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

Source Separation and Collection Pilot
Technical Concept and Preparation

12 May 2021

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

UN environment
United Nations Environment Programme

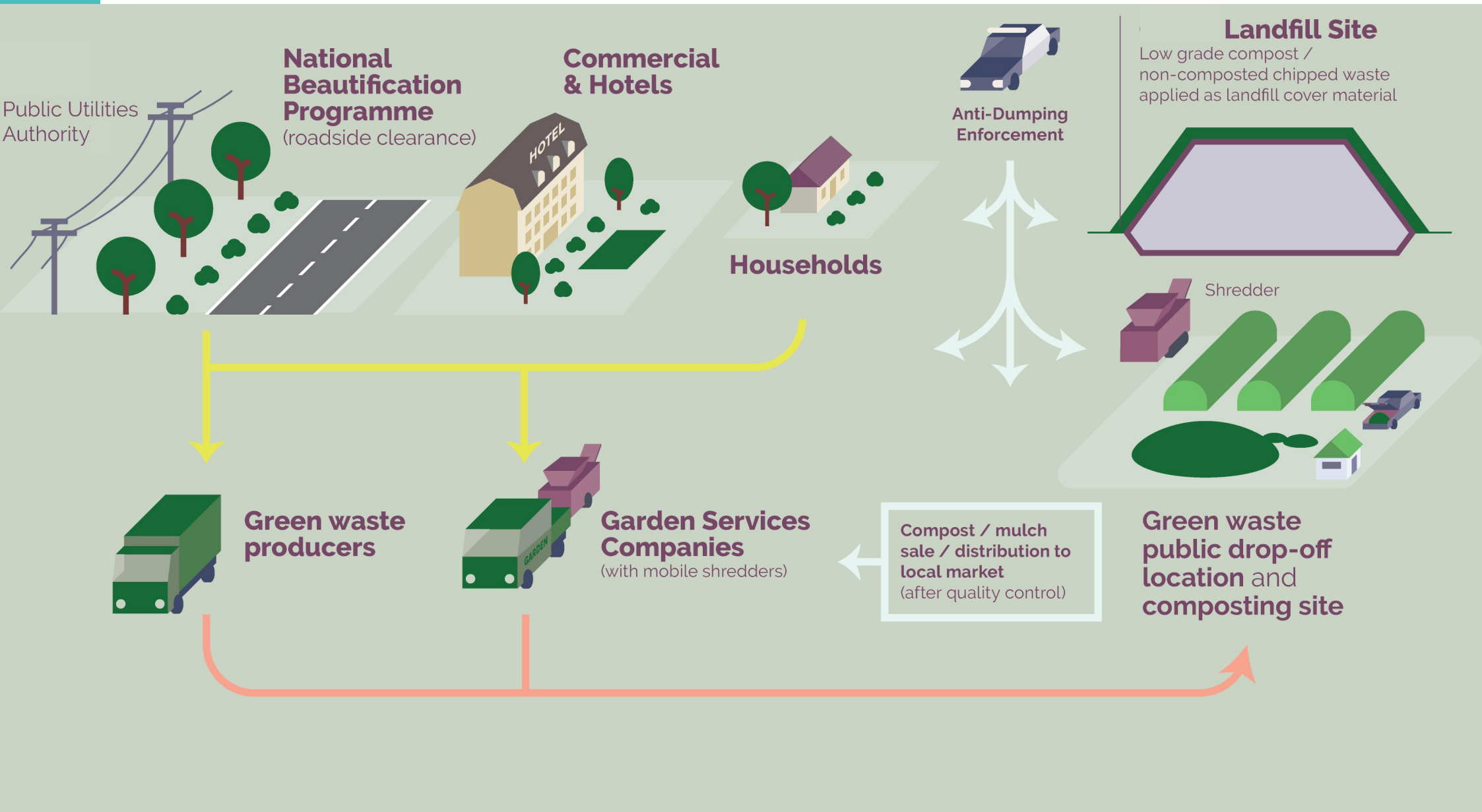
Resources & Waste Advisory Group

gef

STOCKHOLM CONVENTION

UNIDO

Source Segregation Pilot



Pilot study Monitoring and Evaluation Plan

M&E pilot: Review of Baseline data

	Fill in data in Beige cells for Baseline phase				Phase	**Baseline Phase**																												
	Fill in data in Green cells for Implementation phase				Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	**Monthly Subtotal**
					Weeks	1							2							3							4							
					Months	1																												
	Indicator		Sub-indicator	**Data set**	Responsible																													
1	Efficiency of waste disposal and compaction on Landfill that assist mitigate occurrence of fire.	A	Ratio of landfill compactor fuel use (litres / hour) per tonne of waste delivered combined with visual assessment of working face waste compaction (photo evidence)	**Landfill compactor and bulldozer fuel use (litres)**	Name of responsible person																													**0**
				Total landfill compaction machine(s) operating hours (SWMA equipment)																														**0**
				Total landfill compaction machine(s) operating hours (Private contractor cost)																														**0**
				Tonnes of waste delivered on site																														**0**
				Ratio (fuel use/tonne of waste)		Monthly sum value only																												**0**
		B	Number of days smoke is observed rising from landfill mass	**Was smoke observed anywhere on landfill site? (Yes = 1/N = 0)**																														**0**
		C	Number of fires occurring on active landfill site.	**Were there any active fires observed on site (insert number of separate fires if any).**																														**0**
2	Increase in Green Waste diversion from landfill to environmentally sound management.	D	Quantity (weight) of Green Waste loads recorded as entering Landfill	**Tonnes of green waste recorded as being disposed into landfill**																														**0**
		E	Number of separate occurrences of open dumping of green waste (and other wastes).	**Number of locations observed where fresh green waste loads have been dumped in locations targeted for green waste location**		Monthly monitoring																												**0**
3	Effectiveness of communication campaign and source segregated drop-off sites	F	Quantity of green waste delivered to drop-off site	**Tonnes of green waste delivered to compost drop-off point.**																														**0**
		G	Number of green waste producers in target area using drop-off facility	**Number of unique users dropping of waste at location**																														**0**
4	Impact of green waste management on the spread of invasive fauna.	H	Incidences (or number) of Giant African Snails in and around drop-off and composting facilities and in final product.	**Number of Giant African Snails counted during monthly inspection**																														**0**
		I	Occurrence of pathogens in final product (pathogen destruction also indicates sufficient condition to kill any plant seeds)	**Salmonella and Faecal coliform test result.**		Not Applicable at Baseline																												**N/A for Baseline**

