



**Policy, Regulatory Framework and Technical
Guidelines for
Solid Waste Management Facilities
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Project Management Coordination Unit In Collaboration With The
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Recyclers, End-of—Life Quarries, Landfill and Disposal Sites**

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Policy, Regulatory Framework, and Technical Guidelines for Solid Waste Management Facilities

Introduction

In the early 1990's, the decision was taken by the Government of Barbados, under the Ministry of Health, to create a structured framework with respect to the management of solid waste which was fast becoming a critical issue for the island. With this came the development of the Integrated Solid Waste Management Programme. The physical component of this programme speaks to the facilities required to manage solid waste. Over the years there have been several facilities established. The government established landfills and disposal sites are accompanied by some private sector recycling brokerage facilities. While these facilities have been a benefit to the management of the island's waste, there needs to be some structure brought to the system. The overall aim of this exercise is to develop a regulatory framework that would guide how solid waste facilities are established, managed and operated and decommissioned.

Background

The Cabinet, at its meeting on October 17, 2019, considered Note (19) 1234/MHW 80 and agreed that there should be an inter-sectoral Ministerial Committee tasked with establishing a regulatory framework for recyclers, end-of—life quarries, landfill and disposal sites and with reviewing and updating the management processing. The Ministerial Committee comprised of Ministers responsible for: the Ministry of Health and Wellness, Ministry of Energy and Water Resources, Ministry of Home Affairs, Ministry of Environment and National Beautification and the Ministry of Labour and Social Partnership Relations. Cabinet also agreed that this committee would be supported by a technical committee which comprised officers from:

- Ministry of Finance, Economic Affairs and Investment
- Ministry of Health and Wellness
- Sanitation Service Authority
- Environmental Protection Department
- Labour Department
- Barbados Fire Service
- Ministry of Energy and Water Resources
- Town and Country Development Planning Office
- Barbados Water Authority
- Project Management Coordination Unit (Co-opted by the Chair)

In April 2021, a situation occurred at one of the waste brokers on the island which resulted in Cabinet, at its meeting on July 13, 2021, considering Note (21) 627/MHAI HA 20 and agreed that: (a) such facilities should be regularly inspected; (b) the Ministry of Environment and National Beautification shall have oversight of all land filling, dumping and recycling operations; and (c) that the Ministry of Environment and National Beautification and the Ministry of Health shall prepare the appropriate regulatory framework.

Types of wastes to be managed

Wastes are a feature of all civilisations and consequently, how it is managed contributes to some degree to the health and quality of life of a population, and to the state of the environment. Waste is the by-product of social interaction; the consumption of products and services from recreation, work, commerce, and scientific research within a society. These drivers result in the generation of a variety of waste streams which are generally classified as: municipal solid waste, hazardous waste, recyclable waste, electronic waste, construction and demolition waste, special care waste, and medical waste. Such wastes have varying characteristics with different levels of health and environmental risks.

Risks from Improper Waste Management

Waste poses a variety of environmental and human health challenges because its constituents, chemical composition, state, characteristics, and volume with each waste type having unique hazard characteristics that have to be managed. Improperly managed wastes can introduce persistent organic pollutants, endocrine disruptors, heavy metals, pesticides, other industrial chemicals or provide suitable environments for vectors to spread communicable diseases. Approximately 1,000 tonnes per day of solid wastes are collected from 94,173 households which is managed in a variety of public and private sector facilities. Wastes are also indiscriminately disposed which pose a significant threat to the marine environment, biodiversity in the gully network and the groundwater aquifers from which all potable water is abstracted.

Current legislation:

Integrated Solid Waste Management

The Health Services Act is the primary Act that guides solid waste management currently. The aim of the Health Services Act as it states “an Act relating to the promotion and preservation of the health of the inhabitants of Barbados”. While the environment has benefited from the enactment of this legislation, the primary focus is health of persons. There are regulations of this Act that relate to waste disposal facilities. These are:

- Health Services Amendment Act;
- Health Services (Nuisance) Regulations;
- Health Services (Building) Regulations;
- Health Services (Offensive Trade) Regulations;
- Health Service (Disposal of Offensive Matter) Regulations; and
- Health Services (Collection and Disposal of Refuse) Regulations.

