

Tool 5.2 – Evaluation and Improvement of Recyclable Waste Management

Table T 5.2 A: Evaluation of infrastructure, design, and operation of recyclable waste management

Category	Feature	Questions to ask – things to observe – elements to evaluate	Actions and possible improvements
Service provision	Waste separation	Are recyclables segregated at source by users? Do users have access to the necessary infrastructure to segregate waste at the source properly? (specific bins or containers at home, dedicated community collection points, etc.) How well are the recyclables separated? Is further sorting or cleaning of the recyclables required?	For a higher quality of the recyclables stream, waste segregation at source should be pursued. Different materials can be collected as one “mixed recyclable” fraction. This includes all types of recyclable materials, which are then further sorted at a designated location. An alternative is to collect individual materials that can be recycled, each as a separate fraction, for instance, at drop-off centres. Drop-off centres’ rewards can be provided as an incentive for users to bring their recyclables. Reinforce the behaviour change campaign to improve waste segregation at source and the purity of the recyclables collected. Provide adequate infrastructure and materials to allow for source segregation by users.
	Collection and transport	Are the recyclables collected and transported separately throughout the entire collection and transport chain? Is the collection and transport system efficient? (optimised time and effort required at each task, adequate planning and monitoring) Is the infrastructure and local capacity sufficient to collect and transport recyclables, meeting current needs, and does it have the potential to handle an increased volume of recyclables?	Verify that the system design allows for recyclables to be handled separately throughout the system. If not, identify options to ensure that recyclables are not mixed with other waste after they have been previously separated. Evaluate the efficiency of the collection and transport system; you can use Tool 2.2 – Collection and transport – Assessment and Improvement. Evaluate infrastructure utilisation and potential for increasing recyclables recovery. Estimate the maximum amounts of recyclables that can be collected and transported within the current capacity.
	Amounts recovered and potential expansion	What proportion of the generated waste is recyclable? (detail per material required) What proportion of recyclables are currently collected? (detail per material required) What is the percentage of the generated recyclable waste that is recovered? (detail per material required) What are the potential materials that are currently not being recovered but could be recovered, handed in or sold to the recycling market or valorised on site? Is there any potential conflict or risk of harm to the informal sector in the current system, or if the system were to be expanded? Is there potential to address the immediate needs of affected populations by reusing recyclables? (construction, etc.)	Identify the types of waste that are recyclable in your context and conduct a waste generation and composition study (Tool 7 – Waste Generation and Composition Study). Evaluate the quantities of recyclables generated. Implement monitoring and reporting mechanisms for the recyclables collected to record the quantities of each recyclable accurately. Calculate the percentage of recovery and establish achievable short-, mid-, and long-term goals to increase the amounts collected, as relevant to your waste management strategy. Evaluate whether some materials can be reused directly to respond to the needs of the affected population, and implement methods to separately collect, treat, and use these materials. Informal sector integration is a crucial consideration. Refer to Table T 5.2 B for more information on governance aspects. To expand the recyclable waste management service, you can follow the steps to design and plan new services in Step 3.3 of the HAWAI guidelines core text.

	Occupational health	Are there any health or safety risks associated with handling or processing the recyclables? Is the staff trained? (safety and occupational health, use of PPE, disposal site operations) Is the staff vaccinated and have access to healthcare whenever needed? Is the staff protected with PPE? Is there a contingency plan in place if individuals are unable to work due to illness or other reasons?	Prepare an occupational safety plan and Standard Operating Procedures for the facilities. Train all staff on occupational safety and proper handling of recyclables, equipment, and machinery. Equip all staff with the necessary personal protective equipment adapted to the facilities' requirements. Health checks and adequate vaccinations should be ensured according to a physician's advice. Provide access to basic personal hygiene amenities for staff, including toilets, handwashing facilities with soap, showers, a changing room, and separate break and eating areas. Refer to the Compendium - X.4 Occupational Health and Safety (pp. 134-137).
Sale of recyclables	Storage & pre-processing	Is there a dedicated space for storing and pre-processing recyclables? Are the recyclables pre-processed before being handled for the recycling market? (if applies) Is the infrastructure and local capacity for storing and processing recyclables sufficient to meet current needs, and does it have the potential to handle an increased volume of recyclables?	Recyclables pre-processing can increase the value of recyclables. Consider pre-processing such as sorting, cleaning, shredding, compacting and packaging for transportation. Collaborate with the recycling sector actors on the market to find the best compromise and evaluate the degree of pre-processing that would be most beneficial. It is also possible to hand over the recyclables as bulk without pre-processing at lower prices or for free. Evaluate infrastructure utilisation and potential for increasing recyclables recovery. Estimate the maximum amount of recyclables that can be stored and pre-processed with the current capacity.
	Market analysis	Was a market analysis done for the sale of recyclables? What are the primary materials markets for recyclables? Are there contractual arrangements with recyclers?	A market analysis is necessary to determine which materials have the potential to be recycled in the existing market. It is also essential to find recyclable wholesalers that can purchase the recyclables, if possible, at the highest price possible.

