BIO4HUMAN

# D4.2. Gap Analysis Report
# Annex 5. Summary of the data collection on solid waste management from humanitarian operations through multiply studies (Task 4.2.2)

**Disclaimer:**



**Scope:**

This is the report from investigation line in Task 4.2.2 of Work Package 4 dedicated to collecting the data on SWM from humanitarian operations through multiple studies. This document summarizes a desk research effort by Irish Bioeconomy Foundation (IBF), focusing on supply chain gaps in Solid Waste Management (SWM) within humanitarian action. The methodology involved analyzing SWM policies, guidelines, and case studies from various international organizations. The research aimed to identify solutions and technologies for effective waste management in humanitarian crises, recognizing the limited resources and expertise often available. Qualitative research was conducted, analyzing SWM policies, guidelines, and case studies from humanitarian settings. Document analysis was prioritized due to its comprehensive coverage of supply chain stages.

## Contents



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## Abbreviation

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| **DG ECHO** | Directorate-General for European Civil Protection and Humanitarian Aid Operations |
| **HA** | Humanitarian Actor |
| **HO** | Humanitarian Organisation |
| **IBF** | Irish Bioeconomy Foundation |
| **MEAL** | Monitoring, evaluation, accountability, and learning |
| **SWM** | Solid Waste Management |
| **WASH** | Water, Sanitation and Hygiene |
| **WREC** | Waste Management Measuring, Reverse Logistics, Environmentally Sustainable Procurement and Transport, and Circular Economy |
| **HSC** | Humanitarian Supply Chains |
| **MRFs** | Material Recovery Facilities |
| **RL** | Reverse Logistics |
| **IWP** | Informal Waste Pickers |
| **UNHCR** | United Nations High Commissioner for Refugees |

## 1. Introduction:

The WP4's main objective is to better understand bio-based innovative technological solutions and bio-based systems that may be applicable under different humanitarian contexts with best environmental and climate protection results. Task 4.2 is aiming on Identification of existing solutions and supply chain gaps will cover identification of the already existing technological solutions (or solutions being in the pre – production phase) which could respond to the needs of the sector (T4.2.1) identified in T3.3 and the identification of supply chain gaps in SWM system for humanitarian action consisting of analysis of the different links in the supply chain, the techniques used to manage the supply chains and the current techniques and technologies used to manage solid waste that is generated at each supply stage (T4.2.2).

As part of this task, partners were given investigation lines to analyse supply chain gaps in the SWM system for humanitarian action. IBF led Investigation line iii) **Collecting the data on SWM from humanitarian operations through multiple studies**. As part of this desk research, IBF decided to analyse concrete cases of humanitarian

actions as a first priority and aligned with this, analysed best practice institutional guideline documents in SWM settings.

## 2. Methodology:

Addressing SWM properly requires finding solutions and technologies that can support the HA in effectively collecting, segregating, and concentrating groups of waste, in the limited technical, organisational and staffing capacity that Humanitarian Organisations have at their disposal during crises. The SWM issue may not be prioritised in some crises as food, water and shelter will likely be the most immediate pressing concerns of HOs. It is in this context, that we can make the assumption that not all HOs have a SWM policy or may not possess enough expertise or experience to deal with SWM issues.
Using qualitative research, IBF selected SWM Policies and Guideline documents from different international organisations along with extensive examples of SWM practices from humanitarian settings across the world. As part of the task, it was initially open to any form of media including videos, interviews, videos etc. After, looking through data, it was decided to stick with documents as they best addressed the many supply chain stages. Moreover, for many HOs, different SWM strategies identified solutions and recommendations based on their learnings and experience. While identifying the sources to be analysed, partners within this task provided some provisional documents for further reading and understanding of SWM practices. PRO CIVIS helped to identify some key European and global policy guideline documentation while IBF identified some remaining humanitarian cases in which SWM engagement was reported and measured to some extent.
One of the challenges of this task was to find documents that referenced each stage of the supply chain in detail. In many cases, the literature reviewed did not mention many of the supply chain stages in any element of their SWM strategy, therefore it can be concluded that there are many gaps that exist from reading the tables provided. However, much of the literature does in many cases provide solutions and recommendations that may prove useful for Humanitarian sector needs.