The Sanitation Service Authority Act is an Act to establish a Sanitation Service Authority to perform the functions formerly performed by the Sanitation and Cemeteries Board and for related matters. Other Statutory instruments with implications for waste management include labour, environmental and planning laws.

Environment

The Returnable Containers Act, which can be tied to funding as well as to acceptable waste, facilitates the diversion of certain types of wastes from the national sanitary landfill. The Marine

Pollution Control Act is an Act to prevent, reduce and control pollution of the marine environment of Barbados from whatever source.

Labour

The Safety and Health at Work Act - An Act to make provision (a) for securing the health, safety and welfare of persons at work; (b) for protecting other persons against risks to health and safety in connection with the activities of persons at work; (c) for controlling certain emissions into the environment; (d) to consolidate the law relating to health, safety and welfare in the workplace; and (e) for related matters.

The Accidents and Disease Notification Act provide for the notification of accidents and occupational diseases and finally, the Employment (Miscellaneous provisions) Act repealed the Employment of Women, Young Persons and Children Act and made new provisions relating to the employment of persons generally including young persons and children.

Physical Development

Town Planning Act Cap. 240 is an Act to make provision for the orderly and progressive development of land in both urban and rural areas and to preserve and improve the amenities thereof, for the grant of permission to develop land and for other powers of control over the use of land, to confer additional powers in respect of the acquisition and development of land for planning, and for purposes connected with the matters aforesaid. The Act made provision for a Development plan to guide the structured development of lands on a macroeconomic basis. The Town Planning Act will be replaced by the Planning and Development Act which is scheduled to be proclaimed before the end of in 2021.

Water

Barbados Water Authority Act Cap. 274A is an Act to provide for the establishment of the Barbados Water Authority. The Board of the Barbados Water Authority bears responsibility for the Underground Water Control Act, which is an Act to make provision for the control and use of the underground sources of water supply in the Island and other matters connected therewith.

The Water Protection and Land Use Zoning Policy 2020 is an update of the Groundwater Protection Policy as amended in 1973. This policy set controls for the protection of groundwater resources from pollution and wastes generated from development activity.

Proposed Legislation and Legislative Amendments

These risks should therefore be managed using a life cycle approach built into the supporting legislative infrastructure. The characteristics of wastes are dependent on what materials and products are imported into the island and the nature of those materials. A system that determines before the importation of a product whether that product can be integrated into another process or operation, recycled or collected for export through a take back programme would shift the paradigm towards a circular economy and promote improved management through effective application of the waste management hierarchy of source reduction and reuse, recycling and composting, energy recovery, and treatment and disposal of wastes. Essentially, the legislative instruments should contain provisions for improved environmental

management such as: import and export controls, notifications and authorisations, environmental monitoring, inspections, economic regulatory instruments, enforcement, and reporting.

Integrated Solid Waste Management Act

In addition to the above established legislation, there are pieces of legislation that are being drafted that would assist in this regulatory framework. The Integrated Solid Waste Management Act is an Act that will establish a broad framework for the management of solid waste in Barbados and include permitting of solid waste collection vehicles and licensing for waste management facilities. This Act is currently under review to ensure that the resultant legislation would take into account the direction that Barbados is taking relative to becoming a “Green” and “Blue” economy and reducing the use of fossil fuels and decreasing the release of greenhouse gases into the atmosphere. It will take into account the 5Rs, Reduce, Reuse, Recycle, Recover and Repair in that order to ensure waste minimisation.

Amendment to the Sanitation Service Authority Act

Sanitation Service Authority Act Cap. 382 is an Act to establish a Sanitation Service Authority to perform the functions formerly performed by the Sanitation and Cemeteries Board and for related matters. It is recommended that the term “Minister” be amended to mean the Minister responsible for solid waste. In addition, the Act should also be amended to so as to permit the regulations to be enforced through the issue of tickets i.e. ticketing provisions that would allow designated persons to issue tickets to persons who violate the provisions of the Regulations. Designated persons would include police officers, environmental health officers and sanitation officers.

Policy Aim

To create and sustain a culture where by-products derived from social and economic activity contribute to sustainable livelihood opportunities whilst improving the quality of the environment and by extension the quality of life for citizens and residents.

