Reduction of Unintentionally Produced Persistent Organic Pollutants (UPOPs) emissions by improving waste management practices at landfills

Prioritising waste streams

GEF Project ID: 5558 – Component 2 - Development and Implementation of a Sustainable Management Mechanism for POPs in the Caribbean

3 March 2020

BCRC CARIBBEAN
Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean

UN environment
United Nations Environment Programme

Resources & Waste Advisory Group

gef

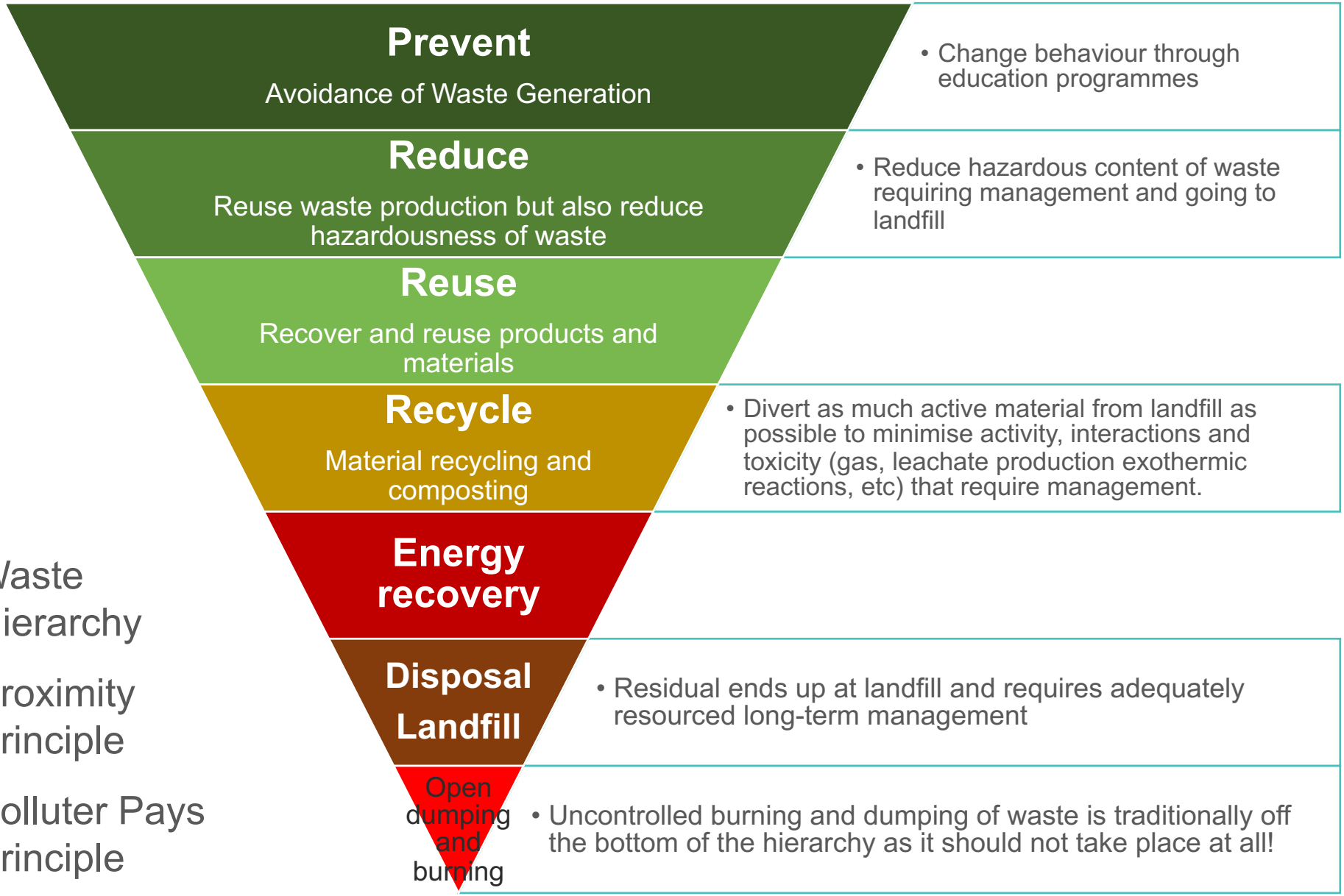
STOCKHOLM CONVENTION

UNIDO

Principals and potential solutions for improving management of waste facilities and priority waste streams