Table T 5.2 B: Evaluation of service planning and governance of recyclable waste management

Category	Feature	Questions to ask – things to observe – elements to evaluate	Actions and possible improvements
Supervision and monitoring	Adequate supervision	Is the recyclable waste management supervised? Is there a mechanism for staff to report problems/issues during any stage of the recyclable waste management?	Supervisor positions are essential for an efficient and functional service. Ensure that you recruit qualified managers for supervision and monitoring. Implement a clear and accessible reporting system to ensure staff can promptly report and track issues related to recyclable waste management. Regularly review and address reported concerns to improve efficiency and compliance.
	Monitoring and reporting	Are there any metrics in place to measure and monitor the recyclable waste management system? (recovery rates, reduction of waste disposal, etc.)	Implement monitoring and reporting mechanisms for the recyclables collected to record the amounts of each recyclable. Calculate the percentage of recovery and establish achievable short-, mid-, and long-term goals to increase the amounts collected, as relevant to your recyclable waste management strategy.

Informal waste pickers	Informal waste pickers and collectors	Is the informal sector present in the recyclable waste management system? At what stages of the SWM system is the informal sector active? How many recyclables are being collected by the informal sector?	Identify the stages of SWM at which the informal sector is active in recovering recyclables and which recyclables are being collected. Assess to what extent the role of the informal sector is important in your context in terms of volumes of recyclables being recovered. Observe and interview informal sector actors to estimate the amounts and types of recyclables they manage.
	Inclusion	Are the informal waste pickers included in the planning process for SWM? Are the contributions of informal waste pickers to waste management acknowledged and supported?	Waste pickers can be active at any part of the service chain. Identify where they operate first to understand their role in the system. Include waste pickers when planning for changes and improvements in the recyclables SWM system to account for their needs, challenges and possibilities to support waste management. Collaborate with informal waste pickers to reduce waste spreading – support them in accessing recyclables sooner in the waste management chain (at source, if possible).
	Interaction with the waste management service	Are there negative impacts from waste-picking activities on the SWM service? (opening bags, spreading waste, burning, etc...) Are there positive impacts from waste-picking activities on the SWM service? (amounts of waste to collect reduced)	Identify, discuss, and plan for alternatives to minimise negative interactions and maximise positive impacts.
	Support and integration	Are informal waste pickers supported in increasing the recovery of materials and avoiding negative interactions with waste services? (trainings, equipment, PPE, easier access to waste, etc.) Are efforts being made to integrate the informal sector into the SWM system?	Provide training, infrastructure, space, equipment, and PPE to informal waste pickers to support them in achieving safer working conditions, improved waste recovery, and increased income. Include and communicate with all informal waste pickers about their rights and obligations – with the intention to minimise uncontrolled dumping and burning of waste. NOTE: Providing support to the informal sector can be an efficient way forward for recyclable waste management. Supporting the informal sector through training, capacity building, and integrating them into the SWM system is important. The following resource provides more in-depth information about integration of the informal sector: Recovering resources, creating opportunities – Integrating the informal sector into solid waste management (GIZ, 2011).

Governance	Regulatory framework	Are rules and regulations regarding recyclable waste management clear and established? Are local, regional and national laws and regulations followed regarding the management of recyclables? Are there mechanisms in place to enforce simple rules and regulations? (prohibit dumping, burning, payment, obligation to use the service, obligation to segregate at source)	Establish simple rules and regulations that support the recyclables recovery system in place and align with local, regional and national laws and regulations. Explore potential incentives to promote and increase the segregation of recyclables at the source. Prohibiting access to the disposal site for informal waste pickers without providing an alternative solution to sustain themselves is not recommended.
	Stakeholder engagement	Are the roles and responsibilities of the stakeholders involved in recyclable waste management clear? Is there close coordination with other humanitarian sectors? (shelter, WASH, health, planning) For situations where humanitarians oversee recyclable waste management, was the local municipality approached to develop a recyclable waste management strategy jointly? Are local authorities and other relevant local stakeholders engaged in the planning and implementation? Has collaboration been discussed? Is sharing of infrastructure and capacity an option? Are there efforts to integrate the informal sector into the SWM system?	Early engagement and empowerment of local stakeholders and authorities will allow smoother transitions for long-term SWM. Engage at different levels: inform, consult, involve, collaborate, and empower. Clarify roles and responsibilities with the relevant stakeholders. Collaborate with informal waste pickers to reduce unsafe practices – support them to access recyclables sooner in the waste management chain (at source if possible). Collaboration with local municipalities from the outset of the project is crucial for ensuring long-term sustainability. By synergising resources for recyclables pre-processing, the project can also boost potential income through economies of scale and strengthen price negotiations with recyclables buyers.
	Equal access to services	Was the host community approached to collaborate on recyclable waste management, for instance, to plan for a common pre-processing site or to explore markets jointly? Is support given to host communities?	Recyclable waste management benefits greatly from economies of scale – shared use of facilities is often desired. Ensuring equitable treatment and resource distribution between host communities and refugees, addressing disparities in access to essential services and support to prevent inequalities or tensions.
	Strategic planning	Is there a long-term strategy to improve and/or at least maintain service provision for recyclable waste management? Is there monitoring of key indicators to facilitate planning and informed decision-making? (recyclable waste generation, amounts collected and disposed of at the disposal site, recovery rates, etc....) What mechanisms exist for adapting and improving the recyclable waste management system to meet future needs and challenges?	Improving recyclable waste management typically involves a stepwise approach, with long-term strategies and a clear vision being created and aimed at, leading to gradual improvements. Define and measure key performance indicators (KPIs) for recyclable waste management, such as recovery rates per material type. Conduct a forecast analysis to help plan for future changes that can impact the recyclable waste management.