Principles

Actions to implementation the Policy Aim will be based on a set of Principles that will guide our actions for waste management. These are: Improvement in the Quality of Life; Environmental Protection; Economic Efficiency and Effectiveness; and Participation.

Improvement in the Quality of Life

The general aim is to ensure that people have the freedom to pursue their dreams and not be inhibited by inadequate access to sufficient clean water, food, shelter, sanitation/sewage, health care, communication, transportation, education, security, recreation and energy. Waste management facilities can potentially generate odours, leachate and harbour vectors that can spread diseases. These facilities shall be sited and managed to mitigate the negative effect for the various operations.

Environmental Protection through Science and Culture

Humans have a deep connection to the environment which has influenced our science, culture and society. This is especially true for Small Island States where changes to the environment have significant livelihood and quality of life impacts. The way we consume products and services and manage wastes is a learned experience. Wastes retain value because of some of the same constituents that may be health and environmental concerns. Energy and other valuable products can be generated through applications of the waste hierarchy. With sound scientific evaluation, wastes can be minimised thereby protecting the environment through reduction in the volume of wastes disposed. Implementing concepts such as Reduce, Reuse, Recycle, Recover and Repair (5Rs) can adjust cultural norms and the proper documentation of wastes types and quantities will advance the use of science for evidence based decision making.

Economic Efficiency and Effectiveness

Waste management activities will be conducted in a manner that reflects the value of waste as a resources which would be balanced against the financial requirements for its management. Economic instruments would be used to encourage the generation of viable products inclusive of energy from waste streams that respect the environmental, social and economic impacts. Economic efficiency and effectiveness require cost benefit analysis of the full life cycle of the wastes, the derived products and their social, environmental and economic impacts.

Participation

Development activity affects people's way of life; how we live, work, and interact; the stability of our communities, property, rights, culture; our mental, physical and spiritual health; and the quality of the environment. Shared decision making and communication of development plans around waste management is a critical component to collecting and incorporating all opinions on waste management and communicating plans to stakeholders. Community participation in the life cycle of wastes management is therefore a critical component to national social cohesion to minimise and or eliminate adverse outcomes from wastes management.

Objectives

- 1. Recognise the environment, health, social, and economic dimensions of waste management whilst creating sustainable waste management facilities.**
 - a. The operations of waste management facilities add value to national development in manner that improves the environmental aesthetics, health and livelihood;
 - b. Protect environmental resources, terrestrial and coastal ecosystems;
 - c. Provide hierarchical approaches for wastes management Reduce, Reuse, Recycle, Recover and Repair (5Rs);
 - d. Building knowledge and influence consumer actions in the selection of products for consumption with an emphasis on waste minimisation inclusive of 5Rs approaches; and
 - e. Research, identify and implement economic instruments to control emission, reduce stockpiles of wastes.

2. Utilise science and technology in the management of waste and waste management facilities.

- a. Implement systems to collect critical data and convert that data to information for planning and decision making;
- b. Promote research to improve waste collection, treatment, resource recovery, processing, and final disposal;
- c. Utilise economic instruments to promote data collection and report by waste management facilities; and
- d. Research, identify and implement economic instruments to promote 5Rs approaches.

3. Create a regulatory framework that addresses wastes management from importation to final disposal applying a life cycle approach.

- a. Prepare facility specific guidelines to address the hazards posed by waste management facilities on communities in which they operate;
- b. Develop and implement waste management legislation to address import and export controls, notifications and authorisations, environmental monitoring, inspections, economic regulatory instruments, enforcement, and reporting; and
- c. Use a graded approach to the regulation of waste management facilities where no more regulations are used than required based on the risks to environmental resources and human health.

Institutional Arrangements

There are three components necessary for the implementation of these guidelines: the preparation, approval and implementation of waste management legislation; designation within the legislation of the competent authority for the regulatory and enforcement action, combined with the provision of adequate human and financial resources for implementation; and an effective communications strategy for stakeholder buy in and participation. It is recommended that the Environmental Protection Department be designated as the regulatory authority for waste management and the legislative instruments reflect this designation.

