Part 2 -

Planning steps – Towards Zero-Waste at Schools

Overview of the seven steps

4) Identify and Evaluate Options

Identify and evaluate options
Discuss and agree on options
Revisit goals and targets

3) Planning Priorities and Principles

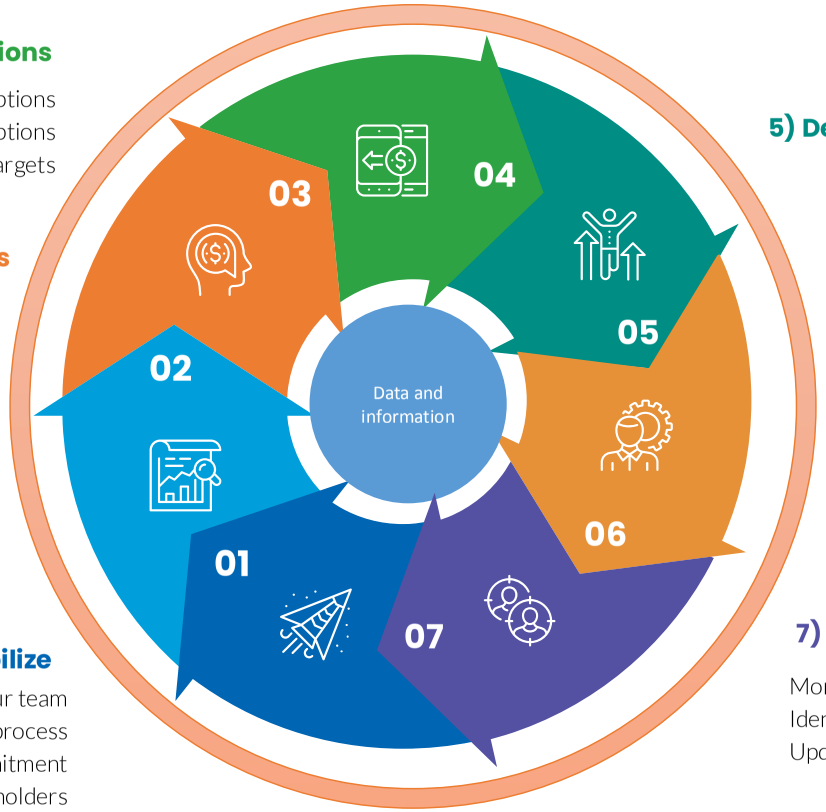
Agree on Zero-Waste priority order
Set goals and targets
Identify priorities based on key issues for each cluster

2) Baseline

Establish a baseline
Identify key issues
Validate the baseline

1) Mobilize

Assemble your team
Agree on principles and process
Confirm school commitment
Identify stakeholders



5) Develop an Action Plan

Develop an Action Plan
Identify roles and responsibilities and set action-specific targets

6) Implement the Action Plan

Begin the process of Action Plan implementation
Communicate the priorities, objectives and targets to all stakeholders

7) Monitor and Evaluate

Monitor and evaluate progress against targets set
Identify opportunities for improvement
Update the Action Plan accordingly

Figure 9: Planning steps - Overview (adapted from [4])

STEP 1. Mobilize

Milestones	Key stakeholders	Tools & Resources
A. Assemble your team B. Agree on principles & process C. Confirm school commitment D. Identify stakeholders	• Zero-Waste committee (ZWC) • School officials	• T 1.B – Zero-Waste principles & process • Technical resources on SWM

(A) Assemble your team

First, assemble your team, which will be referred to as "Zero-Waste Committee" (ZWC) throughout this toolkit. To ensure a broader acceptation among the school community, we recommend to include a large variety of school stakeholders and to have a representative of each school stakeholder group/ constituency.

As the success of projects often relies on "champions" [25], it is important to make sure to have highly motivated and committed people in the team.

Typical school stakeholder groups and potential interested members are:

— Teachers (e.g. science teachers)

— Non-teaching staff (e.g. administrative staff, cleaning staff, kitchen staff)

— Students (e.g. environmental/green club members, representative of students)

— School officials (e.g. representative of headmaster)

— Parents of students (e.g. representative of student's parents association)

The interest and participation of school stakeholders can be triggered through posters, social media posts and concretized in a start-up meeting.

(B) Agree on principles and process

As presented in Part 1 - Key concepts, the main principles behind the Zero-Waste approach in schools are:

Waste hierarchy, where the focus is on preventing waste generation in the school compound to reduce the amount of waste generated;

Circular economy, where the aim is to close the loops of material and resources as close as possible to the production source so that more material and resources can be recycled inside and/or outside the school;

Behavior change and learning by doing, where the aim is that the whole school community can experience sustainable practices and that students are encouraged to adopt such practices in their daily lives;

[1] Champions are defined as specific individuals highly committed, well-linked to the other stakeholders, usually having good expertise on the subject and respect by other stakeholders25. Zurbrügg, C., Assessment methods for methods for waste management decision-support in developing countries, F.d.I. Università degli Studi die Brescia, Editor. 2013.

Participatory strategic planning, where the aim is to involve a broad variety of school stakeholders to come up with an Action Plan towards Zero-Waste tailored to the school context, and which follows a structured approach allowing to take data-driven decisions.

These principles should be explained to the ZWC and the main projects steps and activities presented. You can use the resources of T 1.B as supporting material.

T 1.B – Zero-Waste principles & process

(C) Confirm school commitment

For any project to be successful at school level, political support from school headmaster and school commitment is essential, as this will permit to run the process smoothly and access school financial and human resources.

Experiences showed that projects run at school level are usually more sustainable if own school funding is used, as this signals a stronger commitment from school stakeholders and ownership over the project. Also, it ensures that investments remain reasonable for the school and do not compromise the long-term benefits once installations and/or equipment need to be repaired or replaced.

Conducting "fact-finding" and trying to understand what are the key issues related to SWM felt by the entire school community can help increasing school commitment. Also, you can check if there is any national strategy, policy or target on SWM set by the Ministry of Environment, or any environmental education strategy developed by the Ministry of Education which could support the implementation of the Zero-Waste approach. You can also use the global facts and figures on SWM available in Part 3 - Technical resources to highlight the importance of tackling solid waste issues.

Presenting the resources of T 1.B to the school headmaster is recommended at this stage, so that the key principles and main steps can be agreed on.

T 1.B – Zero-Waste principles & process

Technical resources Solid waste management – Facts and Figures

(D) Identify stakeholders

Together with the ZWC, make a list of all the stakeholders inside and outside the school that are linked directly or indirectly with solid waste management. This will allow you to have more clarity on key stakeholder to be included later on (see Step 2 (A.5)).

A non-exhaustive list of potential stakeholders can be found in Box 7.

Box 7: List of potential stakeholders

Milestones	Key stakeholders	Tools & Resources
— Students — Teachers — Administration — Kitchen staff	— Cleaning staff — Kitchen staff — Municipal collection service (if any) — (In)formal waste recyclers* (if any)	— School officials — School administration — Students associations — Parents of students

**See Part 3 - Technical resources Existing recycling system*

STEP 2. Baseline

Milestones	Key stakeholders	Tools & Resources
A. Establish a baseline B. Identify key issues C. Validate the baseline	• ZWC in collaboration with: • Waste generators • Cleaning staff • School officials • Public/private SWM company (if any) • + External support (if any)	• *T 2.A1 – Waste audit* • *T 2.A2 – WABIs for school* • *T 2.A3 – Water, sanitation & energy assessment* • *T 2.A4 – Curricula review* • *T 2.A5 – Stakeholder analysis* • *T 2.B1 – Problem tree analysis*

The second step is about establishing a baseline and identifying key issues. It is a very important step, most of the time overlooked, but crucial to ensure that meaningful decisions are going to be taken. If we want to change the system in place, we need to understand it!