**The sources of our investigation and summary of documents[1]:**

1. Study on the issues and opportunities of Solid Waste Management within Internally Displaced Persons (IDPs) settings in West and Central Africa.
   *The general objective of the study is to identify the issues and opportunities of Solid Waste Management within IDPs camps, camp-like settings, and areas of concentration of IDPs in West and Central Africa. More particularly, the study is expected to provide:*
   *• A review of good practices related to SWM globally, with a specific attention to those offering waste reduction, re-use, recovery, and job opportunities that could practically be applied in IDP settings in West and Central Africa;*
   *• A review of good practices related to SWM in the perspective of reintegration, prevention of migration, general improvement of living conditions and development of economic opportunities, that can be applied in Senegal and in other countries in the region that are not facing specifically IDPs situation;*
   *• A set of recommendations for the region, in both IDPs and non-IDPs settings.*

2. UNRWA West Bank field operational solid waste management strategy

[1] All the documents are finable by the title and year of publication.

*As of 30 September 2017, there were more than 823,000 Palestine refugees registered with UNRW Ain the West Bank, including East Jerusalem, with 247,886 living in the 19 official refugee camps with an average population growth rate of 4 per cent. In 2016, UNRWA collected 46,611 tonnes of waste from the camps. In the West Bank, the Department of Refugee Affairs (DORA) is the authority responsible for all aspects of cooperation with Palestine refugees. The current SWM system covers all the 19 camps in WB, with 5-6 days of collection and at least three of street sweeping per week. Unfortunately, several technical, economic, and social aspects*
*along the service chain – solid waste generation and composition, storage at source, collection and removal, and occupation health and safety for SWM operators - make the quality of the service limited, and refugees unsatisfied.*

3. GREEN PROCUREMENT MARKET ASSESSMENT IFRC BANGLADESH PILOT – REPORT, May 2024
   *This report targets logisticians, program, and supply chain practitioners in the humanitarian sector, who aim to implement environmentally sustainable methodologies and initiatives across their operations. It introduces the green procurement market assessment methodology and provides insights from a pilot conducted in Dhaka and Cox's Bazar, Bangladesh, in collaboration with the International Federation of the Red Cross (IFRC) country office and the Bangladesh Red Crescent Society (BDRCS).It should be noted that the findings, lessons learned, and recommendations herein are intended to support partners in Bangladesh and beyond to understand what concrete actions can be taken surrounding the implementation of a green procurement market assessment and incentivize cross-sector collaboration.*

4. *YEMEN GAPS AND NEEDS ANALYSIS (GNA) ASSESSMENT AND RECOMMENDATIONS REPORT MAY 2023*
   *The GNA is a series of interviews with the logistics coordinators and managers working on behalf of organisations that have humanitarian logistics operations in country. The GNA is conducted by the in-country Logistics Cluster team and representatives from the Global Logistics Cluster (GLC) and aims to specifically identify the broad logistics gaps and the bottlenecks faced by the community. Should the GNA report identify gaps and needs, the WFP Country Office (CO) can use the report and its recommendations to advocate accordingly to the Humanitarian Country Team (HCT), the Humanitarian Coordinator (HC), and relevant government authorities.*

5. Emergency Multi-Sector Rohingya Crisis Response Project (EMCRP): Environmental and Social Management Framework, JANUARY 2019
   *Seven years after the Rohingya people were forced from their homes in Myanmar, close to 1 million remain stranded in the refugee camps of Bangladesh's Cox's Bazar district – more than half of them women and girls. With scarce means of making a living, many Rohingya refugees are entirely dependent on humanitarian assistance.*
   *Conditions in Cox's Bazar remain very difficult with basic services stretched to their limits in the network of camps, due to shrinking humanitarian funding. Most refugees live in overcrowded, temporary shelters that offer little privacy. An increase in security incidents in the camps has left women and children more exposed to violence.*

6. SOLID WASTE VALUE CHAIN ANALYSIS: IRBID AND MAFRAQ, JORDAN: Mitigating the Impact of the Syrian Refugee Crisis on Jordanian Vulnerable Host Communities for UNDP Jordan
   *This Report presents the findings of a detailed Solid Waste Value Chain Analysis of solid waste in the Jordanian Governorates of Irbid and Mafraq conducted by Disaster Waste Recovery (DWR) in the period February – April 2015. The project was initiated and funded by UNDP Jordan with the objective of providing robust data and information for the design and implementation of solid waste management interventions*