Guidelines for Solid Wastes Management Facilities:

Introduction

Facilities established relate to the processes of managing waste and employing the waste management hierarchy. The types of facilities used are those required to minimise waste, such as recycling facilities, those required to recover energy as well as those required for final disposal. The types of facilities that operate locally are as follows:

- Recycling and waste brokering facilities;
- Transfer stations and materials recovery facilities;

- Incinerators without the energy component;
- Landfills and disposal sites;
- End-of-Life quarries (Rehabilitation); and
- Waste storage facilities (Preparation for shipment as in the case of hazardous materials)

These can all be categorised as described in the Operational Phase section below.

A framework to be developed to cover facilities:

The framework developed to cover these facilities must speak to all phases of their life cycle from conceptual phase through to decommissioning. At each stage in their established life cycle, steps need to be taken to ensure that there is minimised risk to human health and the environment.

1. The Conceptual and Development Planning Phase
2. The Operational Phase
3. The Decommissioning Phase

Conceptual and Development Planning Phase

The Planning and Development Act 2020, which replaced the Town Planning Act CAP 240, guides the planning of development activity on island. The Physical Development Plan, an instrument of the Act, requires the conduct of an environmental and social impact assessment for: (a) Waste management facilities and waste disposal sites other than facilities for initial sorting or processing of source separated dry recyclables; and (b) Facilities storing and handling hazardous materials, radioactive materials, severely toxic substances and petroleum products. Several agencies form part of the planning review process for development including the review of waste management facilities with the new Planning and Development Board being responsible for issuing the planning permit for development. The Development Order, another instrument of the Planning and Development Act, allows exemption for certain lands with development approval for certain classes of activity. It is therefore recommended that the EIA process be applied to these facilities where the development proposed is a waste management facility. At a minimum for all waste management facilities, planning process should be supported by a technical guidance document which addresses the following requirements for the facility:

- a. Environmental and Social Impact Assessment;
- b. Description of operations, process flows and categories of waste to be managed;
- c. Description and quantification of emissions
- d. Siting
 - i. Considering the aquifer as the source of water for the island – Barbados’ geological subsurface,
 - ii. Safe proximity from residential population, schools, workplaces and anywhere where people would spend a considerable amount of time daily. To ensure that air and noise emissions do not impact these sensitive receptors,
 - iii. Implementation of any mitigating measures to decrease negative impact on human health and the environment,
 - iv. Far from any coastal area to mitigate impacts on the coastal and marine environments,

- v. Site accessibility and road infrastructure,
- vi. Access to water for the site,
- vii. Access to electricity,
- viii. Consideration of prevailing winds,
- ix. Resilience to natural hazards for example ground stability considerations;
- e. Drainage considerations
 - i. Prevention of ground water contamination,
 - ii. Prevention of storm water contamination;
- f. Securing the site;
- g. Environmental monitoring and mitigation; and
- h. Reporting.

The planning permitting process should recognise the operational permitting process as required by the proposed Waste Management Bill. It is recommended that the planning permits issued for waste management facilities and waste disposal sites should require the applicant to apply for a permit issued by the competent authority with responsibility for authorisations and inspections in the operational phase or the competent authority responsible for environmental protection under the proposed Environmental Protection Bill.

Operational Phase

Waste management facilities should be categorised to reflect the different risks each type of facility pose to human health and the environmental quality and consequently, the type of permit proposed for the facility. It is recommended that the Waste Management Bill provide provisions for Waste Management Facilities: solid waste, material recovery, organics (green waste), recycling, waste-to-energy and waste disposal facilities. Combined permits should also be facilitated where an applicant demonstrates the ability for multiple waste management activities. In the context of these guidelines:

- a. A “waste management facility” refers to all waste management activities conducted either separately or in combination and include the collection, sorting, processing, manufacturing from wastes a product, and or the final disposal of items that are no longer considered to have an economic and or a social value;
- b. Solid waste management facility means any facility for collection, sorting, storage, processing and disposal of municipal solid waste (MSW);
- c. A materials recovery facility (MRF) means a solid waste management facility that provides for the extraction from solid waste of recyclable materials, materials suitable for use as a fuel or soil amendment, or any combination of such materials. These facilities receive recyclable materials and sorts them by type or grade to meet commonly accepted quality standards needed for further processing or manufacturing;
- d. An organic (green) waste facility accepts lawn and tree clippings, painted and untreated wood waste, forest waste and other organic waste, including consumer food scraps from restaurants, cafeterias and homes and generate a variety of products including compost, fertilizer, soil amendments, mulch, biogas or fuel; and
- e. Recycling facilities are those that collect, sort and process recyclable materials, turn organics or green waste into compost or fuels, or use recycled materials in manufacturing to produce a product for sale.