(A) Establish a baseline

Establishing a baseline will require some time and efforts. It will be done in five stages:

1. Determining waste quantities and composition
2. Reviewing waste management operations
3. Reviewing water, sanitation and energy operations
4. Reviewing curricula
5. Conducting a stakeholder analysis

Each of these activities are described hereafter

A.1) Determining waste quantities and composition

Knowing how much waste, what type of waste and where it is produced is key to improve SWM. This will be determined by doing a so-called "waste audit".

A waste audit consists in collecting waste on a daily basis, over a week, and each day: weigh the waste, characterize the waste (i.e. separate the collected waste in different waste fractions, weigh each fraction separately), and report the gathered information on a document. At the end of the week, an average of waste production per day can be obtained. By using the number of people at the school an average waste production per capita can also be calculated.

Depending on the goal you want to achieve and what you want to use the data for, the waste audit can be performed at different level (from general to specific):

1. If you want to just know the overall amounts and types of waste generated, you can collect all the trash bins together, weigh and characterize them;
2. If you want to come up with concrete actions to be taken by the different waste generators, you can cluster the school waste generators by their activity and characterize them separately (e.g. school canteen/kitchen; classrooms; offices; etc.);

3. If you want to create a "group awareness" and allow foster "competition" inside the school to motivate students to adopt better waste management practices, you can conduct waste characterization studies per classroom.

4. If you want to raise awareness of students regarding their own waste generation, you could ask them to put all their waste in a specific bag and ask them to conduct a waste characterization study based on their own waste.

Box 8 summarizes the different options mentioned above, what needs to be done as well as pros and cons of each.

T 2.A1 explains how to perform a waste audit step-by-step. Don't forget to consider seasonal variation in the type and amounts of waste generated!

Box 8: Summary of waste audit option

Purpose	What to do	Pros and Cons
1) Overall amounts – To design infrastructure (composting site, bins, disposal site, etc.)	Collect all the trash bins, weigh and characterized the waste into different fractions	+ Requires less logistic - Don't give information regarding generation source
2) Cluster by generation source – To come up with concrete actions to be taken at different locations of the school	Collect all the waste from the same generation source (e.g. classrooms, admin. offices, cafeteria, etc.), weigh and characterized the waste into different fractions for each generation source separately.	+ Allows to plan specific actions for each school waste generation source - Requires a bit of logistic
3) Cluster by classrooms – To create "group awareness" and make "competition" inside the school to motivate classrooms to take collective efforts to reduce waste generation	Collect the waste from each classrooms separately, weight and characterized the waste into different fractions for each classroom separately.	+ Motivates collective efforts from each classroom - Requires more logistic and support from each classroom
4) Amounts per students - To raise awareness of students regarding their own waste generation	Ask each student to put all their waste in a specific bag and then ask them to conduct the waste characterization study.	+ Raise awareness of students at individual level - Less relevant to plan concrete actions at school level

We recommend Option 2 if you want to develop an Action Plan specific for each waste generation source. Option 3 and 4 can be used by teachers for teaching and awareness raising purposes.

T 2.A1 – Waste audit

Additional resources:

UN-Habitat, 2021. Waste Wise Cities Tool (Step 2) [4]

Wasteaid, 2017. Making waste work: A toolkit – How to measure your waste [26]

MOOC module – Conducting a Waste Generation and Characterization Study (Eawag/Sandec)

A.2) Reviewing waste management operations

Planning towards a Zero-Waste school requires a good knowledge about the current SWM system, its physical components as well as the governance aspects (see Part 1 - Key concepts).

To help you assess all the relevant aspects of the SWM system, we adapted the Wasteaware benchmark indicators (WABIs), a set of indicators developed by experts to benchmark SWM services of different cities across the globe, for schools. It uses a set of quantitative and qualitative indicators covering the aspects of:

Waste collection – Percentage of waste collected and quality of waste collection

Waste treatment and disposal – Percentage of waste treated and disposed of on site and quality of environmental protection from treatment and disposal methods

- **Resource management –** Recycling rates and quality of the 3Rs – Reduce, Reuse, Recycle
- **Stakeholder inclusivity –** To which extend are stakeholder involved in SWM
- **Financial sustainability –** To which extend SWM is financially sustainable
- **Sound institutions and policies –** School institutional capacity for appropriate SWM

The full list of indicators can be found in Box 9.

You can gather the information through observation, estimation and interviews. Each indicator is scored on a scale of 1 to 5, from very low, to very high. By a "traffic light" color system, allows you to visualize where improvements are needed. An example for a fictitious school is shown in page 33.

Guidelines on how to assess and score each indicator are provided in T 2.A2.

Box 9: Wasteaware benchmark indicators [24] adapted for a school compound

#	Indicator's name	Description
1C	**Collection**	
1.1	Waste captured by the solid waste management system (%)	Percentage of waste generated at the school that is actually handled by the waste management and recycling system, and not "lost" through illegal ("wild") burning, burying or dumping in unofficial areas.
1C	**Quality of waste collection**	
1C.1	Appearance of waste collection points	Presence of accumulated waste around collection points/ containers. It focuses on locations where large amounts of waste is collected (e.g. containers or collection points where all the waste from the school is gathered).
1C.2	Appearance of waste bins	Presence of litter and of overflowing litter bins.
1C.3	Effectiveness of sweeping	Presence of littering inside the school compound
1C.4	Regularity of collection service and monitoring	Presence of documentary evidence of appropriate service planning, service delivery, monitoring procedures and tools.
1C.5	Health and safety of collection workers	Use of appropriate personal protection equipment & supporting procedures

#	Indicator's name	Description
2E	**Onsite waste treatment and disposal**	
2.1	Amount of waste managed onsite (%)	Percentage of waste managed in the school compound and not given outside for further disposal
2.2	Amount of waste burnt on school compound (%)	Percentage of waste burnt in the school compound.
2.3	Controlled treatment or disposal (%)	Of the waste managed onsite, percentage managed in a controlled way
2E	**Quality of environmental protection of waste treatment and disposal**	
2E.1	Control over onsite waste disposal	Assessment of the degree of control over waste disposal reception and disposal operation
2E.2	Control over organic waste treatment (composting or anaerobic digestion)	Assessment of the degree of control over the organic waste treatment in terms of infrastructure and operating procedures for their proper use.
2E.3	Know-how of the responsible person	Assessment of the level of technical competence of the responsible person for waste treatment and disposal.
2E.4	Occupational health and safety	Use of appropriate personal protection equipment & supporting procedures
3R	**Resource Management – 3Rs**	
3	Recycling rate (%)	Percentage of total solid waste generated at the school which is recycled (inside or off-site)
3R	**Quality of resource management**	
3R.1	Source separation of waste	Assessment of how much of the total waste amount is separated at source and how well it is done.
3R.2	Focus on 3Rs in school policy and curricula	Assessment of the degree of both school policy and pedagogical focus on promoting '3Rs'
3R.3	Integration of the informal recycling sector (IRS)	Assessment of the integration of the IRS with the school waste management.
3R.4	Occupational health and safety for waste sorting	Use of appropriate personal protection equipment & supporting procedures