7. Compendium of good practices for a greener humanitarian response June 2021. *This compendium showcases 12 environmentally friendly and innovative projects that have been successfully implemented by various humanitarian organisations. In addition to indicating the technical and financial requirements, the compendium also assesses the advantages, challenges and lessons learned in the framework of each project. As such, the aim is to raise awareness of the existing tools and guidance, and of the numerous good practises that have been piloted by humanitarian organisations.*

8. Waste Management in Humanitarian Logistics Case Study: Greece Refugee Camps. *The study underlines the importance of sustainability in humanitarian operations and offers ideas for implementing sustainable waste management practices by focusing on how to make waste management in humanitarian logistics more sustainable. The case study of Greek refugee camps is used to provide practical recommendations for waste management procedures. Recommendations for making waste management more sustainable are based on past research in that sector as well as a series of interviews.*

9. THE WASTE MANAGEMENT PRACTICES OF AID ORGANISATIONS Case study: Haiti EXECUTIVE SUMMARY
   *In terms of the environmental and health risks associated with this waste management system (risk of flooding, water borne diseases, air water and soil pollution, contribution to climate change etc.), aid actors need to be accountable for minimizing the quantity of waste that they generate and for managing their waste in an environmentally conscious way. This study shows that the issue of waste management is not sufficiently taken into account in aid actors' operations and programs. Aid actors are generally not aware of the types and the quantity of waste that they generate, nor the way that it is being managed beyond having a contract with a collection company.*

10. Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations
    *One of the key deliverables of the approach were the minimum environmental requirements and recommendations, officially released at the European Humanitarian Forum in March 2022. They are the result of a collaborative effort with DG ECHO's partners, experts in the field of environment and humanitarian aid, and compile the currently commonly feasible solutions for reducing the environmental footprint of humanitarian assistance, across projects and programmes. The minimum environmental requirements represent criteria partners need to address in a humanitarian response. Partners were encouraged to apply them in 2022, in anticipation of them becoming mandatory as of 2023.*

## 3. The summary of the collected data:

Aid actors generate waste in their operations as well in their programs, and this can be harmful to the environment if it is not managed appropriately. This commonly held position has been widely articulated throughout the analysis of the documents reviewed by IBF. Much of the literature reviewed is concentrated on SWM for the purpose of this report and there is clearly some emphasis on strengthening this as part of organisations humanitarian provision. However, many of the policy documents studies reviewed demonstrate that the issue of waste management is not sufficiently taken into account in aid actors' operations and programs. For example, the Haiti case study (2015) demonstrated that Aid actors are generally not aware of the types and the
quantity of waste that they generate, nor the way that it is being managed beyond having a contract with a collection company. In addition to this, they are generally poorly equipped to develop strategies to reduce waste or improve waste management. However, the study also highlights the fact that there is growing recognition of the importance of this issue amongst aid actors.

It is evident that the Haiti position in which aid actors find themselves struggling to deal with SWM issues, is common and widespread amongst various humanitarian situations across the world. Many of the issues in humanitarian settings are mutual problems that HO's share. These include:

- More pressing lifesaving needs prioritised; transitory culture complicates active participation while
- Lack of designated disposal sites
- Open dumping and burning of solid waste
- Unclear governance structures for SWM
- Distant dumping areas; lack of budget for newer sites
- Limited technical solid waste management knowledge; no humanitarian partners involved

Task 4.2 is aiming on Identification of existing solutions and supply chain gaps that will cover identification of the already existing technological solutions (or solutions being in the pre – production phase) which could respond to the needs of the sector (T4.2.1) identified in T3.3 and the identification of supply chain gaps in SWM system for humanitarian action. In this context, it can be stated after reviewing the literature, many supply chain gaps exist in SWM policy for many organisations. Many of the supply chain stages which are outlined in T 4.2.2 are not explicitly mentioned or described in the reviewed documents.

It is clear that in the SWM policies that exist/existed, a majority of them do not provide sufficient data or any data for the supply chain stages.

- **Identification of Needs:** There was not any data that could be retrieved for this supply chain stage. However, the Logistics Cluster which operates in Yemen, hold regular coordination meetings, as well developing communication platforms among the humanitarian partners. This is to inform operational decision-making and improve the effectiveness of the logistics response. Although not explicitly mentioned (identification of needs), there are meetings to discuss logistics and supply chains.