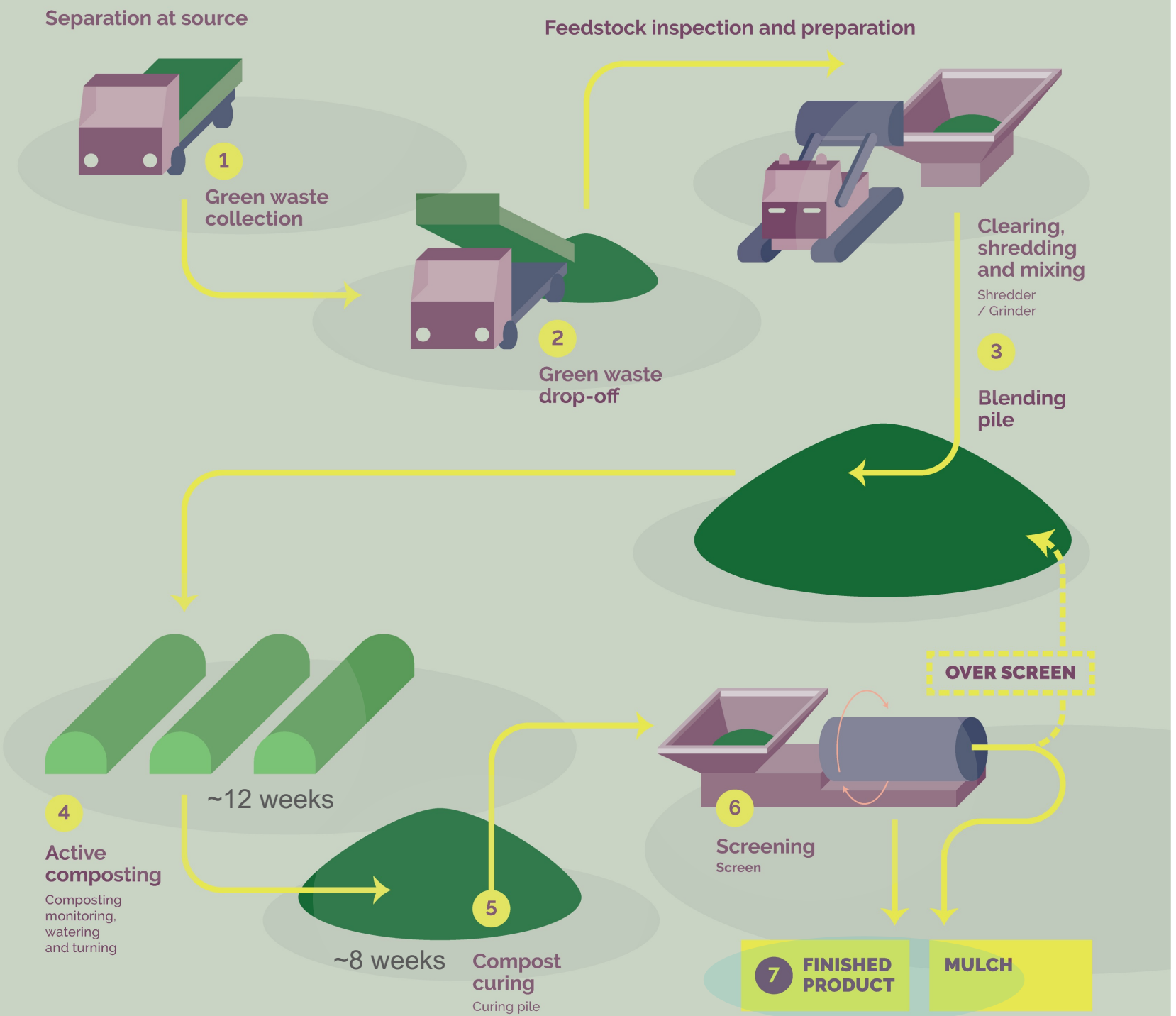
Pilot study Technical Concept

Review of procured items and their application

Source Segregation Pilot – Equipment grant

#	Item	Number of units
1	Composting Documentary Video (filming and editing)	1
2	**Chain Saw (Husqvarna 18 Bar 18")**	2
3	**Compost Thermometers**	3
4	**Water (trash) pump (self-powered petrol)**	1
5	**Water hose (suction pipe)**	10m
6	**Water hose (discharge pipe)**	200m
7	**Water hose spray nozzle and shut-off ball valve**	1
8	**Compost Windrow Geomembrane**	1098m^2 (8 rolls @ 5.5m x 25m)
9	**Static compost / soil sifter / screen**	1
10	**Compost Calculator App**	1 License
11	**Education and behavioural change materials**	1