#	Indicator's name	Description
4U	**Inclusivity of school stakeholders**	
4U.1	Level involvement	Evidence of actual involvement at appropriate stages of the SWM decision-making, planning and implementation process.
4U.2	Feedback mechanisms	Existence and use of feedback mechanisms on SWM services.
4U.3	Education & Awareness	Implementation of comprehensive, culturally appropriate education, and/or awareness raising programs.
4U.4	Behavior in waste management	Assessment of good SWM practices, such as: not littering, applying 3Rs principles, waste separation at source.
5F	**Financial sustainability**	
5F.1	Cost accounting	Extent to which the solid waste management accounts reflect accurately the costs of providing the service.
5F.2	Planning for necessary capital for investment	Extend to which capital investment are available to purchase necessary infrastructure.
6L	**School institutional capacity for appropriate SWM**	
6L.1	Organizational structure	Responsibility at management level
6L.2	Institutional capacity	Institutional capacity and know-how
6L.3	School SWM strategy & plan	Recent strategy or plan in place and implemented at the school level for SWM
6L.4	SWM data	Availability and quality of SWM data

T 2.A2 – WABIs for schools

Wilson, et al., 2015 "'Wasteaware' benchmark indicators for integrated sustainable waste management in cities" [24]

A.3) Reviewing water, sanitation and energy operations

Moving towards a Zero-Waste school goes beyond waste management only. In order to close the loop of all resources and materials, you should also assess the water supply, sanitation and energy system (sources and consumption) of the school. This will help identify improvement possibilities and show potential synergies regarding material recovery options.

The main information of interest for each of these elements are summarized in Box 10[2].

[2] Note that the assessment provided here focuses on flows of material and resources but do not tackle water, sanitation and hygiene (WASH) aspects that need to be considered in a school setting to meet the WHO minimum standards. For a thorough WASH assessment at school level, the Facility Evaluation Tool for WASH in Institution (FACET) can be used. FACET was developed with support from the UNICEF/WHO Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP). More information on FACET can be found here: https://www.eawag.ch/en/department/sandec/projects/sesp/facet/

Box 10: Information needed on water, sanitation and energy

Water	Sanitation

– How much water is consumed at the school
– What are the main sources of water supply
– Is drinking water always accessible or not
– Is there any water treatment
– Does the water quality meet WHO guideline values for presence of residual chlorine, E.Coli, Arsenic, Lead
– Is there any storage system for water and how well is it maintained
– 3Rs:
  – Which efforts are done to reduce water consumption
  – Where are potentials for water reduction
  – Is rainwater collected
  – Could rainwater be harvested to substitute some water source
	– What kind of toilet type is used
	– What is the collection and storage /treatment system used
	– Is there any wastewater treatment system in place at the school or is it connected to a sewer
	– Is greywater (wastewater from showers, sinks, etc.) mixed with blackwater (from toilets)
	– How many toilets are there
	– In which state are these toilets
	– Does the sanitation system works properly or is there any issues of smell, overflow, etc.

Energy

– How much energy is consumed at the school
– What are the main electricity/energy sources
– Is energy always available or not
– 3Rs:
  – Which efforts are done to reduce energy consumption
  – Where are potentials for energy consumption reduction
  – What could be possible options to substitute energy by renewable energy source (e.g. solar panels, biogas, etc.)

Questionnaires to assess water, sanitation and energy system at school are provided in T 2.A3 .

A.4) Reviewing curricula

The Zero-Waste approach in schools targets learning, application and practice so that strategies to reduce, reuse, recycle and recover waste can be experienced by students inside and outside the classrooms. For SWM issues to be effectively tackled in schools, it is important that SWM is considered a topic of high importance for the school community and that education strategies are in place to give guidance to school teachers on how to tackle such issues. SWM education cuts across multiple thematic areas and should ideally be incorporated into different subjects of the school curricula, going beyond sciences subjects. Following the recommendation from UNESCO on ESD (see Part 1 - Key concepts), practical teaching should be preferred over theoretical teaching only.

Box 11 gives an overview of key steps to review curricula. T 2.A4 provides you guidelines on how to assess the current school curricula in more details.

Box 11: Curricula assessment

1. **Check national strategies and policies from ministries of Education and of Environment** to see if any education strategy is in place which could support the implementation of the Zero-Waste approach;
2. **Check the current school curricula** to see if environmental and/or SWM topics are covered or not and how;
3. **Discuss with teachers and headmaster** to see if there would be any ideas on how to integrate Zero-Waste concept in classroom teaching and what would be the main challenges to be overcome to do so.

T 2.A4 – Curricula review

An interesting example of national education strategy guiding schools on how to tackle environmental education in their teaching and operations was found in Peru as described in Box 12.

Box 12: National education strategy – Example from Peru

In Peru, since 2003 emphasis is given to environmental education (including SWM) with different regulatory frameworks developed accordingly. One is the National Environmental Education Plan (PLANEA, 2016) set in motion by the Ministries of the Environment and Education. This plan gives guidance on how to "mainstream the environmental focus" in schools following two main components as described in the Table 1.

Table 1: Environmental focus summary - Peru

Components	Specification	Description
Management components	Institutional	Environmental approach has to be part of the Educational Institutional Project (PEI), Annual Working Plan (PAT) and Internal Rules (RI) lead by the school headmaster.
	Pedagogical	Environmental approach has to be part of the School Curriculum Project (PCI) and Integrated Environmental Education Project (PEAI)
Thematic components	Climate change	Mitigation, adaptation and resilience towards climate change
	Eco-efficiency	Biodiversity, energy, water, solid waste management, air and soil quality, responsible consumption
	Health	Personal hygiene, environmental conservation and cleanliness, healthy nutrition, diseases prevention, sexual health
	Risk and disaster management	Prevention, adaptation and resilience towards natural disasters.

A.5) Conduct a stakeholder analysis

Identifying your stakeholders and understand their needs and position towards changes in the SWM system will help the planning process. This can be done through mapping stakeholder impact, influence, priority, contribution, opposition and engagement options in a so-called stakeholder matrix (see Box 13). As situations and relationships evolve over time, it is advised to update the stakeholder matrix from time to time.

Box 13: Stakeholder matrix

Role in SWM	Impact	Influence	Priority	Contribution	Opposition	Engaging
In which step of the SWM chain do they play a role?	How would a Zero-Waste Action Plan impact them?	How much influence they have on the implementation success?	What is important to this stakeholder?	How can they contribute to the Zero-Waste implementation success?	How could they block the implementation success?	How will they be engaged in the Action Plan dev. & implementation?
[Generation, collection, transport, recycle, disposal and/or treatment]	[low – high]	[low – high]	[Explanation on priority]	[Explanation on contribution]	[Explanation on possible blocking]	[Explanation on how engagement should be strengthened]

Adapted from UN-Habitat [4], Module 1.3

Typical stakeholder groups: students, teachers, school officials, non-teaching staff, parents of students, SWM company (if any), formal/informal waste recyclers (if any).

Additional resources:

- *Lüthi et al., 2011. Community-Led Urban Environmental Sanitation Planning: CLUES, Tool T5 [13]*
- *Wilson et al., 2001. Strategic Planning Guide for Municipal Solid Waste Management, Annex 1.1 [14]*
- *JICA, 2019. Guidebook for Environmental Education on Solid Waste Management in Africa, Chapter 2.2, (2) [2]*
- *Online course – From Data to Tangible Impact: Achieving Waste SDGs by 2030 , Module 1.3 (UN-Habitat) [4]*

(B) Identify key issues

Understanding what are core-issues that need to be solved is always a challenging task. We recommended to bring together different school stakeholders and analyze the issues by answering the following questions:

- **Who –** Who are the people who influence/ will be influenced by a specific issue
- **What –** What is the problem
- **When –** When does the problem occur
- **Where –** Where does the problem occur
- **Why –** Why does the problem occur
- **How –** How does the problem occur

Remember: the process of enabling and achieving participation by the different stakeholders to draw out an output is just as important as the output itself!