Governance	Financing and cost recovery What are the current costs of the recyclables recovery system? Can the current costs be reduced? Are the current costs sustainable in the long term? What are the current revenue sources contributing to recyclable waste management, and how can they be maintained or increased? Is there a strategy in place to cover the long-term operational and capital costs? Has a tariff been implemented to contribute to the management of recyclable waste? Is it possible to increase revenues from the recyclables?	Precisely define the yearly costs of the recyclable waste management, including capital costs and operational costs. Tool 8 – Cost Evaluation can be used for support. Evaluate the recyclables recovery system and improve efficiency to reduce costs. Consider implementing tariffs for recyclables service provision to waste generators (users). Conduct a market analysis to assess opportunities for increasing revenue from the sale of recyclable materials. Explore options for pre-processing and storing larger quantities of recyclables, which could help optimise pricing leverage and enhance profitability. (consider pre-processing steps such as cleaning, shredding, cutting, compacting, sell in larger amounts, store to sell at better market prices, etc.) Early collaboration and empowerment of local stakeholders are essential for the long-term sustainability of SWM services.
	Behaviour change Are there cultural barriers to recyclable waste management? How can consistent participation be encouraged? Are there economic or social incentives to participate in recyclable waste management? Is the community well informed and reminded of the proper practices for waste segregation and how recyclables are collected? Is there an active or planned behaviour change campaign to improve waste segregation at source and target recyclables? Is the efficiency of the behaviour change monitored and evaluated?	Consider possible incentives to increase participation and good practices of waste segregation at source. Evaluate if the current system for recyclables collection is suitable to foster good practices of waste segregation. Define the target behaviours to change and use adapted behaviour change techniques to reach this goal. If social barriers are identified, integrate this element into the behaviour change campaign and work closely with the communities to find suitable and culturally appropriate alternatives. Regularly assess the behaviour change campaign and adapt according to the needs. The first focus should be on ensuring the proper collection and disposal of waste; then, adequate waste segregation can be improved. The following resources provide more in-depth information about waste segregation. Refer to the Compendium Waste Separation (pp. 34-37). Using a systematic approach to define the behaviour change drivers for a specific behaviour can help design a targeted behaviour change campaign. For more information on behaviour change, refer to the Compendium - X.6 Hygiene Promotion and Behaviour Change (pp. 139-141) and to the Compendium of Hygiene Promotion in Emergencies (Gensch et al., 2022) – Social and Behaviour Change.

Governance	Public awareness and participation	Are there opportunities for participatory planning and public consultation? Is there a regular education and public awareness program in place regarding the management of recyclable waste? Is there any mechanism or periodic evaluation to capture feedback from waste generators about recyclable waste management?	Engage the community in planning and decision-making to ensure waste management meets local needs, encourages ownership, and improves compliance. Plan and implement a regular education and public awareness program aimed at improving recyclable source segregation and increasing the amounts being collected and handled separately. Establish a structured feedback mechanism, such as periodic surveys, suggestion boxes, or stakeholder meetings, to gather insights from waste generators. Use this feedback to identify challenges, improve participation, and enhance the efficiency of the recyclable waste management program.
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Table T5.2 C: Evaluation and improvement of on-site treatment: on-site plastic processing and treatment