Windrow composting material flow

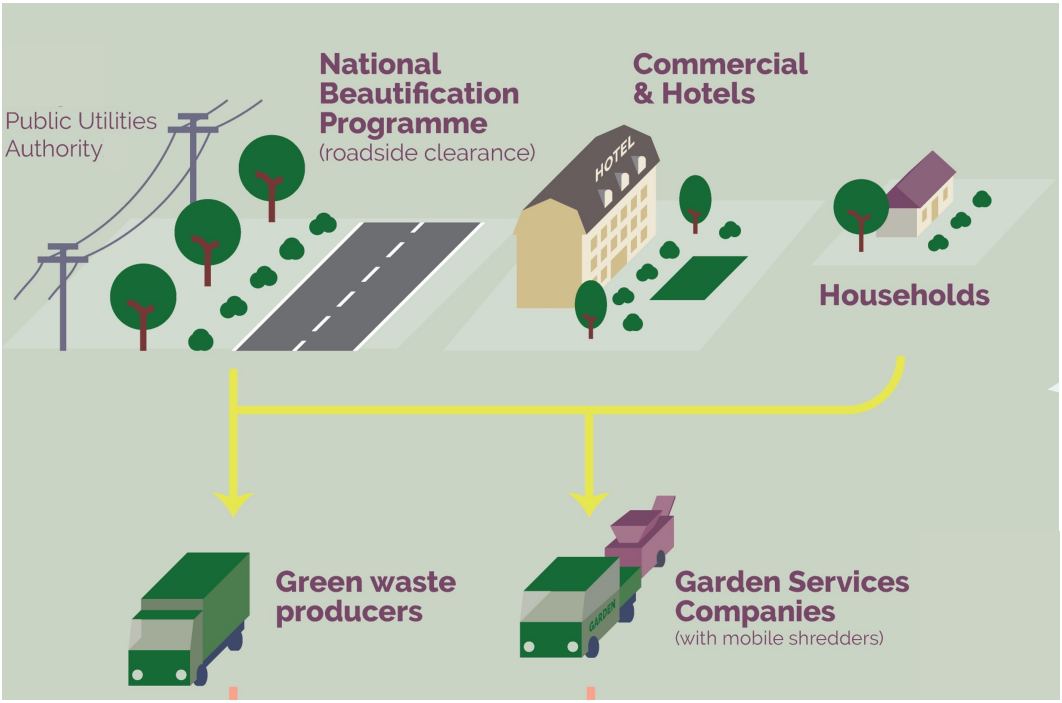


1 - Source Segregation

1 - Source Segregation

KEEPING *[your country]* LOVELY

RECYCLING • REUSING • REDUCING WASTE



BACK

2 - Green waste drop off

To be located in convenient location for waste producers / transporters and for the composting operations.

2 - Green waste drop off

Carbon Rich “Browns”

1. Shredding needed:
Wood, branches, mixed large items

2. Shredding not needed:
Brown leaves, pre-chipped wood / bark,

GREEN WASTE DROP OFF

Nitrogen Rich “Greens”

3. Shredding needed:
Low density new growth branches and leaves

4. Shredding not needed:
Grass, vegetable scraps, fruit/veg waste, manure

BACK

3 – Feedstock inspection and preparation

- Inspecting dropped-off waste for contaminants and removing them
- Size reduce big woody waste
- **Don’t need to shred everything!**

Shredding example

3 – Feedstock inspection and preparation

- Need to collect a mixture of different materials (nitrogen rich green material with carbon rich brown material) to build a pile that will stimulate good biological activity in composting

Summary of optimal composting conditions

Parameter	Composting Phase		
	Active composting	**Curing**	**Product Storage**
Oxygen conc.	13 to 18%		
Free Air Space	40 to 60%		
Particle size	**A mixture of particles between 3 and 50mm**		
C:N Ratio	**25:1 to 30:1**	18:1 to 23:1	15:1 to 20:1
Moisture Content	**55 to 65%**	45 to 55%	40 to 45%
Temperature	55 to 60°C	Less than 50°C	Ambient
pH	6.5 to 8		

High Nitrogen Materials:	**C:N**
Green Grass Clippings	10:1
Coffee Grounds	20:1
Food Wastes	15:1
Cow / horse Manure	20:1
Vegetable residue	25:1

High Carbon Materials:	**C:N**
Leaves and Foliage	40-80:1
Straw	75:1
Wood chips	200:1
Cardboard (shredded)	350:1