- **Conceptualization and planning:** Like above, this supply chain does not feature in many of the organisations' SWM plan. This is not to say that planning does not take but it is difficult to find any information which links this as a supply chain. However, UNRWA which operates in the West Bank have set out various objectives as part of the waste problems that present themselves. Objective 1: Implementation of an efficient and effective waste management system that is robust and sustainable under the prevailing political, technical, and financial framework. Objective 2: Provision of socially acceptable and equitable SWM service.
  Objective 3: Protection of public and occupational health and the environment. The important functions of waste management in the West Bank Field include:
  - Policy and planning
  - Cleaning service delivery (waste collection, street cleaning and vector control)
  - Procurement
  - Repair and maintenance
  - Communication, participation, and awareness
  - Human resource management
  - Financial management.

  These functions are taken care of by the WBFO and by UNRWA staff in each area and camps.

- **Procurement – sourcing/ purchasing of products and services:** In contrast to the first two supply chains, there are some examples of this supply chain stage being implemented by HOs from the analysis. According to WREC, procurement is one of the contact points where sustainable practices achieve the most change. While packaging is critical to ensure that life-saving aid reaches those who need it, it also generates large amounts of waste that can harm human health and the environment. As a result, many humanitarian organizations are rethinking their packaging practices and turning to sustainable or green sourcing. From participants of the last WREC coordination meeting, on green procurement, it could be gathered that 58% of them indicated that their organization does not have a mechanism in place to verify the environmental sustainability of the products that they are sourcing and 30% were not aware of what their organization is doing to establish such mechanism. Referencing the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations* document, "Logistics and transport activities have been identified as having a major impact on the environment, therefore establishing a green procurement strategy can significantly reduce an organisation's environmental footprint.

  From the *Yemen Analysis report*, health is the predominant field in which these organizations operate which indicate that almost 40% of respondents (mainly UN agencies and large INGOs) are depending on international procurement, whilst 60% of respondents (mainly NGOs) rely on local markets for their procurement. Furthermore, changing importation regulations from local authorities pose significant challenges for these humanitarian organizations in importing medicines. It may be difficult to distinguish the green procurement credentials which rely on the local market for their

procurement needs as they may not have the same environmental policies in place.

- **Goods in warehouses destination:** There is very little information or value ascribed to this supply chain so it is clear that it can be considered a gap that needs to be addressed. Referencing the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations* some possible actions to consider enhancing warehouse sustainability include:
  • Using water efficient taps, leak prevention and water recycling methods.
  • Installing energy efficient light bulbs and other energy efficient equipment (e.g., inverter-based air conditioning).
  • Using interceptor tanks to avoid run-off pollution from fuel dispensing areas.
  • Phasing out of ozone-depleting gases from air conditioning systems in warehouses and compounds.
  • Developing a strategy for managing e-waste (old computers, communications equipment) and batteries, which if available, should include disposal at a certified e-waste recycling/refurbishing plant, which should be licensed to operate in a specific country by the national government. It is recommended that organisations visit the plants in question to observe operations first hand.
  • Utilising proper stock management methods to avoid infestation, spoilage, damage, and expiration, all of which lead to waste and disposal.
  • Management and monitoring of hazardous chemicals to avoid spillage or leaking.
  • Management of the production, collection, and disposal of waste, including packaging.
  • Not storing materials that contain batteries for more than 6 months as the batteries will fail.

  It is important to note, that there was almost no information for this supply chain stage.

  The *YEMEN - GAPS AND NEEDS ANALYSIS(GNA) - ASSESSMENT AND RECOMMENDATIONS REPORT* indicate that whilst availability and accessibility of dry commercial warehouses has significantly improved compared with the past years, temperature-controlled warehouses is still posing a significant challenge for humanitarian partners in Yemen. This may be a problem experienced in many humanitarian settings as funding is prioritised elsewhere.

- **Custom clearance:** Like the other supply chains, there is virtually no information from the sources that were analysed so it is clear that there is a gap here. The only reference that provides insight is from *YEMEN - GAPS AND NEEDS ANALYSIS (GNA) - ASSESSMENT AND RECOMMENDATIONS REPORT.* From the report, it states that changing regulations and importation procedures remains as a major challenge in 2022, as per GNA findings. These challenges relate to partners' knowledge of the pre-import and arrival procedures (due to the constant and arbitrary change of regulations). These hurdles lead to uncertainty, delays, demurrage and potentially spoilage of short shelf-life items. Over 40% of respondents considered the existing customs clearance processes as unclear and ineffective. This is the only

reference that could be found but nonetheless, this observation was likely taken from numerous sources in the country.