B.1) Problem tree analysis

A useful tool for structuring the problem and identify what impacts it, is the so-called "Problem tree" and the cause-effect relationship (see Box 14).

Box 14: Problem tree analysis

Problem tree analysis, also called situational analysis or problem analysis, is a method to "identify and understand the main issues around a specific local situation and to visualize cause-effect relationships in a problem tree" [13]. It helps to define in a schematic way the core-problem and related causes and effect.

The different parts of the tree symbolizes the following elements (see Figure 10):

- Trunk: Core problem
- Roots: Causes
- Branches: Consequences, effects

For each cause (root) of the problem it is important to try to break down the problem to its root problem. Always ask yourself: Why do we have this problem?

Remember that there may be many causes for one specific problem.

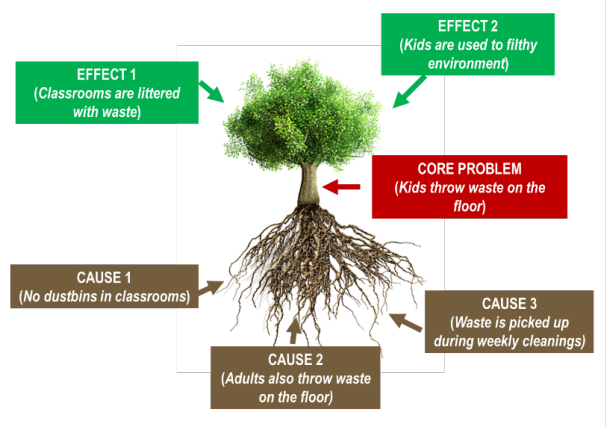


Figure 10: Examples of Problem Tree for elementary school [2]

T 2.B1 – Problem tree analysis

Additional resources:

Lüthi et al., 2011. Community-Led Urban Environmental Sanitation Planning: CLUES, Tool T8 [13]

JICA, 2019. Guidebook for Environmental Education on Solid Waste Management in Africa, Chapter 2.2, (2) [2]

(C) Validate the baseline

Once you have completed your baseline assessment and identified your key issues, you should present your results to all the school stakeholders. This will help you to validate the data and information gathered, as well as ensure that key issues faced by the different school stakeholders are considered. This can be done via a so-called validation workshop.

C.1) Organize a validation workshop

A validation workshop is the premises of the Action Plan development. It aims at [4]:

- Engaging with all stakeholders to reassure that they have been and are listened to, build trust and confidence
- Clarifying terminology and definitions
- Reporting back and presenting the baseline information to the stakeholders
- Discussing and resolve "hot" issues of disagreement regarding the baseline data
- Validating the facts and figures of the baseline
- Validating the identification of problems and priorities in the baseline
- Starting a first discussion on planning priorities and principles
- Identifying and agreeing with stakeholders on next steps in the planning process and scheduling

For such workshop, it is important to prepare the workshop agenda and related technical content well in advance. Also, try as much as possible to use visualization tools to communicate your results (see Box 15).

Box 15: Data visualization

An assessment always generates a lot of data. Yet, tools exist to visualize your data and help you transform data into valuable information.

The way you present your data depends on:

— **Who** your audience is, as presentation style and visuals must be neat, clear and tailored to the needs of your audience

— **What** information you want to highlight, as different tools exist to convey different type of information

Among the many visualization tools available, the most useful to present waste related data include:

Pie, Bar and Stacked bar charts : Helps representing percentages and frequency of a given answer (e.g. waste composition, level of satisfaction, etc.)

Material flow charts and Sankey diagram : Helps representing what happens to the waste

Traffic light systems : Helps identifying what works well and what does not work so well

Examples of visualization tools are shown in Figure 11, Figure 12 and Figure 13

Additional resources:

Online course – From Data to Tangible Impact: Achieving Waste SDGs by 2030 , Module 5.5 (UN-Habitat) [4]

Figure 11 and Figure 12 show examples, visualizing results from waste audits and assessments done in schools. Mass flow charts show how the waste is handled, using a Sankey diagram, where the line thickness is proportional to the amounts.

Such mass flows representation typically highlights the waste generation rate at the school from each source as well as the fate of the waste. The added pie chart in Figure 12 shows the waste composition and thereby visually highlights the potential for waste segregation, as almost 60% of the waste generated is either organic or recyclable.

Figure 13 shows an example of WABIs traffic light system results for a fictitious school. This example shows a good collection system at the school, but a rather poor disposal method and a weak resource management. It also highlights room for improvement regarding governance aspects such as stakeholder's inclusivity and financial sustainability.

[3] A simple way to create such graphic where lines thickness are proportional to waste amount generated is to use Power Point and define width of the line proportionally to the amount of waste generated.

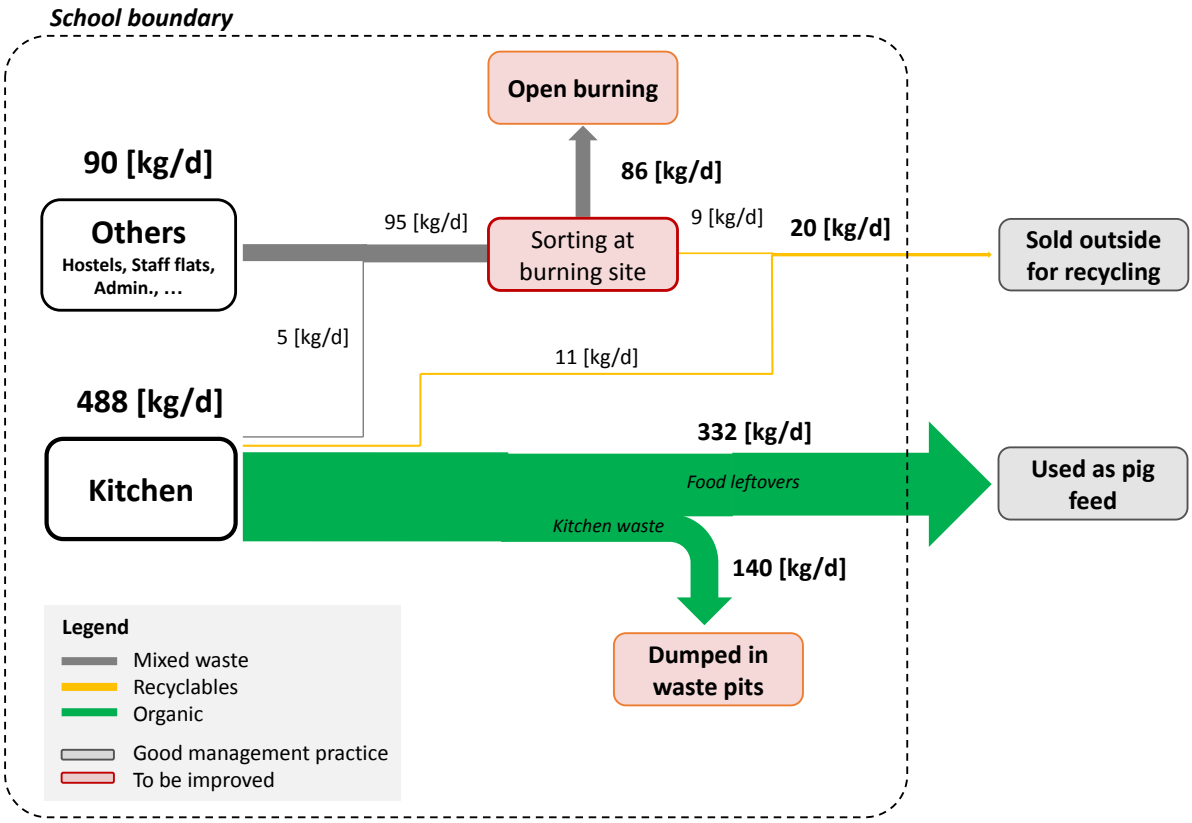


Figure 11: Example of mass flow chart for waste audit visualization [7]