- f. Waste to energy facility means the conversion of waste materials into useable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolysis, anaerobic digestion, and landfill gas (LFG) recovery.
- g. Waste disposal facility (Landfill) means any well-engineered facilities designed to receive specific kinds of waste, including municipal solid waste (MSW), construction and demolition debris (C&D) and hazardous waste for final disposal.

Only facilities with a valid planning permit from the Planning and Development Office would be eligible for an operational permit to operate as a solid waste, material recovery, organics (green waste), and or a recycling facility. In addition, individuals involved in the transport of wastes shall be required to be registered and operate under a licence/permit to collect and transport wastes to waste management facilities.

Consideration should be given to the technical standards and criteria for each type of waste management facilities. These should be related to licensing and permitting of facilities for their operation in accordance with the proposed waste management bill. Only facilities that have been granted permission to operate through licensing and permitting should be allowed to operate. Facilities should also adhere to the requirements of the licence to be able to operate. The operational permit for waste management facilities will consider the conditions of the planning permit but issue conditions for the operational permit based on:

- a. The type of waste management facility and supporting operation;
- b. Type, classification and hazards posed by the wastes to human health (including employees) and the environment;
- c. Volume of waste to be processed (processing capacity);
- d. Method of receipt and processing of the wastes;
- e. Type of technology proposed for the operation;
- f. Location of the facility relative to sensitive receptors;
- g. Emission expected from the facility;
- h. The nature, extent, magnitude, duration, likelihood, and significance of the hazard on sensitive receptors;
- i. Operational hours of the facility; and
- j. Location.

General Technical Guidelines

All facilities wishing to carry out operations that include the collection, processing, manufacture of a product from waste materials and or the final disposal of wastes shall comply with the general guidelines described below.

- a. All waste management facilities shall be required to adhere to the following general guidelines in addition to the specific guidelines for the different type of facility designated by the permit. All recycling facilities shall comply with the requirements of the Planning and Development Act and possess a permit and certificate of compliance from the Town and Country Planning and Development Office;
- b. All wastes management facilities shall have a records management system to collect data on the waste, volumes, weight, type, and characteristics of the waste received from the public. This system shall also include a materials tracking and updated inventory of all materials stored;
- c. All waste management facilities shall report their activities in a format approved by the competent authority.
- d. Evaluation distances for effective air quality and noise management within the planning process should consult with the competent authority to ensure appropriate separation distances to assist in the minimisation of the potential for adverse impacts such as odour, dust, noise and other impacts on amenity;
- e. Prepare stormwater and leachate management plans to prevent materials with the potential to produce leachate and generate contaminated runoff to adversely impact soils or groundwater aquifers. These plans should include leachate collection, treatment and systems;
- f. Provide rainwater storage tanks and collect rainwater for secondary uses including firefighting. The rainwater storage tanks should be easily accessible by fire service vehicle/appliance.
- g. No waste management facility shall manage waste which is not authorised in the operational permit issued to the facility by the competent authority;
- h. Materials must be stored away from surface watercourses, flood zones and groundwater recharge areas to prevent environmental harm to water resources;
- i. All waste management facilities should have a waste reception area to verify the type, volume, weight and characteristics of the waste;
- j. Provisions shall be made for the management of rejected waste, which the facility is not approved to manage. These provisions should include storage and transport of such waste to an approved facility;
- k. All waste entering and leaving the facility shall be documented including waste volume, weight and type.
- l. A waste management facility shall have a written emergency response plan approved by the competent authority and the Department of Emergency Management. This emergency response plan shall be tested twice annually and the results reported to the competent authority by the tenth (10th) day after the end of each biannual period, which start on 1st January and 1st July of each calendar year;
- m. Where a waste management facility manages hazardous chemical waste and other hazardous materials, these materials and substances shall be stored in approved containers for that type of wastes, labelled in accordance with an approved classification system, incompatible waste and materials shall be segregated; and spill containment