Reducing UPOPs emissions from Landfill

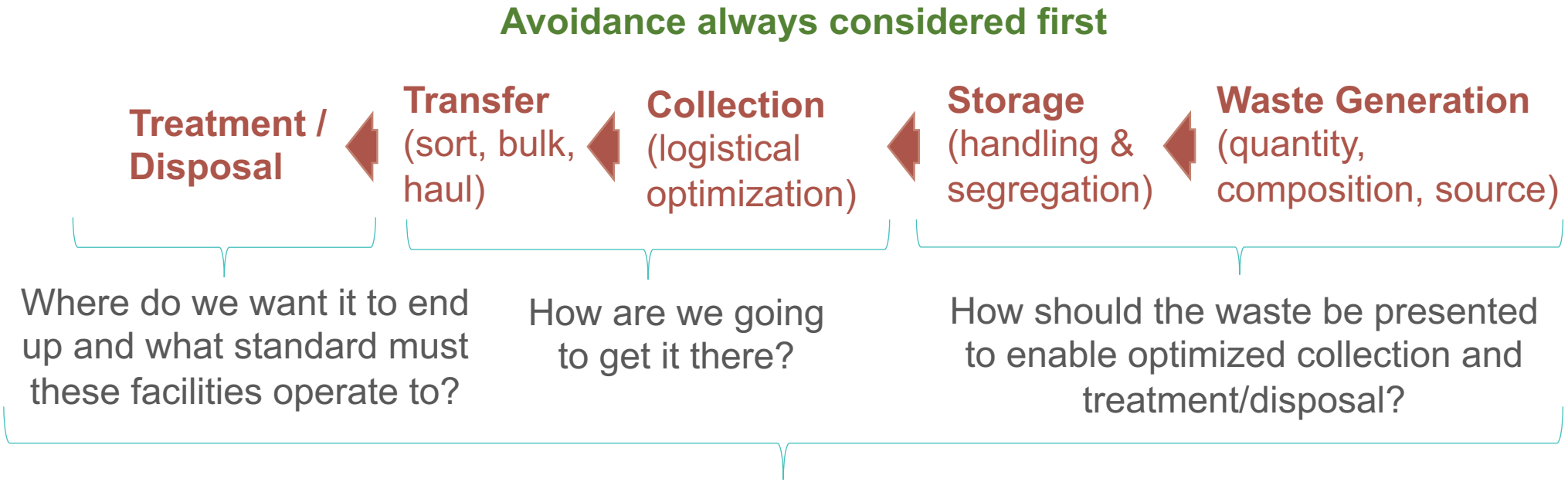
Waste Management Hierarchy – Core Principal



- Waste Hierarchy
- Proximity Principle
- Polluter Pays Principle

Practical Approaches

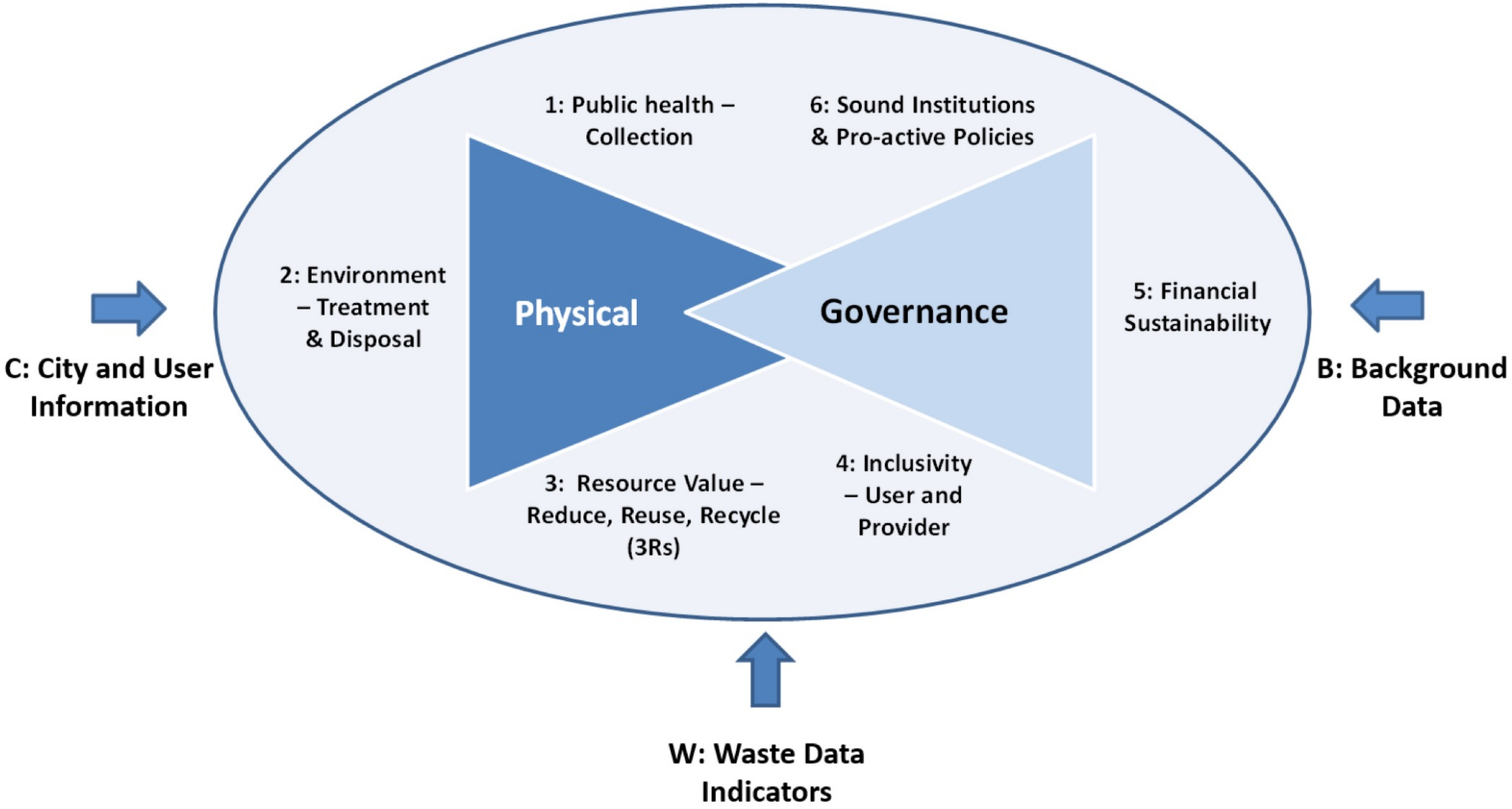
Planning the system in reverse, starting with the end goal, can have many benefits – especially when you know the target waste stream.