- **Transport to the destination country:** Unfortunately, from all the sources analysed there was no information or policy related to this particular supply chain stage. In the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations* transport is mentioned as a very resource intensive activity. Requirements from this document include the following:
- Plan procurement to reduce air shipments of goods and items, which are responsible for higher emissions than sea shipments and land transport.
- For organisations or projects including fleet of vehicles, measure the movements, costs and maintenance of vehicles and means of transport to gather data about their use. Include maintenance of the vehicles in the project plan. Ensure the most sustainable and environmentally friendly performance of vehicles for the given context.

- **Transport to the final destinations:** Similar to the other supply chain stages, transport to the final destination is hardly given any emphasis in the SWM literature reviewed. The only reference found is taken from *SOLID WASTE VALUE CHAIN ANALYSIS, IRBID AND MAFRAQ, JORDAN* report. It states that high electricity prices and transport costs are the main factor impacting competitiveness of Jordanian recycled products which may be an issue shared by other humanitarian crises as there in an intention to export newly created products.

- **Storage at the final destination:** Similar to the other supply chain stages, storage at the final destination is hardly given any emphasis in the SWM literature reviewed. The only reference found is taken from *SOLID WASTE VALUE CHAIN ANALYSIS, IRBID AND MAFRAQ, JORDAN* report. The increase of plastic packaging and the absence of institutionalised source segregation activities at household and commercial level have meant that much of this waste stream ends up either in temporary storage containers or dumped in the streets. This particular issue is prevalent in many cases from the humanitarian situations reviewed.

- **Operational logistic at final destination:** Unfortunately, there was no data or information that could be presented here:

## 4. Conclusions and recommendations

As part of this summary, it is important to note that virtually all the literature analysed does give recommendations to generally strengthen SWM practices and although many of these are not necessarily bio-based solutions, it is important to stress that many of these could help with supply chain stages.

One of the most common and widely stated solutions that emanates from the analysis is that HOs should work together with local authorities and using their capacities and network the following template questions should be posed in all scenarios:

Is there infrastructure for the transport and dumping of waste?

Is there a capacity for temporary dumpsites in the area, that are far enough from the population, and water source so that it would not affect their health?

Are there waste separation practices in place?
What is the quantity and type of waste produced?
These four questions build the essential base for establishing waste management practices. If there is an overwhelming amount of waste in a refugee camp that endangers the lives of the refugees and humanitarian actors working and living there, the first issue that needs to be addressed is where to put the waste. During the assessment, temporary dumpsites, and ways to get the waste to them need to be identified. If at all possible, the waste needs to be separated before being transported to the dumpsites to allow proper disposing of later on after the crisis has passed. Even just separating organic material that can be composted from other solid materials like plastic, can already be a relief to the environment. Separating medical, electrical, and other solid waste from each other is the next step to achieving more sustainable waste management. Other questions that need to be asked during this assessment are:
Is there a need for educating people on proper waste management practices, and the dangers of improper waste management?
Are there products that can be recycled, reused, or replaced by more sustainable ones?
Is the organization able to financially sustain these sustainable practices? Educating the local population, the refugees, and the humanitarian workers on how to handle waste, its separation, and its disposal is integral to making sure that they are not harmed during the process. The education can come through experts provided by the donors as well as templates and other guidelines. But also educating people at home about what donations are necessary and which donations amount to just more waste is important.
From the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations* it is recommended as a priority, to establish waste separation systems, preferably at the household and facilities level. This will immediately decrease the volume or waste by removing organic waste that can often be composted locally and to undertake a waste audit to understand waste volumes and types, this is necessary to inform the potential for waste recycling and any related livelihoods activities.
Organise proper reverse logistics to support end-of-life management of items. This can be linked with an income generation activity for affected persons (collection of waste), which could be extended beyond the project cycle in cooperation with private enterprises, or linked to the national level. Income generation activity is mentioned throughout the analysis. One of the other main and most common recommendations was to include safe waste management education into projects for displaced persons. Along with this most literature indicates that opportunities should be considered to strengthen the capacity of local communities and supply markets to support local market actors and develop opportunities for local production and procurement, while considering the need to procure environmentally friendly humanitarian items.