- employed for the storage area. The records management systems shall document the dates when containers are filled;
- n. All wastes management facilities shall have written standard operations procedures which shall be submitted to the competent authority for approval prior to commencement of the operations of the facility. Existing facilities shall prepare and submit an operational plan to the competent authority for approval within the 90 days after date of notification by the competent authority. The Standard Operation Procedures shall:
 - i. Set out the organisational structure and identify clear roles and responsibilities for all aspects of the operation;
 - ii. Describe the types of materials received and the hazards posed by the material;
 - iii. Describe the operations of the facility;
 - iv. Set out the procedures for the handling of all wastes including residuals for final disposal;
 - o. All waste management facilities shall be operated in a manner to prevent fires, explosions, cross contamination of waste, release of any managed substance, material or by-product from their operations to the environment (land, water, soils, or air), which can cause harm to human health and the environment;
 - p. All wastes management facilities shall prepare environmental management and mitigation plans to control, minimise and or prevent impacts that may occur as a result of the operations of the facility. These plans should also include rehabilitation of any impacted water, air, or soils from the operations and shall present information on the on the state of the environment prior to the operations of the facility with strategies to return the environment to its original state;
 - q. All waste storage areas shall have adequate signage to reflect the nature of the risks posed by the wastes;
 - r. Pest control plans should be prepared and approved by the Ministry of Health and Wellness. These plans shall be submitted to the competent authority and shall include controls such as barriers, covering, minimised storage timeframes and generally good housekeeping should be implemented to help mitigate potential impacts from vermin;
 - s. All waste management facilities shall adhere to the Safety and Health at Work Act and shall provide employees and visitors to operational areas of the facility with adequate personal protective equipment;
 - t. Staff employed by the waste management facility shall have a minimum of 40 hours training biennially in health and safety from an institution approved by the competent authority;
 - u. All waste management facilities shall be required to establish a recovery and mitigation fund, be it through a bond or otherwise to facilitate clean-up of facilities where abandonment or collapse of the waste market; and
 - v. All waste management facilities shall comply with all applicable laws of Barbados.

Materials Recovery Facility (MRF)

Separation of waste at source is important for the operation of waste management facilities. This allows a facility to reduce the processing costs, and control the potential risk that can be derived from the sorting, and processing activities. Like all waste management facilities,

environmental and health impacts can occur if waste is not processed in a controlled manner. In addition to the general technical guidance above, these facilities shall:

- a. Implement fire, pest, and vector control and prevention methods;
- b. Not accept putrid organic matter namely food;
- c. Provide rainwater storage tanks and collect rainwater for secondary uses including firefighting;
- d. Extracted materials shall be sorted by type, baled and stored away from ignitions sources, volatile substances;
- e. Baled materials shall be stored indoors except when permission is granted through a permit for outdoor storage of materials;
- f. Storage requirements for stockpiles outdoors shall be based on the material type and the associated risks they pose;
- g. Materials with a potential to produce leachate and contaminated runoff or soils should be stored in a sealed/lined and bunded area in order to divert stormwater away from the waste, and contain and prevent impact from potentially contaminated runoff. Covering these materials may also be required to reduce the potential for leachate generation or to prevent or minimise gaseous or dust or other emissions;
- h. Inert waste, asphalt, green waste, construction and demolition waste (inert), untreated timber and wood waste maybe stored outside;
- i. Baled recovered materials shall not exceed the height of five metres (5m) and when stockpiled shall be arranged in a manner to facilitate emergency response with adequate distance between stockpiles for normal operation, emergency and to help prevent the spread of fire. Unbaled stockpiles materials shall also conform to the special arrangements;
- j. Areas between stockpiles should be kept free of obstruction and allow easy movement of emergency vehicles;
- k. Detailed plans for the control of rodents and other vermin from harbouring.
- l. Prepare a visual assessment as part of the planning process to ensure compatibility with the landuse for the operation. Existing facilities shall be required to prepare visual assessments and submit the results with mitigation measures within three months after the guidelines are approved and legislation enacted. Facilities shall not be untidy and unsightly;
- m. Not store more material than can be processed within 4 weeks;
- n. Baled materials or stockpiles shall not remain in the same location for extended periods of time; and
- o. Prevent improperly stored items – that would cause degradation of the items such as impact of sunlight on plastics.