- Financial
- Technical (using the Best Available Technology)
- Legal
- Institutional (can the institutions administer and enforce system)
- Environmentally and socially (following Best Environmental Practice)

Integrated Systems approach

The enabling environment



Prioritizing Waste Streams (Common current management in Caribbean)

1	**Municipal Solid Waste / Household and Institutional**	• Open burning at sources • Landfill
2	**Commercial and Industrial**	• Open burning at source • Landfill
3	**Construction and Demolition**	• Landfilled
4	**Parks and Gardens (green waste)**	• Landfilled • Open burning • Limited composting
5	**Recyclable Packaging**	• Private recyclable material brokers • Landfilled • Stockpiled
6	**Tyres**	• Uncontained Stockpiles (frequent burning)

Prioritising Waste Streams (Common current management in Caribbean)

7	**End-of-Life Vehicles**	• Private Scrap yards / • recyclable material brokers
8	**WEEE**	• White goods stockpile • Landfilled • Formal and informal recovery (with burning)
9	**ULABS**	• Private recyclable material brokers • Exported without Basel Convention compliance
10	**Agricultural pesticide residues and used containers**	• Landfilled • Limited official stockpile • Informal dumping and burning at farms
11	**Laboratory Chemicals (hazardous)**	• Stored at point of use (often out of date) • Disposed of with municipal waste
12	**Waste from Paint manufacturing and dry cleaning**	• Liquid Waste Ponds (unlined) at landfill sites • Stockpiled at point of use
13	**Oils and petroleum contaminated wastes**	• Oils to rum distillery boilers • Liquid Waste Ponds (unlined) at Landfills • Landfilled • Oil filters and rags
14	**Medical waste**	• Medical waste incinerators / autoclaves • Landfill – deep burial

Common POPs and UPOPs emission risks

	Waste	Treatment / Disposal	Emission Risk
Stockpile Management	Mixed waste	Dumped / stockpiled Landfilled	Fires
	Tyres	Stockpiles	Fires
	WEEE, White goods and mattresses	Stockpiled Private material brokers Landfill	Fires Leaching of POPs from foams
	Recyclable materials	Private material brokers	Fires
	ELVs	Private material brokers	Fires Leaching of POPs from foams
Unsegregated Hazardous	Hazardous Waste	Uncontained hazardous chemicals and containers in stockpiles and landfill	leakage of POPs chemicals into soil / water bodies
	Oily water and hazardous liquids	Oily water disposal pits	leakage of POPs chemicals into soil / water bodies

Common challenges in Caribbean (from UPOPs/POPs release from waste)

Stockpiles:

- Tyre and other waste stream stockpiles are large, uncontained, unmonitored with no fire breaks or bunds to rapidly smother a fire.
- No fire prevention standards, plans, permits or compliance inspections conducted at any waste management facility.
- Limited fire fighting procedures in place at waste management facilities and little advanced coordination with fire department.
- Low flash point wastes in with mixed waste stockpiles

Hazardous materials:

- Hazardous materials (including POPs) in landfill and liquid pits that are leaching into surrounding environment unmonitored.

Priority Actions - Common

1. Manage tyres to mitigate fire risk.
2. Establish / Improve waste management facility operating standards and permitting with accountability in order to reduce fire incidences.
3. Divert hazardous waste to appropriate facility and management system
4. Improve environmental monitoring / environmental regulation to better inform decision makers and investment planning.
5. Ensure oils, solvents and hazardous liquids are captured and diverted from liquid pits.

