for extra bins. They also worry about the extra costs of door-to-door collection, which would involve vans driving further.

Stakeholder personas

Municipality representative

You are cautious about both the costs of any new policy and the ability to change the behaviour of an ageing population. The municipality is under-resourced and, therefore, very open to suggestions and ideas from external experts. However, keep in mind that the municipality has a limited budget and there is little interest from other colleagues, so any decision needs to be sustainably financed and easy to sell. Therefore, the presentation of data and figures to the municipality is key. Come into the discussion looking for ideas and tips on what can be done locally to improve the situation – you want to listen to the 'experts' and want to be able to take away some tangible policy ideas.

Waste management company owner

The waste company is owned by the municipality. As the company owner, you have worked for years to satisfy the municipality requirements, but you have also built up your hidden marketing network of recycled materials that you are not reporting. The proposals by Zero Waste Ambassadors might work if the final owner of a company – the municipality – gets excited. This, however, would ruin your comfortable business plan.

The current incineration approach is expensive for the city but profitable for the company. The contract expires within the next 8 years. So, it is your interest to postpone any actual zero waste activities until then. After that point, you would agree to planning sustainable waste management without landfill and incineration anyway. The biggest concern is that current contacts offer stability. You have a serious fear of changes.

Disruption

The head of the waste management company gets arrested for fraud and illegal side businesses in the recycling market. The company is temporarily closed by the police and, after a short search, another waste company takes over the waste management at the municipality. It happens fast – mostly because the new waste management company owner is friends with the mayor. The new head of the waste company has ties with the waste-to-fuel industry and it's rumoured they are interested in developing that direction. Your next meeting is with the head of this company.

New stakeholder personas

New waste company

You are an "old machine" who knows all about waste, very technically skilled and supportive of innovations. You know how things work in the field but you are

struggling when it comes to soft approaches and to communicating effectively with residents (specially elders). You have high goals to improve waste management, but are very eager to follow the realization of waste-to-energy practices as this is the best thing you know. You are strongly committed to do your job well, although you are not putting environmental impacts first.

Journalist

You are an inquisitive investigative freelance journalist that will drill for concrete details and will not be satisfied with generic and handwavy answers, let alone misdirection. Also, since airtime is limited, there will be pressure on the interviewees to be concise.

Expert comment on the municipality case

Advice for the group

Collect and build your evidence bank which shows why waste-to-energy is such a bad idea for the municipality. Use mostly climate and energy efficiency reasons, whilst showcasing the lock-in effect on waste generation that these incinerators have. With the right collection system in place, the volume of residual waste can be drastically reduced here, which means there is no need (and no economic sense) in building the waste-to-energy plant. Focus first on the benefits that greater collection, recycling, and prevention can have to reduce the need for any incinerators.

GROUP 3

Municipality profile

- The municipality is large and quite urban. 20% of the population have access to a garden.
- 400,000 inhabitants generate 380 kg of residual waste per capita per year.
- The average income of local residents is below that of the EU. Most residents' income comes from the service sector (government, finances, customer support).
- Language diversity: 2 different languages spoken by residents throughout the town.
- The municipality partners with the local waste management company, who are responsible for implementing the waste and separate collection systems. The municipality has an overall say and control over which company operates this programme, but the waste management company is realistically the only business who have the capacity and technical requirements to run this service within the local area.
- Last year there was a 55% separate collection rate in the municipality:
  - Glass: street container.
  - Door-to-door collection of residual waste + paper and cardboard.
  - Plastic bottles: street containers.
  - No separate collection of organics.

- Separate collection rates have been stable at around 50-55% for the past 5 years, despite a couple of public awareness-raising campaigns on why and how to recycle.
- Most of the residuals (75% approximately) are landfilled locally.
- There are two central drop-off locations that citizens use for hazardous, bulky, garden, and organic food waste within the municipality, with relatively good use rates.
- The municipality is interested in the possibility of introducing a stricter PAYT scheme, with local businesses not opposed to the idea either, but no action has been taken yet due to competing schemes and the city being unsure which one to adopt.
- There are no repair or reuse centres in the local area, although some businesses do offer the service for a small fee.

