

# Optional Sectoral Module SOLID WASTE MANAGEMENT



In a resilient city, the solid waste system offers affordable collection services to all residents, irrespective of their tenure status (*inclusive*). Regulations for waste collection, disposal and treatment, especially of hazardous waste, are enforced to protect human health and safety, and the environment (*robust*). Performance of waste facilities and collection services are regularly evaluated and the recorded (and potential future) vulnerabilities during shocks and stresses inform maintenance and upgrading decisions (*reflective*). After a disaster event, the city has resources and procedures for dealing with large quantities of debris and/or cleanup of hazardous waste (*redundant and coordinated*).

TOPIC	GUIDING QUESTION	APPLICABLE RESILIENCE QUALITY	RELATIONSHIP TO RESILIENCE QUALITY
Institutional Capacity	Who manages the waste collection services in the city, including municipal, industrial, electronic, and construction waste? If there are several agencies, are they well-coordinated in terms of management, planning, and emergency response?	Coordinated	Close coordination among solid waste service providers facilitates planning for future demand, and accelerates re-routing and treatment of excess or hazardous waste after a disaster event.

Finance	What are the funding sources for waste collection, treatment and storage, and to what extent does each mode achieve cost recovery?	Robust	Waste management systems that strive for complete coverage and continuous operation require sustained and reliable funding. Cost recovery within the solid waste sector implies sustainable management, where revenues from waste collection (ie. user fees), treatment (ie. composting revenue), and disposal (ie. tipping fees) recover operational expenses, at the very minimum.
Finance	Does the city have funds set aside to cover waste collection and disposal in the event of a disaster?	Redundant	A contingency fund covers unexpected disruptions in the solid waste management system, accommodates sudden demand increases and changes in regular financing flow. Waste contingency funds are also used for cleanup of hazardous waste after industrial accidents, and damage to solid waste facilities
Planning	Do current waste management systems cover all areas of the city, including informal and low income neighborhoods, in an equitable manner? If no, are there plans for expanding solid waste services for all segments of the urban population?	Inclusive	An equitable waste management system is characterized by coverage to all residential areas of the city (irrespective of formality), as well as service quality and affordability. Extending waste collection services to all residents, irrespective of their tenure status, is an important element of environmental protection.
Planning	Does the city monitor and gather data on the performance of the solid waste system? Are informal settlements incorporated into demand estimates?	Reflective	Monitoring the city's current and estimated growth, both formal and informal, allows for improved capacity management and targeted collection in new development areas. Recognition of informal settlements during solid waste demand estimates allows for more inclusive and accurate planning of services.

<p>Planning</p>	<p>Are any waste facilities located in high risk areas? How have the facilities been impacted by past disasters? Have previous disruptions informed improvements and substantial changes in the system?</p>	<p>Robust; Reflective</p>	<p>Monitoring performance of key waste facilities during previous disaster events allows the city to identify vulnerabilities and make necessary maintenance/upgrading investments to improve the overall robustness of the city's waste management system. High risk sites (such as dumpsites that are unmonitored and could result in an explosion or landslide/collapse) should be managed and/or closed. demand estimates allows for more inclusive and accurate planning of services.</p>
<p>Capacity</p>	<p>Does the current capacity of the waste system meet existing and projected demand?</p>	<p>Robust</p>	<p>Being able to manage current and projected quantities of waste is essential for avoiding the environmental consequences of non-collection and inappropriate disposal.</p>
<p>Capacity</p>	<p>Does the city have a waste reduction strategy and implementation system? Does the city promote waste reduction at the household and industry level by means of formal education, community training/awareness raising campaigns and government incentives? Does the city promote incentives for diversion and/or productive use of waste (ie. composting, anaerobic digestion) in addition to waste reduction?</p>	<p>Robust</p>	<p>Successful waste reduction at both the household and industry level can lessen the pressure on the waste system and reduce the public resources that go into managing waste. Waste reduction is particularly important in face of growing population and economic activity.</p>