1. Manage tyres to mitigate fire risk.

Fire Prevention Objectives

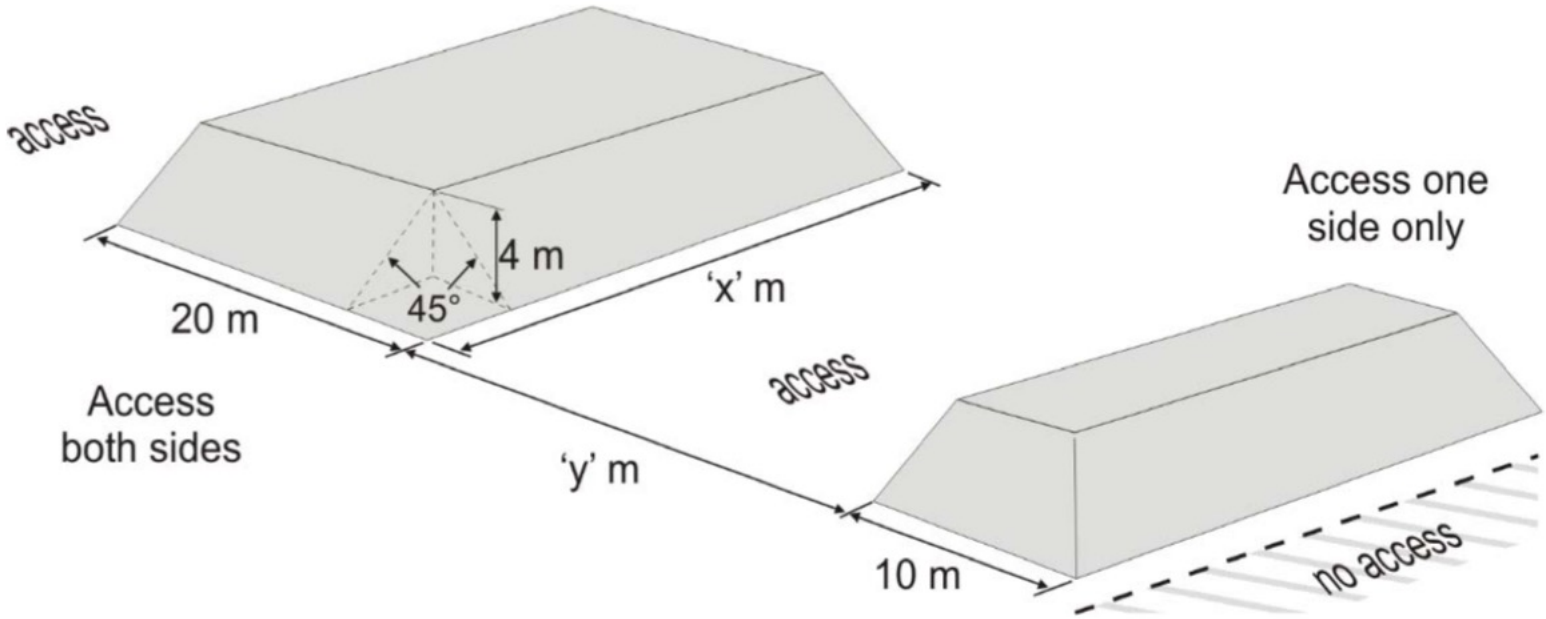
- Minimise the likelihood of a fire happening
- Aim for a fire to be extinguished within 4 hours
- Minimise the spread of fire within the site and to neighbouring sites

Fire Prevention Basics

- Implement effective fire prevention and site procedures to minimise the risk of fire occurring
- Limiting the size of waste material stockpiles as far as is practicable
- Maintaining adequate clearance between stockpiles and other infrastructure
- Configuring stockpiles in a way that ensures access for firefighting and maximises its effectiveness
- Protection of human health and the environment in the event of a fire.

Quick low-cost interventions:

- Minimise pile sizes (small piles with appropriate separation are safer than one big one) –
- Tyre piles must not exceed 450m^3 - e.g. 20m wide x 10m deep x 2m high – no side should ever exceed 20m and never exceed 4m high.
- Minimum distance between piles of 6m but more effectively 20m (unless fire walls used)



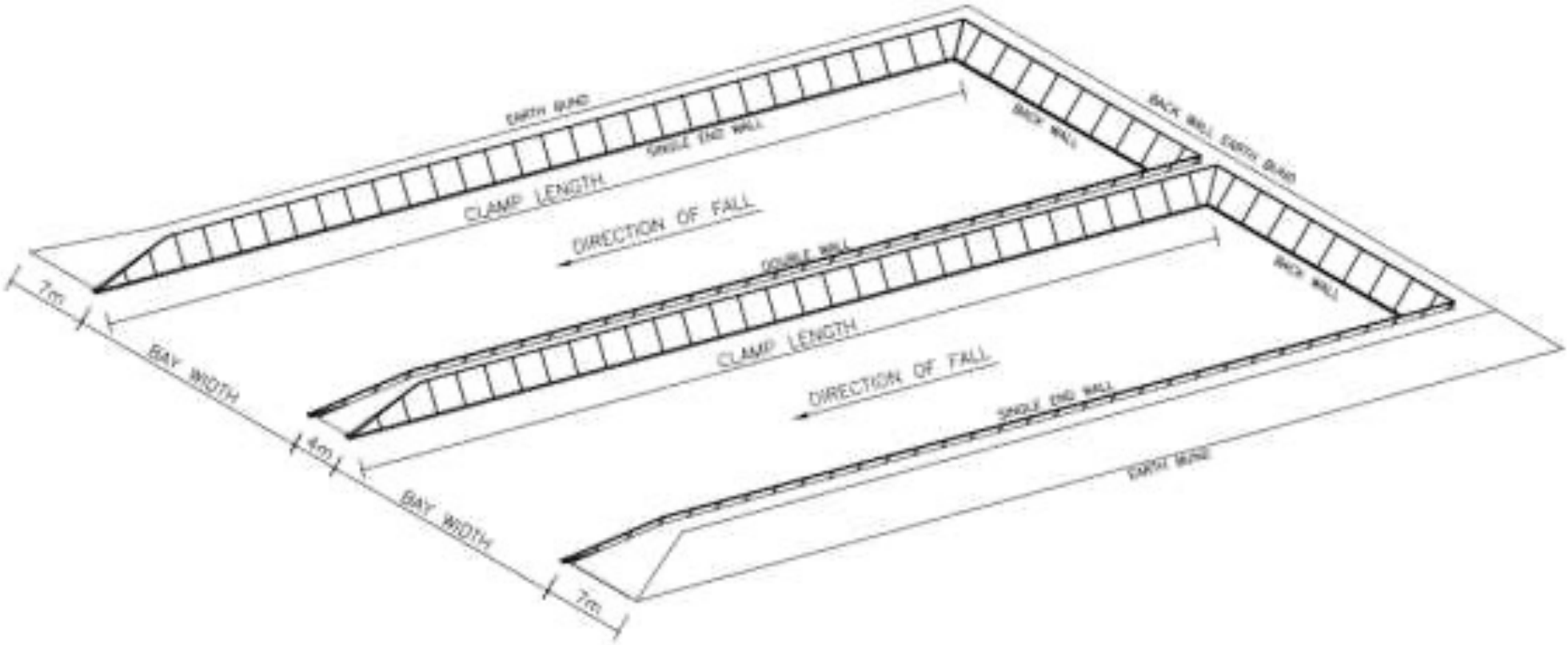
Maximum external stockpile size and minimum separation