Facility design and operations	Material sorting	What type of plastics can be processed in the facility? How easy is it to further sort plastic waste? What is the level of contamination in the plastic, and how can it be minimised? Is cleaning required, and if so, can it be done efficiently?	Verify the purity of the plastics used in the process, especially when plastics require heating and melting. It is crucial that the plastic resin is pure, as different types of plastic melt at different temperatures and can burn and produce toxic emissions if heated too high. Revise the process before arriving at the facility to increase initial purity whenever possible. Connect with the behaviour change campaign to improve segregation at source.
	Resource efficiency	Does the facility have access to water and electricity? Are energy, water, and other resources being used efficiently? Is renewable energy used? Can water be reused or minimised during the process? Are there any efforts to minimise waste or byproducts during the operation? Are by-products disposed of safely?	Consider installing and using solar energy to power the operations. Evaluate how water is used in the process and identify opportunities to reduce and reuse it. Ensure that by-products are minimised and disposed of adequately at a designated disposal facility.
	Design and operations	Is the facility designed for efficient plastic sorting, processing, and storage? Are the material flows to, within and out of the facility efficient? Are the machines and equipment in good working condition? Are there clear workflows for the operations at the facility?	To improve the facility design, optimise the layout and storage for better plastic sorting and accessibility. Establish a regular preventive and corrective maintenance schedule, along with staff training, to ensure equipment remains in good working condition. Implement clear workflows and standard operating procedures to enhance efficiency within the facility.
	Maintenance and repair	How often is equipment maintained or repaired to ensure smooth operation? Are there quick-response protocols in case of machinery failure or downtime?	Establish a regular preventive and corrective maintenance schedule, along with staff training, to ensure equipment remains in good working condition. Prepare clear instructions to react in case of downtime.
	Monitoring and reporting	Is there a system for tracking and reporting the quantity of plastic processed and the amount of usable material produced? Are regular assessments conducted to ensure the facility is meeting its performance goals?	Establish metrics and instruct staff to regularly measure and report quantities of plastics entering the facility, being processed, being discarded and products produced. Evaluate monthly performance and set goals for short, medium and long-term performance.
	Facility capacity	Is the facility operating at full capacity, or is there room for optimisation and scaling up? How much plastic is processed daily/weekly?	Evaluate each step of the process in the facility and assess the utilisation rate. Estimate the maximum capacity of the facility based on its current layout and process.

Facility design and operations	Occupational safety	Are there any health or safety risks associated with handling or processing the plastics? Is the staff trained? (safety and occupational health, use of PPE, disposal site operations) Is the staff vaccinated and have access to healthcare whenever needed? Is the staff protected with PPE? Is there a contingency plan in place if individuals are unable to work due to illness or other reasons?	Prepare an occupational safety plan and Standard Operating Procedures for the facilities. Train all staff on occupational safety and proper handling of plastics, equipment, and machinery. Equip all staff with the necessary personal protective equipment adapted to the facilities' requirements. Health checks and adequate vaccinations should be ensured according to a physician's advice. Provide access to basic personal hygiene amenities for staff, including toilets, handwashing facilities with soap, showers, a changing room, and separate break and eating areas. See Compendium - X.4 Occupational Health and Safety (pp. 134-137).
Process sustainability	Objectives and Community Impact	What are the main goals of the plastic treatment initiative (e.g., reduce plastic waste, create jobs, provide valuable products)? Are these goals clearly defined and communicated to all stakeholders? Are key community members involved in the planning and decision-making process? How does the initiative benefit the local community (e.g., improved environment, local job creation, education)? Is the initiative designed to be sustainable in the long term (financially, environmentally, socially)?	Clearly define and communicate the initiative's goals to all stakeholders to ensure buy-in. Involve key community members in the planning and decision-making process to increase engagement and support. Focus on creating long-term benefits, such as job creation, environmental improvement, and educational opportunities. Ensure sustainability by integrating financial, environmental, and social strategies for ongoing success.
	Products	Are the products being used locally? Is the quality of the product sufficient for the purpose? Can the product quality be improved? Is there a market for the products?	Ensure the products are locally applicable and meet the community's needs. Focus on enhancing product quality through regular testing and feedback. Explore ways to improve quality by upgrading materials or processes. Identify and expand local or regional markets to ensure demand for the products.
	Financing and cost recovery	What are the current costs of the facility? Is the process affordable to maintain? Can the costs be reduced? Who is taking responsibility for the costs? Is there a financial sustainability plan in place for the facility? Is the process generating revenues? Can these be increased?	Precisely define the yearly costs of the facility, including capital costs and operational costs. Tool 8 – Cost Evaluation can be used for support. Assess cost-saving opportunities by optimising resources and reducing waste. Clearly assign responsibility for costs to ensure accountability and effective financial management. Develop a long-term financial sustainability strategy that explores funding sources and cost-sharing models. Increase revenue potential by expanding product offerings, improving efficiency, and exploring new markets.