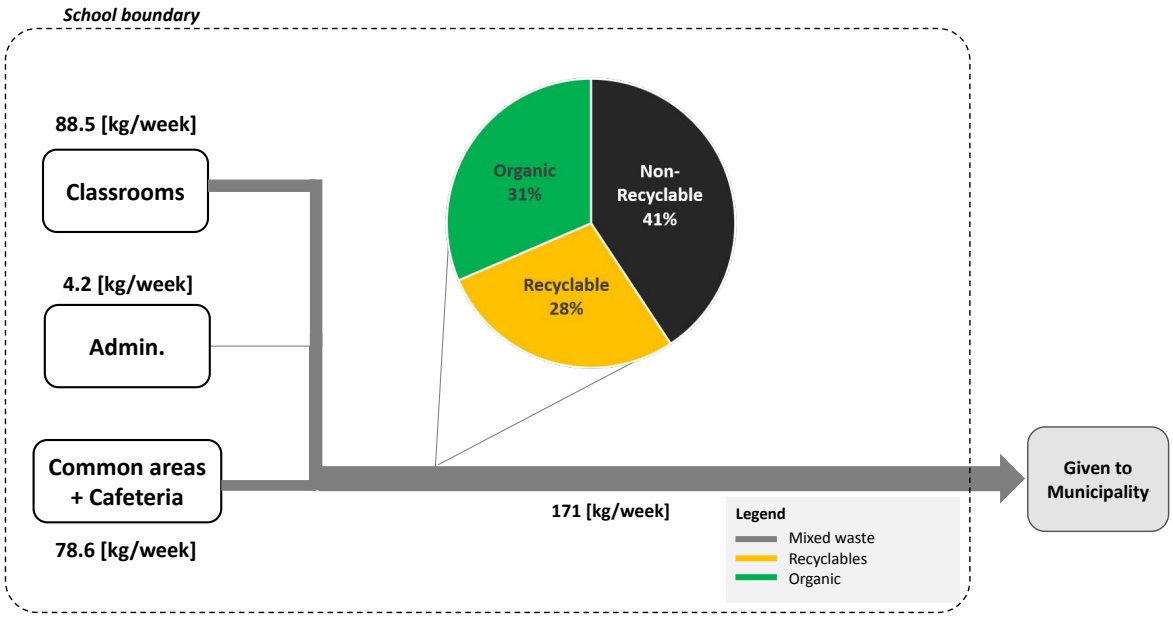


Figure 12: Example of mass flow chart for waste audit visualization combined with pie chart [27]

1. Background information on the school							
School name		**Happy School**					
Municipality, Country		Happy land					
Date since previous application of indicators:				-			
B1	General information	School type		Boarding school			
		# Meals served		4			
B2	Population of school	Total population of the school		**1,286**			
		Students		1,070			
		Staff (teaching and non-teaching)		216			
B3	Waste generation	Total municipal solid waste generation (kg/week)		**4,080**			
No	**Category**	**Data/ Benchmark Indicator**		**Results**	**Code**		**Progress**
Key Waste-related data		***Data***			-	-	-
W1	Waste per capita	MSW per capita	kg per week	3.17	-	-	
			kg per day	0.45	-	-	
W2	Waste composition:	Summary composition of MSW for 3 key fractions – all as % wt. of total waste generated			-	-	-
W2.1	Organic	Organics (food and green wastes) %		86	-	-	-
W2.2	Paper	Paper %		5	-	-	-
W2.3	Plastics	Plastics %		3	-	-	-
W2.4	Metals	Metals %		0.3	-	-	-
Physical Components		***Benchmark Indicator***		-	-	-	-
1	Public health – waste collection	Waste captured by the solid waste management system (%)		99			
1C		Quality of waste collection service		90			
2.1	Environmental control – waste treatment and disposal	Amount of waste managed onsite (%)		40			
2.2		Amount of waste burnt on school compound (%)		14			
2.3		Controlled treatment or disposal (%)		0			
2E		Quality of environmental protection of waste treatment and disposal		6			
3	Resource Management – Reduce, Reuse, Recycle	Recycling rate (%)		60			
3R		Quality of 3Rs – Reduce, reuse, recycle		38			
Governance Factors		***Benchmark Indicator***		-	-	-	-
4U	Inclusivity	Inclusivity of school stakeholders		19			
5F	Financial sustainability	Financial sustainability		25			
6L	Sound institutions, proactive policies	Local institutional coherence		38			

Key for color coding:

Low: Red ; **Low/Medium:** Red/Orange ; **Medium:** Orange ; **Medium/High:** Orange/Green ; **High:** Green

Figure 13: Example of WABIs results summary

Milestones	Key stakeholders	Tools & Resources
A. Agree on Zero-Waste priorities B. Set goals and targets towards Zero-Waste C. Identify priorities for each cluster	• ZWC • School officials	• *T 3.C1 – Priority identification per cluster*

The third step in the process is to define the planning priorities and principles and setting goals and targets towards Zero-Waste.

(A) Agree on Zero-Waste priority order

Once the baseline is validated and the core-issues agreed on, we can start defining the Zero-Waste priority order as presented in Box 16.

Box 16: Zero-Waste priority order

Going towards Zero-Waste at schools goes hand-in-hand with a general SWM improvement. Following the waste hierarchy and circular economy principles (see Box 1 and Box 2), the priority order towards Zero-Waste should therefore be on: 1) waste reduction, 2) waste segregation, 3) improving waste collection, 4) enhancing reuse/recycling, 5) improving waste disposal (inside school compound), while considering cross-cutting and underlying elements such as infrastructure needed, stakeholder involvement, behavior change and education, institutional policies and financial sustainability, as shown in Figure 14.