Improved tyre stockpile layout

Manage stockpiles with adequate bunding

Bunds must have 1m free height above top of waste stockpile maximum height

Earth bays with earth walls sufficient to quickly push over contents and extinguish fire



Stockpile bays with fire walls

Tyre Management Options

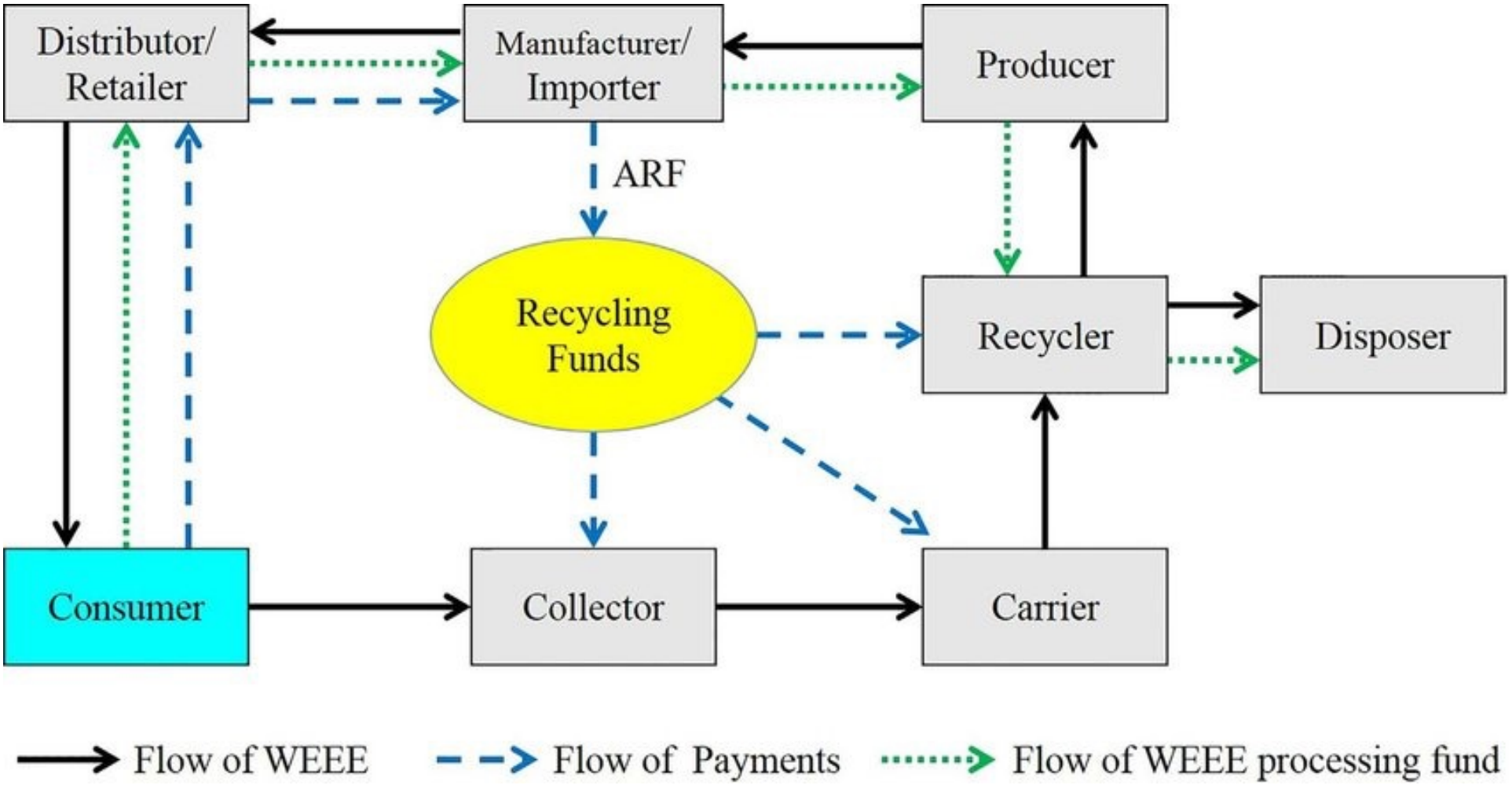
Effective segregation of Tyres operating

Establish sustainable management route for Tyres

- EPR system to fund management
- Shredding for integration into cover material
- Shredding for use in tyre-derived aggregates (TDA) (locally or regionally)
- Cut up and used as leachate or gas drainage medium on and around landfill

- **Needs a robust sustainable Operator Model!**

Example EPR flows



Similar Management for all waste stockpiles

Establish improved management options for stockpiled waste streams with accountability against performance standards

Establish enabling environment for private sector to sustainably operate.

- **ELV** – De-polluted and baled for export
- **Whitegoods** – de-polluted and baled for export or disposal
- **WEEE** – containerized whole, dismantled or shredded with hazardous components to Hazardous waste facility, valuable components to brokerage

Establish voluntary or mandatory EPR

Feasibility studies required to assess economic viability of local initiative versus regional hubs for activities.