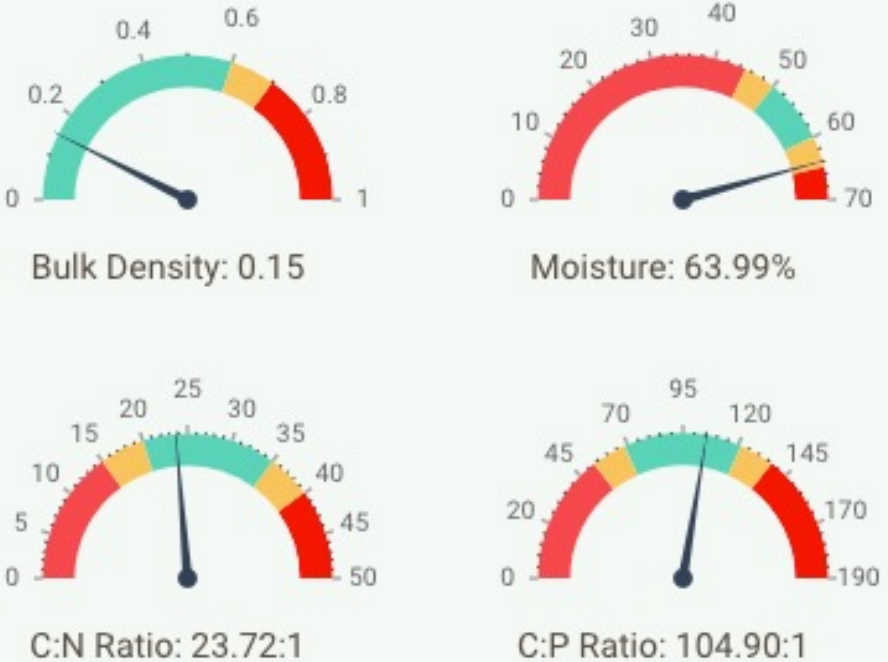
3 – Feedstock inspection and preparation

Compost Calculator

Cooks - Antigua

Feedstocks

	weight (kilogram)
Manure, Poultry	1
Grass Clippings	30
Seaweed	15
Woodchips	24
Tree trimmings	30



Additional resource on recipe development:

https://www.compostingtechnology.com/compost-calculator/

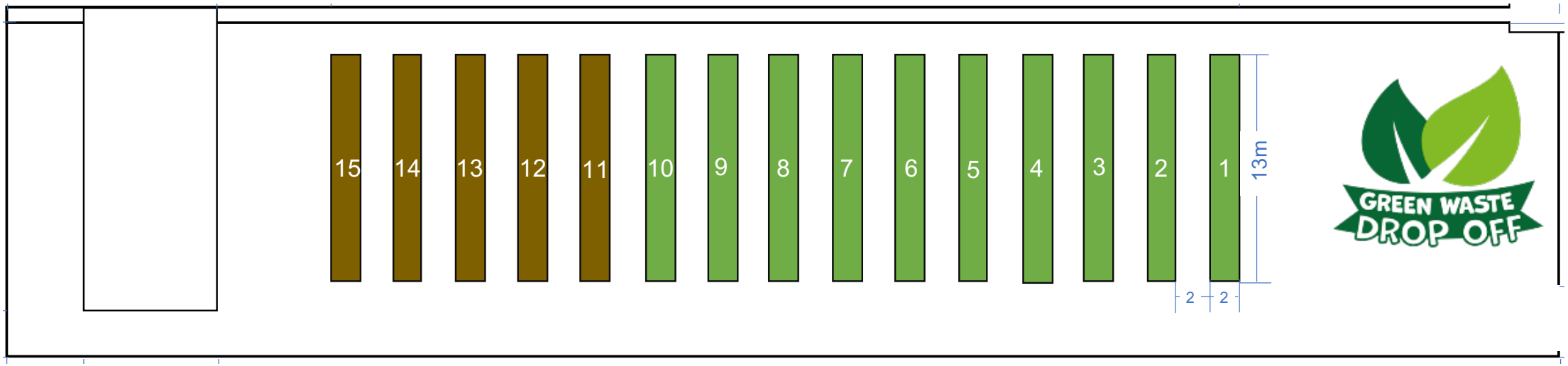
https://vimeo.com/92672795

BACK

4 – Active Composting

Once optimum mix of materials are sourced- load into windrow piles by bucket loader or manually. As compost will be turned by wheeled loader, these piles can be up to 2m heigh by 4m wide if space enables.