Stakeholder personas

Waste management company owner

You are a person of obvious practical concerns: you are both stern, old school, and unfavourable to suggestions of soft and poorly defined measures. You think in people, trucks, tons, euros – not long-term visions and social innovations. It's all about waste management technology and performing the core services the company was founded for.

Municipality representative

You are covering the tourism sector, which is very commercialised and with minor sustainable practices. You are aware of the waste overload problems but don't have much knowledge about waste management. You are looking for quick solutions. Numbers, results, and reputation are very important to you. You are a bit afraid of change and don't want to lose the municipality's popularity. You might not see the benefits that zero waste measures could bring to the municipality.

Disruption

Your local mayor has announced that the city's finances have secretly not been well-managed for several years and, as a result, each department is being asked to cut its budget by 30-40%, which includes the waste management department. You also need to prove value for money for your activities and contracted services, with any new or increased revenue coming in (e.g. recyclable materials) being actively encouraged. Your next meeting is with the consultant for the mayor in charge of overseeing budget cuts.

New stakeholder personas

Consultant for mayor in charge of overseeing budget cuts

Money is tight and every policy needs to have a solid bank of evidence showcasing its costs, value, and impact. Time is also in short supply for you these days, so you want facts presented clearly and efficiently – you are not afraid to demand these from those with whom you meet. Waste is not your area of expertise and action on waste/recycling has been limited in the past – so not only do policy changes need to be well-evidenced, but you are also seeking easy sells to the population.

Journalist

There has to be a 'news value' in your article. News values in journalism are proximity, controversy, personal influence, suitability, impact, bizarre, human interest, timeliness, progress, genuineness, completeness, negativeness, and money (of course). These elements determine whether the news is necessary or not for the readers. You will ask questions about money, duties, roles, things that are done well or gone wrong, and the persons involved. In a climate where money is tight and cuts are happening everywhere, stories of any new financial investments are viewed sceptically, yet they would make a great storyline for your editor.

Expert comment on the municipality case

Advice for the group

- Gather all the necessary data possible surrounding the municipality's waste budget so that you can understand where costs can be saved or reduced.
  For example, the key indicators are the fees for disposal, the operational costs of the collection and treatment, as well as the revenue made from selling on recyclables and (if relevant) the income generated by any EPR scheme used.
- To improve collection – focus on organics! Community composting could be one option or, if not, you could explore a central composting plant with potential biogas capture (see the Milan case study for inspiration).
- Explore local partnerships and options to embed reuse (see briefing document for guidance).

GROUP 4

Municipality profile

- The regional government consists of 4 small municipalities of 2,000-3,000 inhabitants each, with 10-15 km distance between them, in a rural area with no high-rise buildings. The vast majority of the population have access to a garden.
- Altogether, 9,000 inhabitants generate 350 kg of residual waste per capita per year.
- The average income of local residents is above that of the EU. Most residents' income comes from the tourism sector and the food production industry.
- 3,000 people of additional workforce commute to the region daily and weekly from neighbouring areas.
- The regional government has a contract with a private waste management company, who is responsible for implementing the waste and separate collection systems for mixed waste and recyclables. All biowaste is collected and treated by one local farm that is happy to use the compost it generates. The government has contracts with both, and they will run out in 5 years.
- 65% separate collection rates in the municipality:
  - Door-to-door collection of all waste: glass, paper and cardboard, organics, mixed packaging, mixed waste.
- The door-to-door collection system has been in place for one year, which caused the separate collection rate to go from 20% to 65% (the system in place before was a bring system with public collection points on the street supplemented by mobile collecting points).
- Residual waste goes to an incineration plant located 300 km away, with a gate fee of 150 euros/ton.
- There is no central drop-off location for hazardous and bulky waste, the service is available only on demand twice a year (hazardous waste for free, bulky waste for extra pay).
- Currently, residents pay a flat base rate of tax to the regional government for waste collection and management, which does not differ depending on the amount of waste they produce.
- Local food producers offer food delivery in reusable packaging and have a "factory shop" where they sell their produce in bulk. Reusable tableware dominates public events.
- During the launch of the door-to-door collection, a media campaign was organised for all the towns to inform inhabitants about the changes by visiting and doing events in all neighbourhoods.