2. Establish waste management facility operating standards and permitting

- Should waste management facilities be permitted? Can they be (do institutions and resources exist)? Will it help prevent fires and manage hazardous wastes?

- Establish minimum standards for waste facilities and their stockpile management that are practical for Barbados and that reduce the risk of fire and stipulate minimum fire fighting equipment / infrastructure.
- Without minimum standards, permitting and enforcement can not take place.
- Requires defining clear roles and responsibilities for all parties, transparency of minimum standards and regular audits with enforcement measures.
- Fire prevention and hazardous waste plans should be integral component of environmental / Operating permits that are audited annually.

Causes of waste management facility fires

1 UK waste management company, over five-year period, 120 plus sites and more than 200 reports of fires/smoulders.

- 31% of fires were likely caused by hot or hazardous materials and items in wastes accepted at sites, such as hot ashes, lithium batteries, gas cylinders, flammable liquids, aerosols etc.
- 24% of fires were likely caused by self-heating, both in waste reception and storage
- 5% were likely caused by hot surfaces, 7% by electrical faults, 5% by hot-works such as welding and grinding and 9% by friction
- The remaining 19% were caused by a variety of other smaller likely causes

Site permitting and licensing

Waste management facilities should meet minimum standards / requirements and be audited on an annual basis to ensure compliance with minimum standards.

The agencies involved should include:

- The planning authority - Town and Country Development Planning Office (TCDPO)
- The environmental regulator - Environmental Protection Department / Ministry of Health and Wellness Public Health Inspectors
- The workplace safety regulator -
- The fire service - Barbados Fire Service (BFS)

- Standards development and regulators / inspectors must be well trained in facility operations and clearly understand and comprehend minimum requirements.

Reducing POPs / UPOPs emissions through sector planning and regulation

1. Where is the waste stream going (current practice)?
2. Where should it go (National strategy / norms and standards / legislated)

Which entity is responsible for:

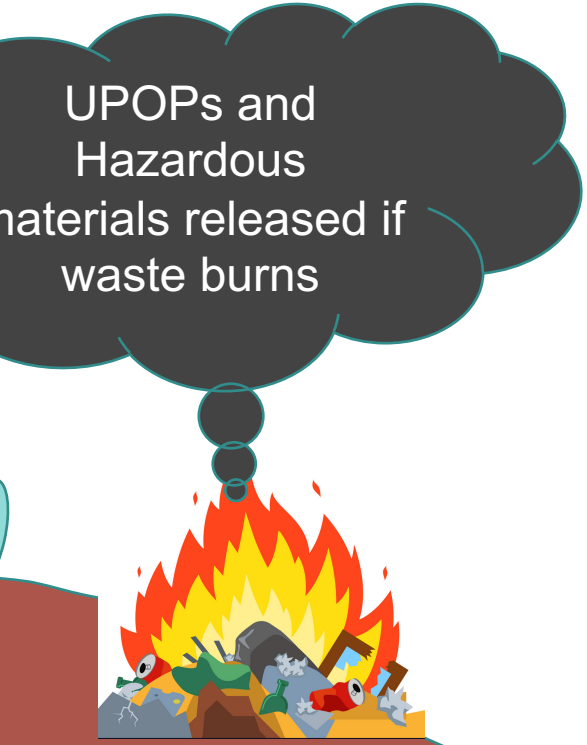
1. Developing technical standards for collection and treatment/disposal facilities
2. Developing environmental standards for treatment/disposal facilities
3. Permitting / licensing collectors, treatment / disposal sites and operators according to the standards.
4. Regulating the collection, treatment / disposal sites and operators according to the technical standards (permit / license conditions) - **Technical Regulator.**
5. Regulating the collection, treatment / disposal sites and operators according to the environmental and health standards – **Environmental Regulator**

3. Divert hazardous waste to appropriate facility and management system

- Reduces toxicity of landfill leachate and ease of alternate treatment including reducing risk to operator health & safety
- Benefits outweigh economic cost of operating when environmental monitoring can demonstrate the improvement.
- Establish hazardous waste interim storage facility
- Establish mechanisms for Source Segregation of hazardous wastes from Household Waste, Industrial, Commercial and Institutional, and Construction and Demolition wastes.
- Includes chemicals (acids, solvents, etc.), pesticide wastes, oils and oil contaminated wastes, biomedical, solvents, hazardous WEEE, etc.

What goes in, is what comes out!

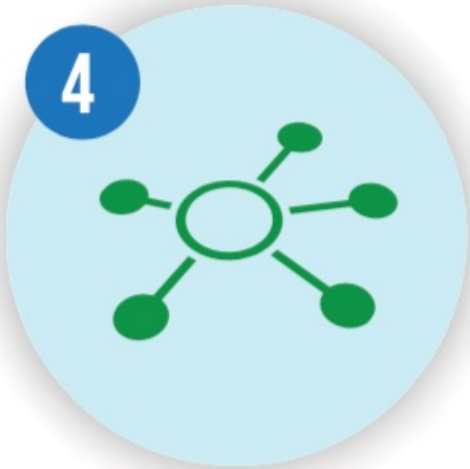
- MSW
- ICI
- Green
- CDW
- Hazardous
- WEEE
- Oils
- Chemicals
- Pesticides