Another one of the common recommendations is to set up decentralized systems, in which camp residents could get involved in collection and transportation of wastes, giving them an opportunity to improve their camp environment and give a sense of belonging. Giving priority to source segregation of wastes and design that would ensure efficient collection of segregated wastes would be helpful.

In terms of bio-based solutions that could be adopted, composting and biogas are realistic and attainable for many situations. For example, significant gap in the solid waste management system for both Irbid and Mafraq is organic waste (i.e. food

waste from households). This waste stream constitutes more than 50% of the overall solid waste generation in both Governorates but is not being captured for recycling or recovery to any significant degree. The following recommendations are proposed:

Compost can be sold to local tree nurseries or employed to promote small household gardens, the final products either destined for self-consumption or for sale on the local markets.

However, in this case composting and biogas are an intermediate step between the kitchen waste transformation and wider livelihood and employment opportunities linked to the agriculture sector. Following a more centralized approach would allow for increased quantities and economies of scale for composting as well as for a greater size of land to be reserved for income generating activities such as tree nurseries, seed banks, small farming, and training in composting and farming techniques.

An option for organic waste diversion is anaerobic digestion. Small, household sized biogas digesters would provide several benefits in terms of reduced quantities of waste to be disposed of, reduced energy costs, and create jobs for the installation and maintenance of such systems. Building on current early stages in the Jordanian biogas industry it is proposed to support the establishment of a programme in training, installation and maintenance for an AD plant; maintain a show-case for available options; and a unified reference point for designing, financing and building of biogas plants. Marketing biogas and making the installation process easy and quick will ensure the popularity of the technology and its spread. This view is also shared with the *Emergency Multi-Sector Rohingya Crisis Response Project (EMCRP): Design (including Feasibility Study) of Fecal Sludge and Solid Waste Management System.*

Waste sorting and recycling center in Cité Soleil: Cité Soleil's sorting and recycling center, which is managed by Athlétique d'Haiti in partnership with CEFREPADE, is an interesting alternative to simply transporting waste to Truitier's landfill. Waste is sorted manually and is then processed in the following way: organic waste is made into compost; plastic/metal/aluminum waste is sold to Haitian recycling firms; and paper and cardboard waste is transformed into "briquettes" used as an alternative to charcoal.

To finalise, it is important to reference the *GREEN PROCUREMENT MARKET ASSESSMENT IFRC BANGLADESH PILOT – REPORT.* As a result of this pilot (2024), it can be concluded that suppliers in Bangladesh are open and willing to learn and implementing changes to make their goods and services more environmentally sustainable. This sentiment can be adopted for other HOs but it requires a shift in mindsets and working practices to integrate these requirements into the day-to-day processes. According to the report, success hinges on starting with small changes while maintaining the current momentum and interest among stakeholders in the country office; these incremental steps will lead to significant transformations over time.

Education will have to be ultimately provided by the HOs as waste management in humanitarian logistics is an important topic lacking awareness according to the European Commission and other institutions, so to advance SWM practices, the incremental improvements will have to begin with HOs.

# 5. Summary

## 5.1 Identified gaps

1. **Awareness of waste generated and quantity generated**

As is reported by the *THE WASTE MANAGEMENT PRACTICES OF AID ORGANISATIONS Case study: Haiti EXECUTIVE SUMMARY, many of the policy documents studies reviewed demonstrate that the issue of waste management is not sufficiently taken into account in aid actors' operations and programs.*
This is a cross-cutting issue which affects many supply chain stages. Particularly the supply chain stages including Identification of needs, Conceptualization and planning, Procurement – sourcing/ purchasing of products and services, Storage at the final destination and Operational logistic at final destination.

2. **Lack of designated disposal sites**

In many cases as demonstrated by the overview, there is a lack of proper disposal facilities and many HOs, local community actors or displaces persons are formally and informally exposed to the waste. This is taken from *THE WASTE MANAGEMENT PRACTICES OF AID ORGANISATIONS Case study: Haiti EXECUTIVE SUMMARY* amongst other documents.
This is a cross-cutting issue which affects some supply chain stages. Particularly the supply chain stages including Identification of needs and Conceptualization and planning.