Capacity	If a processing/disposal facility fails, how long can the collection continue without waste piling up on the collection points?	Robust; Redundant	The ability of the city's waste management system to absorb regular waste production despite failure in one processing/disposal facility is indicative of the systems robustness or need for alternative facilities.
Capacity	In the event of exceeded capacity or disaster, are alternative service providers with adequate equipment and trained staff readily available? If needed, does the city have a process in place to accelerate the contracting process with private entities to undertake waste collection and disposal of large quantities of waste?	Redundant	A city which has identified alternative waste service providers and contracting processes in place for outsourcing waste management activities is effectively able to handle sudden increases in service demand. If waste accumulates in the streets, there is also a risk of an infectious disease epidemic.
Safety & Health	Does the city have a fire management plan for its collection and disposal sites? Does the city require leachate and landfill gas collection and treatment systems to screen for hazardous waste and be constructed with explosion proof-equipment?	Robust	Because waste can be combustible, waste collection and disposal sites should have procedures for reducing risk of fires and containing potential fire impacts. Collection and appropriate handling of leachate and landfill gas prevents landfill explosions and contamination of groundwater with toxic chemicals.
Safety & Health	Does the city have regulations for treatment and disposal of hazardous industrial waste? Are the regulations enforced?	Robust	Regulations for treatment and disposal of hazardous waste are necessary for protection of human health and the environment. Enforcement of protective regulations ensures that the responsibility of safe treatment and disposal hazardous waste lies with industries that produce such waste.

Safety & Health	Does the city have a separate collection and treatment system for medical and infectious waste? Is the waste disposed in a sanitary waste disposal facility (sanitary landfill or a waste to energy facility) that is operational? Are the regulations for separation of medical waste enforced?	Robust	In order to limit exposure to contaminants and infectious diseases medical waste must be managed according to rigorous public safety regulations. This requires the city to enforce its own medical waste regulations and to have an operational sanitary waste disposal facility for appropriate treatment of medical waste.
Safety & Health	Does the city have programs to improve safety and health of waste workers and waste pickers (i.e. education about hazardous and explosive waste, provision of protection equipment etc.)?	Reflective; Inclusive	Waste pickers face many risks to their health and safety to their exposure to heavy and sharp materials, hazardous and infectious waste and smoke from dump sites. Awareness regarding these risks and access to protective equipment helps reduce injuries and infections among waste pickers.
System Continuity	Is the collection system able to continue to operate in event of extreme weather (e.g. heavy snow, storm/flooding, heavy winds)? Are the transfer stations and treatment/disposal facilities able to continue to operate in the event of extreme weather? Is accessibility on major roads maintained? Are the collection trucks enclosed?	Robust	Extreme weather can disrupt waste collection. Ability to continue collecting waste during severe weather events depends on the design of collection trucks, ability to use main roads and/or re-route when necessary.
System Continuity	Does the waste management department have emergency fuel storage to handle extended shortages? Are the waste facilities equipped with backup generators to keep critical equipment in service during power outage (ie: leachate pumps, gas collection systems)?	Redundant	Emergency fuel storage can support continued waste management during extended power shortages. Backup generators can keep critical waste equipment in service to avoid leachate and gas spills during power outage.

System Continuity	Does the city have an emergency disposal site (or otherwise an agreement with a nearby facility) to dispose all excessive amounts of waste that its system cannot handle?	Redundant	Disaster events can leave large amounts of debris and waste behind. Approved sites allow the city to quickly dispose of excess waste after a disaster.
Connectivity	Does the city ensure that solid waste does not block drainage, and contaminate waterways or wetlands? Are major storm drains across the city equipped with trash removal grates?	Robust	The city can help prevent waste blocking drainage and contaminating the environment by providing affordable collection services to all areas of the city and penalizing those that inappropriately dispose waste. Grated stormwater drains allow for easy removal of debris that would otherwise clog drains.

Documents and Tools Informing the Guiding Questions:

- Environmental Services Association UK, Reducing Fire Risks at Waste Management Sites. Draft fire control guidance (2014)
- UNEP, Health and Safety Guidelines for Waste Pickers in South Sudan (2013)
- US Environmental Protection Agency, Incident Waste Decision Support Tool (I-WA