SIDS generate **small quantities of hazardous waste** (chemical, medical, electronic, lead-acid batteries, asbestos and used oil) but **lack capacity and capability to effectively manage it** and implement waste-stream specific management practices

Audit and **enforcement of legislation** and regulations are important components of effective hazardous waste management

Hazardous waste should be considered a top **priority** requiring coordination between SIDS



Regional cooperation and management models that utilize **synergies between countries** are required

Already developed **regional hazardous waste management models** have a potential to be transferred to other waste streams as well, e.g. recycling

Starting with the end - Hazardous Waste Interim Storage Facility

Example from north Cyprus

Hazardous Waste Interim Storage Facility

Example from north Cyprus

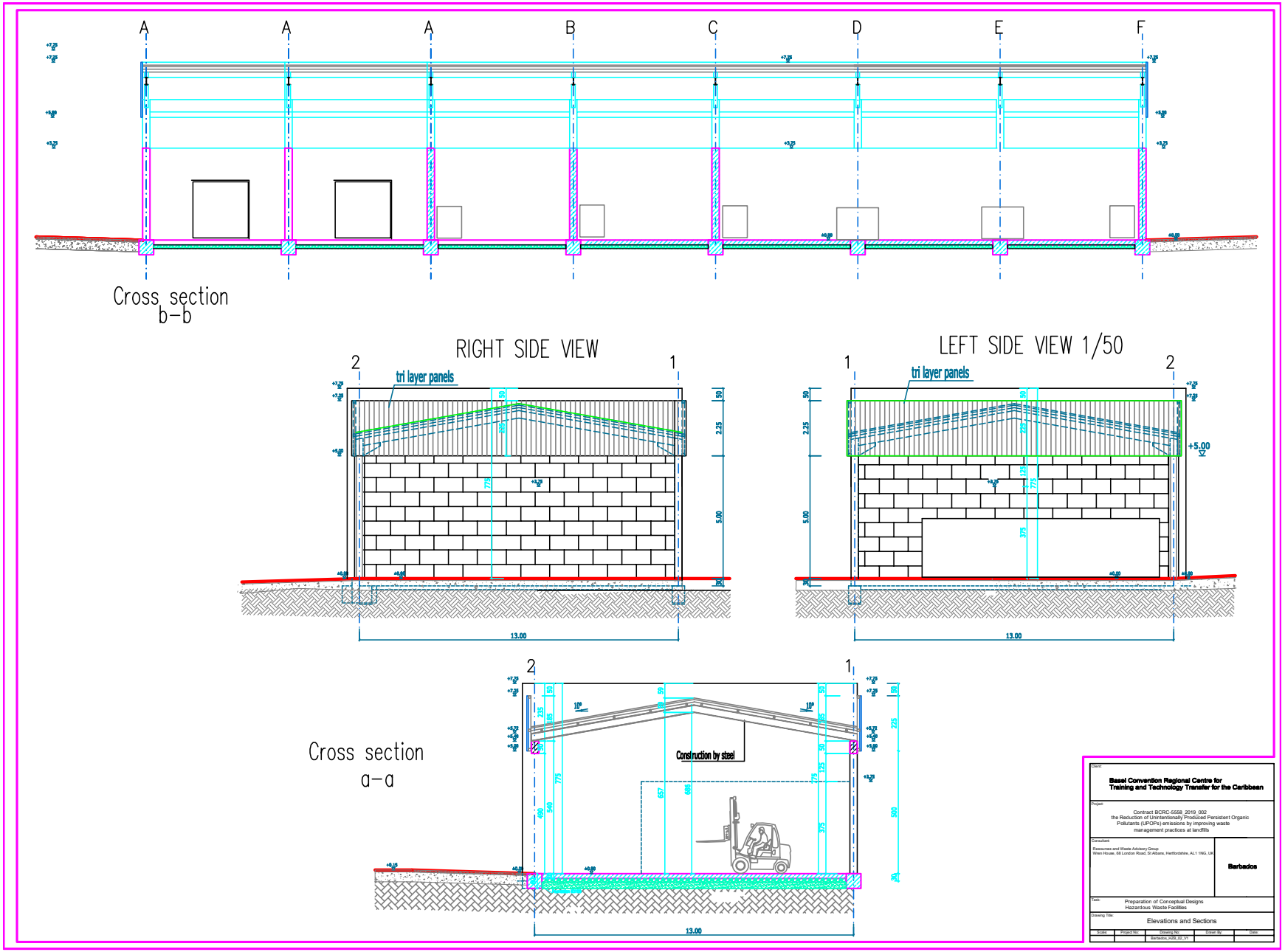
Hazardous Waste Interim Storage Facility

Example from north Cyprus

Starting with the end - Hazardous Waste Interim Storage Facility

Hazardous Waste Interim Storage Facility

Design plans for Barbados



Hazardous Waste Interim Storage Facility

Design plans for Barbados

Separating the waste streams

- Each waste stream has different characteristics and End-of-Life management options
- Segregating waste streams into homogeneous fractions can dramatically increase ability to improve available management options.
- Costs and benefits exist with all segregation options.
- Three main segregation systems:

Decentralised

Segregation at source (before collection)

Distributed

Segregation at community level / transfer station / Point of Sale (mid-collection)

Centralised

Segregation at central treatment facility / Disposal Site (after collection and delivery)