Organic (Green) Waste Facility

Green waste facilities collect and process a variety of wastes that may include food scraps, grass clippings, leaves, wood chips, branches, trees, animal manure, and other compostable wastes to energy, biofuels or compost products. Current approaches utilise aerobic, anaerobic, and vermicomposting technologies. These operations can introduce excess nitrogen into the environment, generate odours and provide a place for vermin and other vectors to proliferate. Specifically, these types of facilities shall:

- a. Be sited in locations away from sensitive receptors;
- b. Prepare detailed plans for submission to the competent authority for the control of rodents and other vermin from harbouring and approval by the Ministry of Health and Wellness;
- c. Implement fire, pest, and vector control and prevention methods;
- d. prepare stormwater and leachate management plans to prevent materials with the potential to produce leachate and generating contaminated runoff to adversely impact soils or groundwater aquifers. These plans should include leachate collection, treatment and systems;
- e. Areas where these materials are processed should sealed/lined and bunded in order to divert stormwater away from the waste and control runoff for collection and treatment prior to disposal;
- f. Wastewater generated from the facility should be treated to the standard approved by the Environmental Protection Department prior to final discharge to the environment;
- g. Establish systems and procedures for the control of odours, noise, pests, vectors, and dust;
- h. As part of any fire prevention plan monitoring of the temperature of stockpiles should be conducted and results recorded for inspection by the competent authority and the Barbados Fire Service;
- i. Anaerobic processes should have appropriate pollution control measures and plans for the prevention and reduction of obnoxious odours for their operations; and
- j. Provide rainwater storage tanks and collect rainwater for secondary uses including firefighting.

Recycling Facility and Waste Brokering Facilities

Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products. Waste Brokering occurs when the items are sorted and prepared for shipment. Like all other waste management facilities, recycling and waste brokering have their unique hazards and associated risks. Some facilities may execute several processes based on how the solid waste materials are received, or whether it is sorted and classified as clean materials. Requirements shown here can be excluded by the competent authority where applicable.

- a. All recycling and waste brokering facilities shall comply with the requirements of the Planning and Development Act and possess a permit and certificate of compliance from the Planning and Development Office;
- b. Establish systems and procedures for the control of odours, noise, pests, vectors, and dust;
- c. Implement fire prevention methods including temperature monitoring;
- d. Prepare stormwater and leachate management plans to prevent materials with the potential to produce leachate and generating contaminated runoff to adversely impact soils or groundwater aquifers. These plans should include leachate collection, treatment and systems. Areas where these materials are processed should sealed/lined and bunded in order to divert stormwater away from the waste and control runoff for collection and treatment prior to disposal;

- e. Baled materials shall be stored indoors except when permission is granted through a permit for outdoor storage of materials; and
- f. Provide rainwater storage tanks and collect rainwater for secondary uses including firefighting.

Waste to Energy Facility

Incineration and waste to energy facilities have the capability to receive and process a wide range of solid wastes generated from residential, commercial, industrial and institutional wastes. The solid residual and the gaseous emission from the numerous technologies used for thermal volumetric reduction of solid waste can have significant environmental and health effects if not managed.

- a. All incineration and waste –to-energy facilities shall comply with the requirements of the Planning and Development Act and possess a permit and certificate of compliance from the Planning and Development Office;
- b. All incineration or thermal volumetric process shall have air quality pollution control technology capable of removing dangerous air pollutants from the process gases emitted from the operation;
- c. All facilities shall prepare an environmental monitoring plan and environmental management plan for approval by the competent authority. Both documents shall address the hazards and risks identified in the Environmental impact assessment prepared during the planning process;
- d. All facilities shall assess the concentration, volume and dispersion of CO₂, CO, O₃, NO_x, SO_x, PM₁₀, and PM_{2.5} and report to the competent authority on the levels both within the stack and the identified impact area and closest receptor to the facility based on the approved environmental monitoring plan.
- e. The performance efficiency of the pollution control equipment shall be monitored to and reported to the competent authority to ensure optimum efficiency at capturing harmful emissions;
- f. An ash residual management plan shall be prepared to control the daily managements of ash. This should include at a minimum, methods for processing and final disposal of the ash; and
- g. The leachate potential and the chemical characteristic of the ash shall be determined using a leachability test approved by the competent authority.