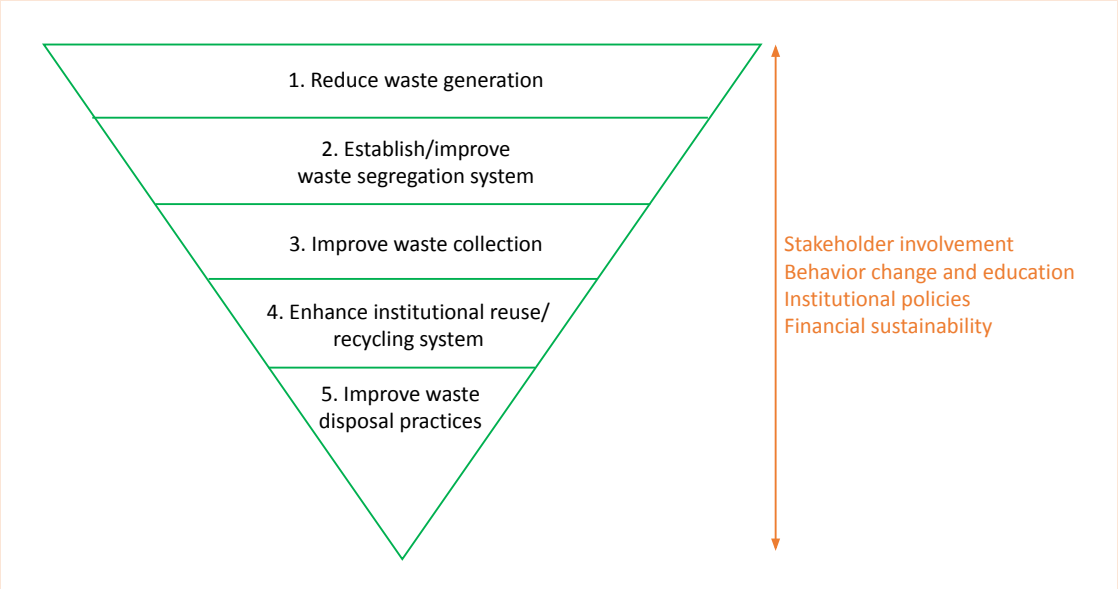


Figure 14: Zero-Waste priority order

Based on the baseline assessment results and problem tree analysis, this priority order should be discussed, contexualized and agreed upon together with school officials.

(B) Set goals and targets

Once the priority order is agreed on, we can start settings goals and targets towards Zero-Waste.

At this stage, national as well as local policies on SWM at school and in the surrounding communities should be reviewed to check if there are already goals and targets set at national or local level that could be referred to, to support the school's decisions.

Such goals and target could include for example:

- Reduce by X% the amount of waste generated
- Increase to X% the amount of waste segregated at source
- Increase to X% the amount of waste collected on the school compound
- Increase by X% the waste recycling/reuse rate at the school
- Increase to X% the amount of waste disposed/treated in a controlled manner
- Reduce to 0% the amount of waste burnt on school compound

Note that these goals and targets will help you define priorities for each school waste generation source but targets will be revised once the final decisions on actions to be taken are defined (see Step 4 (C)).

(C) Identify priorities based on key issues for each cluster

Once the general goals and targets towards Zero-Waste are defined, it is time to dig into the priorities and define what needs to be fixed urgently for each school waste generation source referred hereafter as "cluster". Filling out the cluster priority matrix will help.

Box 17: Cluster priority matrix

The cluster priority matrix helps you to define the priorities for each area of the school, based on the results of the baselines assessment. By using a scale from "no specific improvement required" to "major improvements required", it visualizes focus points as shown in the example below of a boarding school in Table 2. In his case the table suggests: "There is a big potential for reducing waste from the kitchen; waste segregation should be improved primarily in classrooms, administration offices, open spaces and dormitories; and in general disposal practices need to be improved."

Table 2: Example of cluster priority matrix

	General SWM	Classrooms	Kitchen/ Canteen	Offices/ Admin	Open spaces	Dormitories*
Reduce waste generation	-	*	***	**	-	*
Establish/improve waste segregation	-	***	*	***	***	***
Improve waste collection	*	-	-	-	*	-
Enhance institu. reuse/ recycling system	***	-	-	-	-	-
Improve waste disposal practices	***	-	-	-	-	-

*** To be considered in case of boarding schools Where:**
- : no specific improvement required; *** :** minor improvement required; **** :** some improvements required;
***** :** major improvements required

T 3.C1 – Priority identification per cluster

STEP 4. Identify and Evaluate options

Milestones	Key stakeholders	Tools & Resources
A. Identify & evaluate options B. Discuss and agree on options C. Revisit goals and targets	• ZWC ⊕ External support from SWM expert (optional)	• *T 4.A1 – Improvement options evaluation* • *T 4.A2 – Recycling market assessment* • *Technical Resources on SWM* • *Factsheets on Organics (O.1 – O.4)* • *Factsheet on MRF (R.1)* • *Factsheets on Plastic (P.1 – P.4)* • *Factsheet on Handicraft (HC.1)* • *Factsheet on Disposal (D.1)*

Once you have established your baseline and understand school community priorities it is time to think about options for the future – What can you do to achieve a Zero-Waste school?

In Step 4, the ZWC, who can also ask support from an external SWM expert, will identify options that are feasible at the school level.

The selection of options should be based on a system approach, i.e. considering all components required for the adequate management of the different waste fractions, from generation source to disposal. The main outcome of Step 4 is a consensus agreement of what should be done.

(A) Agree on Zero-Waste priority order

Based on Zero-Waste priority order (see Box 16), two categories of options can be defined:

1. **General SWM improvements**
2. **Specific improvements per waste fraction**

Options for both categories are described in the following subchapters. Each option should be evaluated considering the 5A principles (see Box 18).

Box 18: Evaluating options – 5A principles

In order for an option to be suitable for a given context, the 5A principles can be used [4]:

- **Applicable –** Is this option feasible in the given context?
- **Appropriate –** Does it fit the purpose?
- **Achievable –** Are adequate resources (capacity, know-how, infrastructure, etc.) available to implement that option?
- **Acceptable –** Does it receive enough support from the entire school community?
- **Affordable –** Can the school afford the cost related to that option?

For each option, the resources needed (i.e manpower, materials, infrastructure, funds, space, time and expertise), the level of stakeholder involvement, the need for institutional policy to support that option, as well as the required behavior change and possible education strategy to support it should be considered. The templates provided in Too 4.A1.2 can be used to evaluate the different options and corresponding needs.

T 4.A1 – Improvement options evaluation

Online course – From Data to Tangible Impact: Achieving Waste SDGs by 2030 , Module 5.4 (UN-Habitat) [4]

A.1) General SWM improvements

Improvement on SWM can be divided into 4 categories. For each of these categories, the following questions should be answered:

- **Waste segregation:** Can you improve/put in place a waste segregation system?
- **Improving waste collection:** Can you improve collection coverage and/or collection frequency?
- **Enhancing recycling:** Is there any (in)formal recycling market in the nearby community the school could link to? (e.g. (in)formal businesses or individuals buying or collecting recyclables)
- **Improving waste disposal:** If the waste is disposed of at the school, can you improve waste disposal practices?

To answer these questions, you can use the resources available in Part 3 - Technical resources.

Technical resources – Waste segregation

Technical resources – Waste collection

Technical resources – Waste recovery

Technical resources – Waste disposal

T 4.A2 will guide on how to perform a recycling market assessment.

T 4.A2 - Recycling market assessment

A.2) Specific improvements per waste fraction

For each waste fraction generated at the school compound, the following questions should be answered:

Reduce: Which type of waste could be avoided? (e.g. single-use items, foodwaste, etc.)

Reuse: Is there any way that the reuse of certain material can be institutionalized? (e.g. books, cloths, etc.)

Recycle: Is it possible to sell/give it for recycling outside the school? If not, can the waste be recycled at the school compound?

Safe disposal: For waste which cannot be reduce/reuse/recycled and should be managed on the school compound, what would be a safe disposal option?

To help you answer these questions, we prepared tables summarizing options to reduce, reuse, recycle and safely dispose the different waste fractions. These options should be revised and contextualized for each school.

Technical information for options requiring a certain level of knowledge can be found in the factsheets presented in Part 3 - Technical resources.