Tools to encourage segregation / Diversion

1. Convenience
   - Maximise convergence with / Minimise divergence from existing **habits**
2. Information, education and communication
   - Who, what, where, when and how?
   - Publication of Environmental Monitoring and Tests
   - Official Government and Civil Society
3. Economic Instruments / Market Incentives
   - Deposit refunds (EPR)
   - Subsidies, tax breaks, grants
   - Gate fee at landfill / Increased collection cost
4. Punitive Measures / Enforcement
   - Fines / other punishments for non-compliance
5. Laws / Norms and Standards
   - What should be done with the waste?
   - Landfill bans
6. Financing (CAPEX and OPEX)
   - Willingness to pay / willingness to accept
7. Voluntary codes and commitments

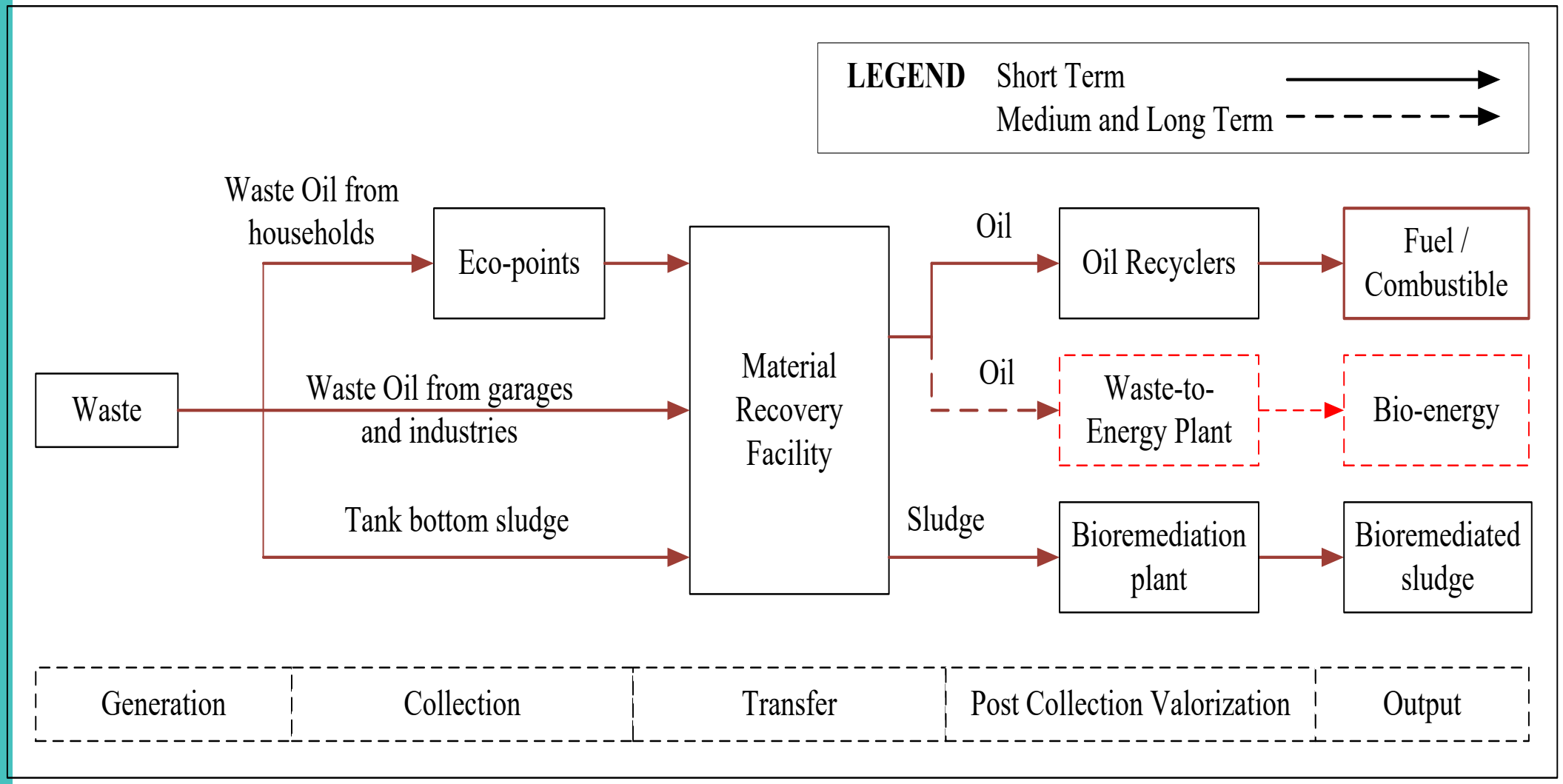
4. Improve environmental monitoring / environmental regulation to better inform decision makers and investment planning

- Establish minimum environmental standards for ground water, surface water, air and soil samples taken around waste management facilities
- Establish testing regime and responsible environmental regulator
- Utilise tests to inform policy, planning and investment decisions

5. Ensure oils, solvents and hazardous liquids are diverted from liquid pits

Unlined liquid waste pond at Mangrove Pond Landfill area, Barbados

Oils & petroleum Contaminated Waste



Ensure oils, solvents and hazardous liquids are diverted from liquid pits.

- Install oil and grease / water separator at liquid pits.
- Remove oils and grease for recovery / use in industrial boilers or interim hazardous waste storage containment.
- Education Communication and Information campaign on segregating oils, fats, solvents and liquid chemicals at source with a robust management system in place for them.

Oils & petroleum Contaminated Waste

Oil filter crusher