Waste Disposal Facility (Landfill)

A landfill is a critical component of all waste management operations. Landfills are specially engineered to manage different types of wastes such as municipal solid waste (MSW), construction and demolition, and hazardous waste. The design and operation of a landfill must take certain hazards and risks into consideration to ensure the smooth operation of the facility. Landfill operators shall:

- a. Conduct annual surveys to assess settlement and lateral movement within the landfill and report the results in a report to the competent authority. The initial survey for the location of the landfill during the planning phases shall be included in the environmental impact assessment and will be used as the baseline measurements or benchmark for the facility;

- b. A leachate management system for leachate shall be installed to collect, process and dispose of leachate;
- c. A landfill gas management system shall be installed to control the release of landfill gases to the atmosphere or for the processing and utilisation of the landfill gas as part of an energy recovery process;
- d. Establish systems to control nuisances from the operations;
- e. Prepare a traffic management plan and inform the public of the requirements detailed in the plan. This plan shall be submitted to the competent authority and must be approved by the Ministry of Transport, Works and Water Resources;
- f. Establish procedures for the management of litter within and around the landfill which at a minimum shall include provisions for windblown litter, litter fences, and litter patrols;
- g. Establish systems and procedures for the control of odours, noise, pests, vectors, and dust;
- h. Within the emergency response plan, fire prevention and control measures shall be described and include:
 - i. Firefighting resources
 - ii. Classification of landfill fires
 - iii. Internal incident command structure
 - iv. First response activities
 - v. Firefighting measures
- i. Risk reduction measures
- j. Temperature monitoring
- k. Monitoring of gas consumption
- l. Personal protective equipment
- m. Training
- n. Storm water management and flood prevention and control
- o. Maintenance of equipment - The Safety and Health at Work Act requires that risk assessment be conducted before the start of any operation and the necessary steps put in place to reduce health and safety impacts to workers,
- p. Training
 - i. Use of PPE, and
 - ii. skills necessary to carry out work correctly and safely.

Transport Technical Guidelines

Waste haulers are not waste management facilities but provide a critical role in the transport of wastes to waste management facilities. These operators can be associated with a particular facility or operate independent of any facility. Wastes can also be transported by private citizens using their own means of transport. The following shall apply to waste haulers and transporters:

- a. Waste haulers and the vehicles used for waste transport shall be registered with the competent authority;
- b. Vehicles and operators shall be registered for specific category of wastes;
- c. Waste shall only be comingled where the permit allows specifies the nature of the comingled wastes;

- d. Vehicles transporting hazardous chemicals or wastes listed in any applicable schedule or deemed to be so dangerous by the Environmental Protection Department shall be restricted to such routes and times as specified by the EPD;
- e. All registered vehicles transporting waste shall have a waste manifest indicating the waste being transported as well as the source of the waste; and
- f. All registered vehicles must first be registered with the Ministry of Transport, Works and Water Resources under the Road Traffic Act Cap 295.

Management of Liquid and hazardous waste

- a. Hazardous wastes with different characteristics should be stored separately in a well ventilated area;
- b. Hazardous wastes must be clearly identified with the appropriate labelling to show name of waste, quantity of waste, date stored.
- c. Operations accepting liquid waste should have a management plan for the range of liquid wastes being accepted.

Close out phase / Decommissioning

All wastes management facilities should be operating under either or both a planning permit and an operational permit. The main risk or concern is the abandonment of the facilities, equipment, vehicles and stockpiles of waste materials without any plan for final disposal of the material. Final disposal of waste may include; conversion to another product for sale, extraction of economically valuable materials for export or landfilling.

- a. All facilities shall provide a closure plan which details the final disposal of all waste materials and products generated for the operations. The closure plan should include provision for the remediation of environmental impacts observed from assessments conducted within the framework of the environmental monitoring and management plans or by independent assessment done by the competent authority.

References

1. Environmental Protection Authority, 2019. Guideline for stockpile management: Waste and waste derived products for recycling and reuse. September 2010 Updated June 2019. Environmental Protection Authority.
2. Institute for Local Government, 2015. Understanding Recycling Facilities and Required Permits.
3. EPA Website Accessed 2 November 2021. <https://www.epa.gov/recycle/recycling-basics>.