4 – Active Composting



4 – Active Composting

Parameter	Composting Phase		
	Active composting	**Curing**	**Product Storage**
Oxygen conc.	**13 to 18%**		
Free Air Space	**40 to 60%**		
Particle size	A mixture of particles between 3 and 50mm		
C:N Ratio	25:1 to 30:1	18:1 to 23:1	15:1 to 20:1
Moisture Content	**55 to 65%**	45 to 55%	40 to 45%
Temperature	**55 to 60°C**	Less than 50°C	Ambient
pH	6.5 to 8		

4 – Active Composting

Temperature of 55°C or greater for at least 15 consecutive days of active composting, turning at least 5 times will kill pathogens and seeds

Compost Pile Monitoring: https://vimeo.com/92671220

Compost Pile Turning: https://vimeo.com/92672239

Full resources: https://www.composttechnicalservices.com/resources

Active Composting - Monitoring & recording

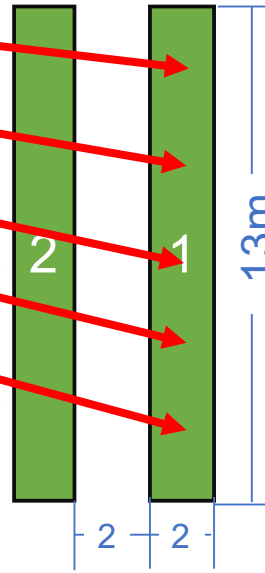
Compost Monitoring Log		
Pile Identification:	Date Pile Built:	Page Number:
Feedstocks and mix proportions:		

Date	Pile Temperature					Air Temp	Moisture content	Odour	Visual	Notes (management, weather, vectors):
	1	2	3	4	5					
	30cm / 90cm	30cm / 90cm	30cm / 90cm	30cm / 90cm	30cm / 90cm					

Active Composting - Monitoring & recording

Compost Monitoring Log		
Pile Identification: 1	Date Pile Built:	Page Number:
Feedstocks and mix proportions:		

Date	Pile Temperature					Air Temp	Moisture content	Odour	Visual	Notes (management, weather, vectors):
	1	2	3	4	5					
	30cm / 90cm	30cm / 90cm	30cm / 90cm	30cm / 90cm	30cm / 90cm					



22

80m

95m

Active Composting - Monitoring

Thermometer and Monitoring Logs are your essential tools!

Monitor temperature, moisture and oxygen levels and adjust:

- if moisture is low (<55%), turn and add water,
- if moisture too high (>65%), turn without adding water.
- Maintain optimum water content using cover and water pumps
- If oxygen is low (<13%), turn,
- if temperature is high (>60°C) or low (<50°C), turn.

Active composting -Moisture content test

Example	Description	Moisture content
	Moisture drips from sample when squeezed (too wet)	>70%
	Moisture seeps slowly through fingers (not dripping but “glistening”)	**65%**
	Sample holds a ball structure without dripping or crumbling. If it falls apart, it’s less than 55% and too dry	**55%**