Stakeholder personas

Waste management company owner

The waste company operates on the basis of a contract between you and the local government. The conditions are fixed in the contract. You only see proposals by Zero Waste Ambassadors as doable if they fit into existing contracts; or you might use it in future contracts. You can not change the content of the contract, but sometimes we can do more. Additional work, however, has a cost. Proposals are certainly valuable if they let you save costs, e.g. cutting transportation costs. New ideas would need to be presented to show how they can facilitate the company to fulfil the contract.

Municipality representative

Performance is already high, so you are not desperate to change – but you know that the current fees and costs of the system are too high in comparison with other places. Come into the discussion with an open mind, looking for new ideas, whilst also remaining very pragmatic about things. There is a bit of frustration with the lack of flexibility from the contracted waste company, but the performance has increased so much over the past 12-24 months that you cannot complain too much. As a region, you know that any change in policy must be clearly planned and thought through, especially as you will be the one presenting these to your municipal colleagues. Therefore, data and evidence of such policies working elsewhere are key.

Disruption

The largest importer of your waste for recycling and disposal decided to stop waste trade permanently. The city is left with a third of its waste streams without a final step. Waste starts piling up, there is a risk of overflow and the city government frantically looks for solutions. The industry suggests incinerating all the remaining waste. Your next meeting is with the representative of the city's waste management team.

New stakeholder personas

City's waste management team

You are in a position of power, but not ultimate power (not the mayor), so while largely autonomous, big decisions will have to be screened, plus the waste management company will need to be convinced to comply. Therefore, your mindset is one of openness to any solutions, allies, but you quickly evaluate them through thinking out loud and asking follow-up questions. After all, you are tasked with preparing concrete proposals for solving the disruption and doing that fast. In the short-term response there's no place for intangible measures, but mid- and long-term there is and the team knows these can complement each other.

Journalist

Your job is your life. You work for uncensored news and you are never satisfied with brief information, so you will not stop until you find the truth. You act very skeptical, and cast doubt on everything. You are an advocate of justice, a journalist with respectable mileage and great achievements. Your stories matter.

Expert comment on the municipality case

Advice for the groups

In waste management, volume matters. Instead of building a system for 4 individual sites, cooperation would offer savings and flexibility for the municipality. Due to the small number of people, communication is easy. Motivate people to source-separate waste and do home composting. However, feedback and continuous education has a great role. As a Zero Waste Ambassador, you could take the role of building communication and feedback plans for people, encouraging community-based actions, and serving waste collection and treatment in a way that consolidates the community. Let everyone feel like a player in this. Keep in mind that income and profit for waste in such a small region is also small, and the waste company is probably not willing to lose it. Perhaps it is possible to find a trade-off between new proposed actions (be it building repair shops, recycling centre, or similar).

EXPERT COMMENTED MUNICIPALITY PROFILE

How an expert reads and analyses information

Group 1 municipality info

Size is important: it will give us a critical mass of waste that is inked to cost and income

- The municipality is medium-sized (200,000 inhabitants) and is quite residential with lots of high-rise buildings in densely populated areas and suburbs. Only 30% of the population have access to a garden.

Not much industrial waste

Lower transport distances, easier to collect

Less garden waste available, homecomposting will make little sense, brown biowaste bin becomes a must

Cannot use individual options, anonymous client

This volume is a bit too much compared to background data, there is space for reduction, check for errors in statistics

- 200,000 inhabitants generate 550 kg of residual waste per capita per year, which includes a lot of waste coming from local cafes and restaurants.

Calculate total amount, make waste audit, calculate sum per each material

So they have massive catering? Is that waste included in residential amount? Try to keep household and catering amounts separately, go for food waste reduction and brown biowaste bin

- The average income of local residents is below that of the EU. Most residents' income comes from the tourism and hospitality sectors.

Tourism requires information campaign

- Challenge of language diversity: there are often 5 different languages spoken by residents throughout the town.

Language diversity requires information campaign in all languages but mainly about 'how-to-separate-and-collect'

- The municipality partners with the local private waste management company which is responsible for implementing the waste and separate collection systems. The municipality has an overall say and control over which company operates this programme, but the waste management company is realistically the only business that has the capacity and technical requirements to run this service within the local area.

Municipality rules, but they have no trucks and personnel. Private waste company does collection. Each proposal that municipality has, has a price. Discuss with waste company what could be realistic solution.