Factsheet O.1 – Direct animal feed

Factsheet O.2 – Composting

Factsheet O.3 – Vermicomposting

Factsheet O.4 – Biogas production

Factsheet R.1 – Material Recovery Facility (MRF)

Factsheet P.1 – Ecobricks

Factsheet P.2 – Paving tiles

Factsheet P.3 – Shredding

Factsheet P.4 – Extrusion

Factsheet HC.1 – Plastic film crochet

Factsheet D.1 – Waste pit

Box 19: Specific improvement options per main waste fraction

Organic waste	Reduce	Reuse/ Recycle
Food leftovers served	Change the serving system so that less waste is generated;	Direct animal feed [O.1] Composting [O.2] Vermicomposting [O.3] Biogas production [O.4]
Food leftovers unserved	Implement a system to know how many people eat every day; Adjust the ratio of food cooked per person; Invest in cold storage system;	
Other organics (e.g. garden waste, vegetable/fruit waste)		

Plastic waste	Reduce	Reuse/ Recycle	Safe disposal
Plastic - dense (e.g. PET, hard plastic (HDPE), etc.)	Buy things in bulk	Sell/give recyclable plastic to (in)formal entity collecting recyclables*	Waste pit [D.1] Ecobricks [P.1]
Plastic – film (e.g. food wrappers, PP, LDPE, etc.)	Stop using/ban single-use plastic Buy things in bulk	Ecobricks [P.1] Paving tiles [P.2] Extrusion [P.4] Handicraft [HC.1]	

Paper/cardboard	Reduce/ Reuse	Recycle	Safe disposal
Paper	Optimize paper use	Sell/give paper/cardboard to (in)formal entity collecting recyclables* Handicraft	Waste pit [D.1]
Books	Re-use school books		
Cardboard (e.g. egg crates, etc.)	Re-use cardboard		

Glass, metal, textiles & shoes,	Reduce/ Reuse	Recycle	Safe disposal
Textiles & shoes	Re-use glass	Sell/give materials to (in)formal entity collecting recyclables*	Waste pit [D.1]
Glass	Re-use glass		
Metal	Re-use metal		
E-waste	Fix and repair e-waste		

Other	Reduce/ Reuse	Safe disposal
Inert	Reuse in construction	Waste pit [D.1]
Sanitary waste	Use reusable sanitary pads Use menstrual cup	
Medical waste	-	
Paints, solvents	-	

** Check T 4.A2 on how to perform market recycling assessment*

These lists of options can be found in Tool 4.A1.1. They should be revised considering the 5A principles (Box 18).

T 4.A1 – Improvement options evaluation

(B) Discuss and agree on options

Once the different options were identified and evaluated, it is time to take decision on what should be implemented at the school. For that, it is very important to be transparent with the financial consequences in terms of capital cost and operational cost, as well as the level of stakeholder involvement required of each option.

Typical questions to be answered at this stage are:

- **Capital cost**
  - How costly is the infrastructure needed?
  - What is the lifetime of the infrastructure and equipment? How often does it need to be replaced?
- **Operational cost**
  - Does it require electricity, water and/or fuel?
  - How frequently does it require management and maintenance (e.g. daily, weekly, monthly)?
- **Level of stakeholder involvement**
  - Does it require dedicated staff for operation and maintenance?

The selected options should be discussed and a consensus agreement should be found among the different school stakeholders.

At this stage, approval from school officials and support from the entire school community should be confirmed.

(C) Revisit goals and targets

Once the decision is taken on what will be implemented at the school the specific goals and targets defined in Step 3 (B) can be revised to represent more realistically the potential achievements.

STEP 5. Develop an Action Plan

Milestones	Key stakeholders	Tools & Resources
A. Develop an Action Plan B. Identify roles and responsibilities and set action-specific targets	• ZWC ⊕ External support from SWM expert (optional)	• *T 5.A1 – Action Plan content*

The objective of step 5 is to develop a so-called Action Plan, a plan describing what needs to be done and by whom in order to achieve a Zero-Waste school. The Action Plan does not have to address every detail but should rather serve as a guiding document. It should be realistic in terms of cost, include a timeline for implementation and address institutional and human resources issues.

If financial support allows, you can ask support from an external SWM expert to help you in that step.

(A) Develop an Action Plan

Once decisions are taken on what will be done at the school, the next step is to formulate a concrete Action Plan. For that, you need to:

1. Define the timeframe for the Action Plan implementation (e.g. 1 or 2 school year(s), X semester(s), etc.);
2. Make a list of activities to be undertaken to fulfil the goals and targets set in Step 4 (C).
3. For each activity, define the following elements (see Figure 15):
   - **What** the actions are – **Activity**
   - **Who** should take the action – **Owner**
   - **When** it should be taken – **Timeframe**
   - **Monitoring** of action implementation – **Progress**

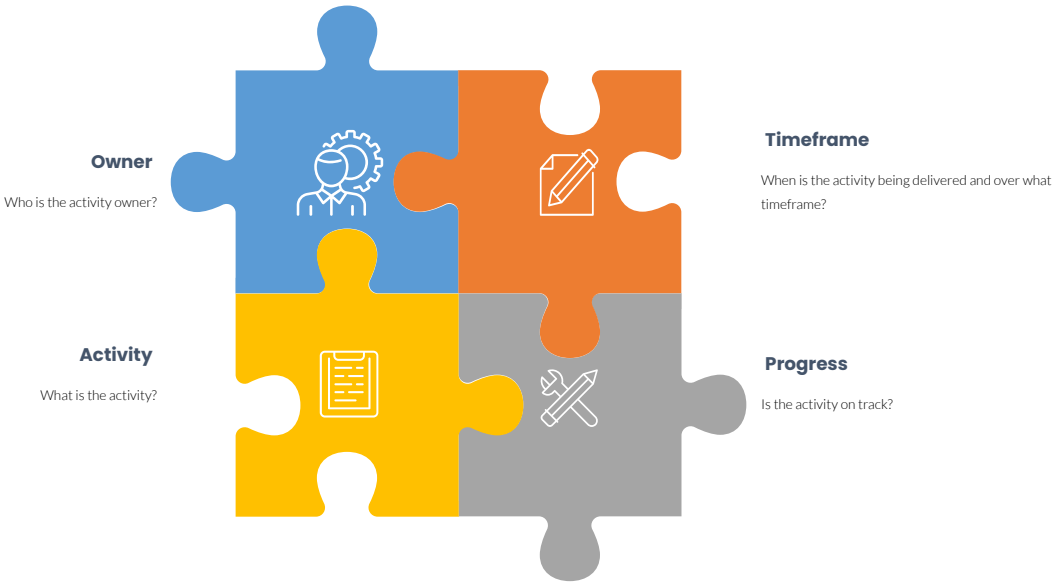


Figure 15: Key components of an Action Plan, adapted from [4]

It is important to remember that although it may be that other stakeholders such as an external SWM expert support the school in developing the Action Plan, the school must have overall responsibility and accountability for it. The Action Plan should be a "live" document that is updated regularly, as such it will detail activities which are on track and those that have been delayed for any number of reasons.

Examples of Action Plan table of content and Action Plan activity timeline are presented in the Tools 5.A1.1 and 5.A1.2.

Box 20 gives an overview of possible activities or actions, as well as key steps to be undertaken for each. For any activity to be performed, always assess the available and needed resources (manpower, materials, funds, space, time and expertise).