3. **Education/Awareness/Limited knowledge**

Some waste generation is preventable such as identifying what waste is avoidable, what can be recycled and embracing more sustainable options. Educating the local population, the refugees, and the humanitarian workers on how to handle waste, its separation, and its disposal can alleviate issues according to the *Waste Management in Humanitarian Logistics Case Study: Greece Refugee Camps study.*
This is a cross-cutting issue which affects some supply chain stages. Particularly the supply chain stages including Identification of needs and Conceptualization and planning, Storage at the final destination and the Operational logistic at final destination.

4. **Green Procurement**

Some of the HO's according to the review do not reference how they procure products for humanitarian crises and moreover, don't have information or evidence to validate the environmental sustainability of products procured. Taken from the *Waste Management in Humanitarian Logistics Case Study: Greece Refugee Camps study* in a interview conducted with Information Management Officer from WREC team.
This is a cross-cutting issue which affects some supply chain stages. Particularly the supply chain stages including Conceptualization and planning and Procurement – sourcing/ purchasing of products and services.

## 5.2 Best practices

1. **Following template questions and a uniform standard for assessing situations**

There should be basic questions asked to build the essential base for establishing waste management practices.

- Is there infrastructure for the transport and dumping of waste?

- Is there a capacity for temporary dumpsites in the area, which are far enough from the population and water source so that it would not affect their health?
- Are there waste separation practices in place?
- What is the quantity and type of waste produced?

This is taken from the *Waste Management in Humanitarian Logistics Case Study: Greece Refugee Camps study*.
This basic strategy can be applied to all supply chain stages.

2. **Waste Separation System**

This should be initiated at the beginning of the SWM as a priority, to establish waste separation systems, preferably at the household and facilities level. This will immediately decrease the volume or waste by removing organic waste that can often be composted locally and to undertake a waste audit to understand waste volumes and types. From *the Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations*.
This best practice applies to the following supply chain stages: Identification of needs, Conceptualization and planning, Procurement – sourcing/ purchasing of products and services, Storage at the final destination and Operational logistic at final destination - distribution of goods and services.

3. **Local Community opportunities**

This can be linked with an income generation activity for affected persons (collection of waste), which could be extended beyond the project cycle in cooperation with private enterprises, or linked to the national level. There should be support for local market actors and develop opportunities for local production and procurement, while considering the need to procure environmentally friendly humanitarian items.
This was taken from the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations*.
This best practice covers the following supply chain stages: Identification of needs, Conceptualization and planning and Procurement – sourcing/ purchasing of products and services.

4. **Bio-based solutions**

In terms of bio-based solutions that could be adopted, composting and biogas are realistic and attainable for many situations.
Taken from the *SOLID WASTE VALUE CHAIN ANALYSIS: IRBID AND MAFRAQ, JORDAN.*
This refers to the supply chain stages: Identification of needs and Conceptualization and planning

## 5.3 Missing information

Unfortunately for many of the supply chain stages there was little to no information in the documents analysed and for the most part there was no data to input for the tables. There is a summary of this in the collected data where there is some more information and some sources for guidance.

1. There was lack of information regarding **Identification of Needs** related to all provided columns.
2. There was lack of information regarding **Conceptualisation and Planning** related to all provided columns. There was some guidance and instructions

from policy documents including the *UNRWA west bank field operational solid waste management strategy*

3. There was lack of information regarding **Goods in warehouses destination** related to all provided columns. There is very little information or value ascribed to this supply chain so it is clear that it can be considered a gap that needs to be addressed. The *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations* provided possible actions to consider to enhance warehouse sustainability.
4. There was lack of information regarding **Custom clearance** related to all provided columns. The only reference that provides insight is from *YEMEN - GAPS AND NEEDS ANALYSIS (GNA) - ASSESSMENT AND RECOMMENDATIONS REPORT*. From the report, it states that changing regulations and importation procedures remains as a major challenge in 2022, as per GNA findings.
5. There was lack of information regarding **Transport to the destination country** related to all provided columns. Unfortunately, from all the sources analysed there was no information or policy related to this particular supply chain stage. In the *Guidance on the operationalisation of the minimum environmental requirements and recommendations for EU-funded humanitarian aid operations transport* requirements were listed.
6. There was lack of information regarding **Transport to the final destinations** related to all provided columns.
7. There was lack of information regarding **Storage at the final destination** related to all provided columns.
8. There was lack of information regarding **Operational logistic at final destination** related to all provided columns.