If you propose changes in collection and treatment then one has to invest. Do you propose public, private or private-public ownership? This depends on local-national financial context, might need discussion with financial experts.

So the private company actually rules! Do you tolerate this or would you diversify?

Good figure for a start! It means that residents are willing to participate. Expand!

- 35% separate collection rates in the municipality:
  - Glass: street container
  - Door-to-door collection of residual waste + paper and cardboard
  - Plastic bottles and metals: street containers
  - No separate collection of organics

Consider collection of packages. See what is in the legislation, one has to collect WEEE, hazardous waste and bulky, too

Why do we need street container system if we have high rise buildings where door-to-door is doable easily.

Without introducing separate collection high recovery rate is not possible. Support the door-to-door idea.

- An incineration plant is used for the vast majority of residual waste and has a contract to run for the next 5 years. The incinerator services many towns and communities across the local region, charging high taxes due to there being little alternatives available for municipalities to manage their waste. The plant is 50 km away from the town, resulting in high transportation costs, too.

Not my worry, irrelevant data for me

Any other waste treatment method cheaper than that is worth doing

Have better sorting, incinerate only what is inevitable

Any other waste treatment facility requires time to build. 5 years is quite close, until then we can afford incineration. You are bound by a contract, but consider not prolonging it after 5 years start with investments to reduce incineration

If we can introduce more local treatment options, then we can offer source-separation collection schemes with financial motivation to recycle rather than incinerate

Study the cost components, is it incineration tax, transportation or just high gate fee? Transportation you can reduce by considering transfer stations and transport optimisation. Incineration tax you can avoid by not incinerating! Huge gate fee can be a motivator to change the current waste treatment practice & waste collection practice

- There is one central drop-off location that citizens use for hazardous, bulky, garden, and organic food waste, which is currently 10 km outside of the town, with low usage rates of around 5-10%.

It's a good start to show what's possible

Very wrong place, too far for frequent use

And here is a proof: wrong locations equals to low usage and pointless business. Bring it to town, make it easy to use for citizens. Collect large variety of waste materials. Try with no fee or low fee. PAYT is possible

- The municipality is interested in the possibility of introducing a (PAYT) scheme, with local businesses not opposed to the idea either, but no action taken yet due to capacity.

The prerequisite for PAYT is very good source-separation and separate collection. Introduce this first-hand, and only then consider PAYT. Managing PAYT requires funding too, and it can be too expensive to apply, even if it feels a fair play

- Currently, residents pay a flat base rate of tax to the municipality for waste collection and management, which does not differ depending on the amount of waste they produce.

Flat rate does not motivate, differentiate the price – mixed waste has to be expensive, well sorted waste has to be free or cheap

- One small and independent packaging-free shop has been established in the town within the last 12 months, but otherwise there remains little to no encouragement of reuse. There are no repair centres in the local area, although some businesses do offer the service but with a small fee.

One shop has insignificant effect on waste volumes, but has a great effect on public opinion – keep going. Best if it is in location of the municipal dropoff centre – one place to visit

This is private initiative, the government can just support it, nothing more

- Educational posters have been spread around the town in the past to encourage the use of separate collection bins for residents and tourists, as well as some social media advertising paid by the municipality to try to get more younger people recycling and reusing.

Education has to be life-long, posters have limited effect

Good start, keep going, but remember that educating citizens is in the end lifelong work

Expert comments:

- We have no information about waste composition. Propose making an audit.
- We have no info about the waste company. What are they capable of, what obligations do they have in contract?
- We have no info about infrastructure, amount and type of bins, trucks, facilities.
- We need to find the people who are making decisions in the city and waste company. In the end we need our proposals to find its way into investment plans.
- We have no info about how the city is administered. There has to be a waste or environmental regulation in the city. Find it.
- We do not know the national regulations. We can only guess that the location is in Europe, so EU directives will apply too.
- We definitely need to draft a waste management plan for the city with a 5+ year perspective and in relation to national ambitions.
- Every decision has a price tag. Learn about the financial situation with the current waste system. How the flat based rate was proposed? Can we propose a better one?
- Planning has to cover ALL waste fractions and consider ALL target values, not just easy-to-reach or popular ones.

What is irrelevant info?

Mere recognition that the system is like that and cannot be changed is a justification for doing nothing. One should be guided by national targets.

BEZWA PROJECT 2022