Box 20: Type of activities & actions

Procurement of goods or services	**Awareness raising and behavior change activities**
– Identify the requirements for goods and services – Identify and evaluate a list of suppliers (ask for offer, qualify offers, etc.) – Negotiate contracts with selected suppliers	– Identify key behavior to target – Consider the RANAS factors to see which factor(s) you want to trigger* – Consult RANAS Behavior Change Techniques (BCTs) catalog – Design innovative campaign – Optional: Assess impact of the activity of awareness raising
Initiating and operating a new technology (e.g. biogas reactor, composting, etc.)	**Educational activities**
– Assess end-product market demand – Conduct a feasibility study / Hire a consultant to make a feasibility study – Launching of the initiative/technology – Training of school staff – Set up of monitoring protocol (who, how, what, when, resource needed, etc)	– Evaluate rooms for improvement in current (extra-)curricula activities – Set objectives appropriate for each age and stage of development – Get inspire by existing educational resources (see Resources for schools) – Prioritize experiential learning over theoretical learning (see chapter Learning by doing - Education for Sustainable Development)

** See Behavior change chapter for more information*

T 5.A1 – Action Plan content

Additional resources:

Lüthi et al., 2011. Community-Led Urban Environmental Sanitation Planning: CLUES, Tool 23 [13]

Online course – From Data to Tangible Impact: Achieving Waste SDGs by 2030 , Module 6.5 (UN-Habitat) [4]

[4] The RANAS Behavior Change Techniques (BCTs) can be found here, and the catalog of BCTs here

[5] The Bloom Taxonomy for teaching, learning and assessment can help defining aims and goals. https://www.bloomstaxonomy.net/

When developing the Action Plan, it is important to consider typical barriers for long-term success of waste initiatives in schools and plan ahead coping and mitigation measures. Box 21 highlights typical barriers encountered in many school projects worldwide as well as possible mitigation measures.

Box 21: Typical barriers for long-term success & mitigation measures

— **Lack of school political support**

- Align with National strategy
- Make sure to get written political support
- Put in place a mitigation strategy in case of changes in school officials

— **Lack of financial resources**

- In case of donation for infrastructure, make sure to build some reserves to replace infrastructure at the end of its life-time;
- Be realistic when defining potential revenue from recyclable sale or other end-product (e.g. compost, biogas, handicraft, etc.);
- Create a basket fund with revenues from sales

— **Lack of capacity and know-how**

- Make sure to have someone inside or outside the school who can give trainings and can ensure a follow-up to answer questions, doubts and troubleshooting after few months of implementation
- Make sure to train permanent school staff for proper operation and maintenance
- Ensure knowledge transfer in case of staff turnover

— **Lack of time**

- Be realistic when defining time required as well as time availability of school staff
- Divide responsibilities to make it less time intensive
- Involve students clubs in activities
- Integrate activities in (extra-)curricula activities depending on which option works best in your school setting

(B) Identify roles and responsibilities and set action-specific targets

Once the Action Plan is drafted and the list of activities to be undertaken more clearly defined, it is time to determine roles and responsibilities and set targets.

Having clear roles and responsibilities will allow you to smoothen the Action Plan implementation process and to reach a better commitment from the different stakeholders. In addition to that, it will also allow to distribute tasks among the different stakeholders and decrease the potential burden from Action Plan implementation. Setting targets will help monitoring the progress of the Action Plan implementation. Targets should be set using SMART indicators (see Box 22).

Box 22: SMART indicators

SMART indicators stands for:

Specific – Indicator should be as specific as possible

Measurable – Indicator should be easy to track, monitor and measure

Achievable – Indicator should be realistic and attainable

Relevant – Indicator should support the achievement of the overall goal and target

Time-bound – Indicator should have a time-frame in which it should be achieved

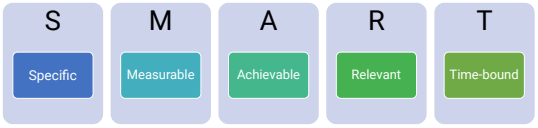


Figure 16: SMART indicators definition, adapted from [4]

STEP 6. Implement the Action Plan

Milestones	Key stakeholders	Tools & Resources
A. Begin the implementation process B. Communicate the priorities objectives and targets to all stakeholders	• Action Plan leader • Activity owners • ZWC • School officials	–

An Action Plan is not an end in itself; developing an Action Plan would be completely useless without its implementation in practice. The aim of the Action Plan is to provide a practical plan which makes a difference when it is implemented. So let's start implementing it and see where it brings us!

(A) Begin the process of Action Plan implementation

To implement an Action Plan smoothly and effectively, it is important to [14]:

- **Have an Action Plan "leader"**, a designated person who can guide the Action Plan both through approval process and initial stages of implementation
- **Obtain necessary approvals and budgets** when decisions taken have financial consequences
- **Continue consensus building**, particularly if significant organizational changes are being proposed
- **Build capacity** among school stakeholders on SWM issues to ensure skills transfer to and capacity building within the school

(B) Communicate the priorities, objectives and targets to all stakeholders

It is important to communicate the priorities, objectives and targets to the whole school community so that everyone is informed and can support the implementation process. Ideally, this should be embedded into one of the first step of the public awareness and education strategy of the school.

Milestones	Key stakeholders	Tools & Resources
A. Monitor and evaluate progress against target B. Identify opportunities for improvement C. Update the Action Plan accordingly	• Action Plan leader • Activity owners • ZWC • School officials	–

The Action Plan will include a number of milestones and indicators, but is however not written in stone. It is important that progress is reviewed by key stakeholders at regular intervals so that necessary amendments and adjustment of the plan can be made as appropriate.

(A) Monitor and evaluate progress against targets set

Action Plan follows the so-called PDCA cycle, which consists in planning, doing, checking and acting (see Figure 17). As such, progress against targets set should be monitored and evaluated regularly throughout the implementation of the Action Plan.

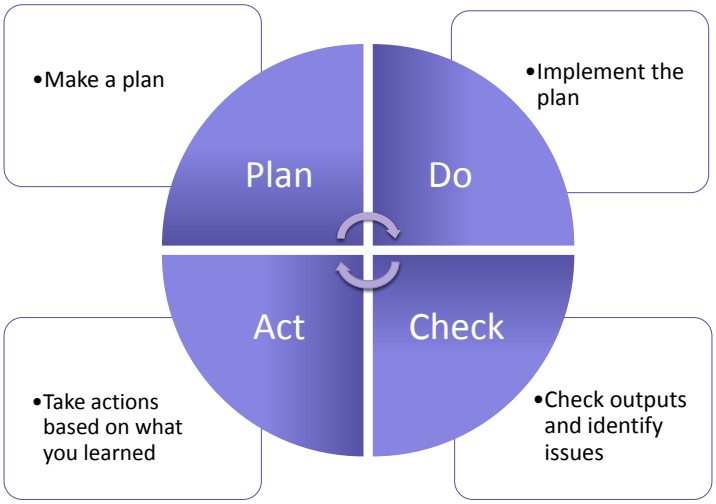


Figure 17: PDCA cycle, adapted from [2]

(B) Identify opportunities for improvement

Based on the monitoring results, opportunities for improvement can be identified. It can be for adapting slightly the strategy, or adding/deleting activities whenever it is appropriate.

(C) Update the Action Plan accordingly

Once the changes are agreed upon the main school stakeholders, the Action Plan can be updated accordingly.

Remember that is it very important that the progress, success and/or changes are communicated to all school stakeholders. Transparency on performance can help building confidence and can also be an opportunity to gain further feedback from different school stakeholders.