Source: https://www.composttechnicalservices.com/resources

Active Composting - watering

BACK

5 – Compost Curing

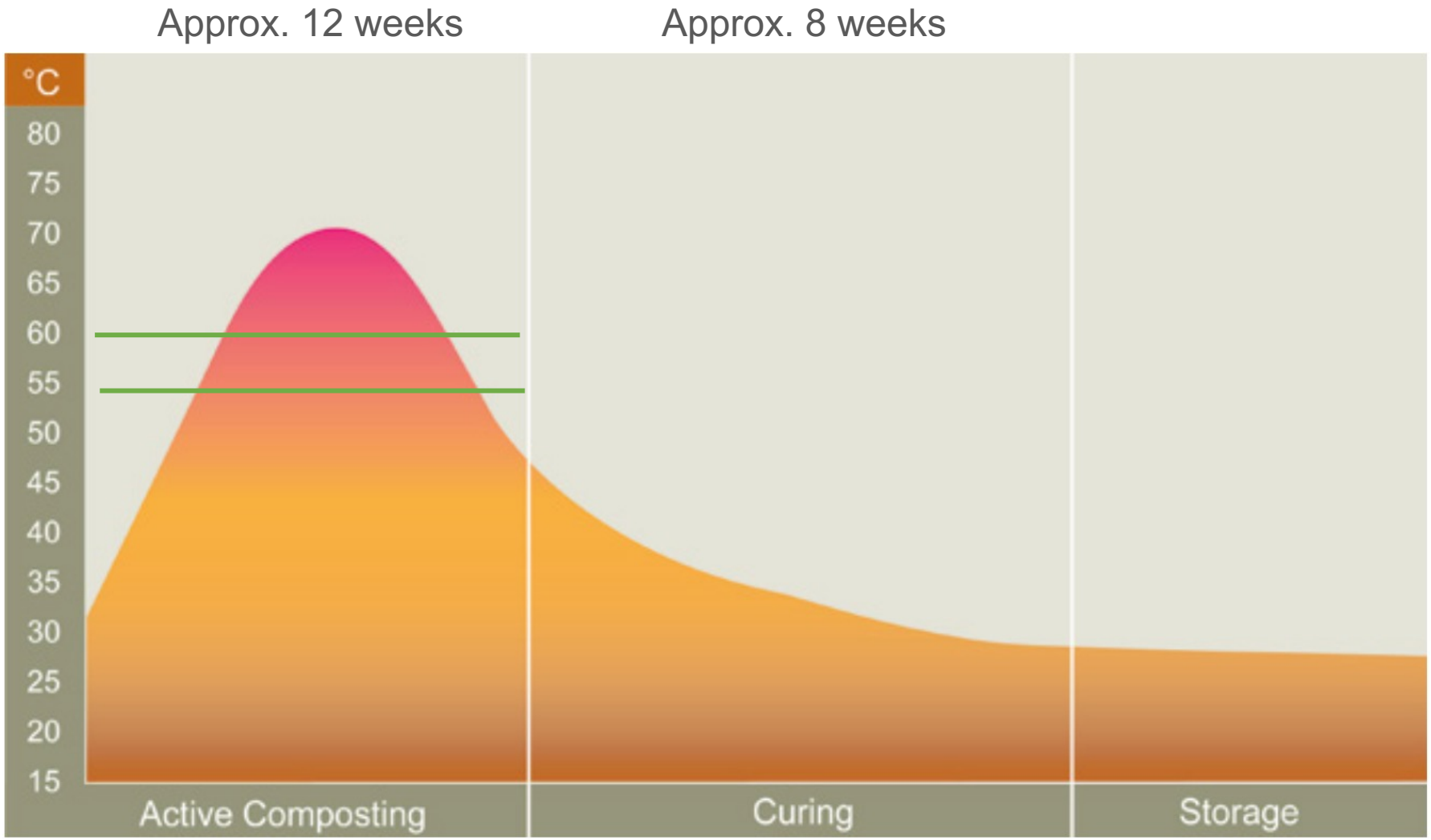
When temperature falls below 55oC and can't be brought back up through turning, and doesn't use up the moisture as fast, the active composting phase is over.

If to be marketed, pile in a larger pile and cover from the elements.

Continue to monitor temperature and moisture. Once internal temperature becomes ambient, the composting is complete.

Don't use too early – the C will take N from the plants / soil to finish composting, starving the plants!

Curing - Typical Temperature Indicators



Source:
https://www.canada.ca/content/dam/eccc/migration/main/gdd-mw/3e8cf6c7-f214-4ba2-a1a3-163978ee9d6e/13-047-id-458-pdf_accessible_ang_r2-reduced-20size.pdf

BACK

6 – Screening

1 – High quality fine compost – for land application

2 – Over screen – return to blending pile to seed microbes into new compost and continue to decompose materials, or use as coarse mulch

Screening – Basic manual screen

BACK

7 – Finished product

Once screened, the product can be marketed as a soil amendment and used by the authority directly, or sold / given back to garden services or other potential outputs once quality tests have been conducted appropriate for the use.

BACK

Personal Protective Equipment

Secure tool and equipment store

Compost Monitoring Log

Pile Identification:	Date Pile Built:	Page Number:

Feedstocks and mix proportions:

Date	Pile Temperature					Air Temp	Moisture content	Odour	Visual	Notes (management, weather, vectors):
	1 30cm / 90cm	2 30cm / 90cm	3 30cm / 90cm	4 30cm / 90cm	5 30cm / 90cm					

Example home scale green waste composting

ELIET
NOR 45
ETO +36 20 942 8898
N-739