



SMART WASTE MANAGEMENT UNIT

PUBLIC PRIVATE PARTNERSHIP (PPP) MODEL

MUNICIPALITY

&

FIRMWARE INFOTECH PVT LTD.

THE IMPACT

ENVIRONMENTAL IMPACT

The single use plastic is believed to take thousands of years to decompose, which leads to soil and water contamination and can pose hazards for land, water, and wildlife. In some cases, the existence of single use plastic in water or food is leading to presence of plastics in human body, and health issues.



ECONOMIC IMPACT

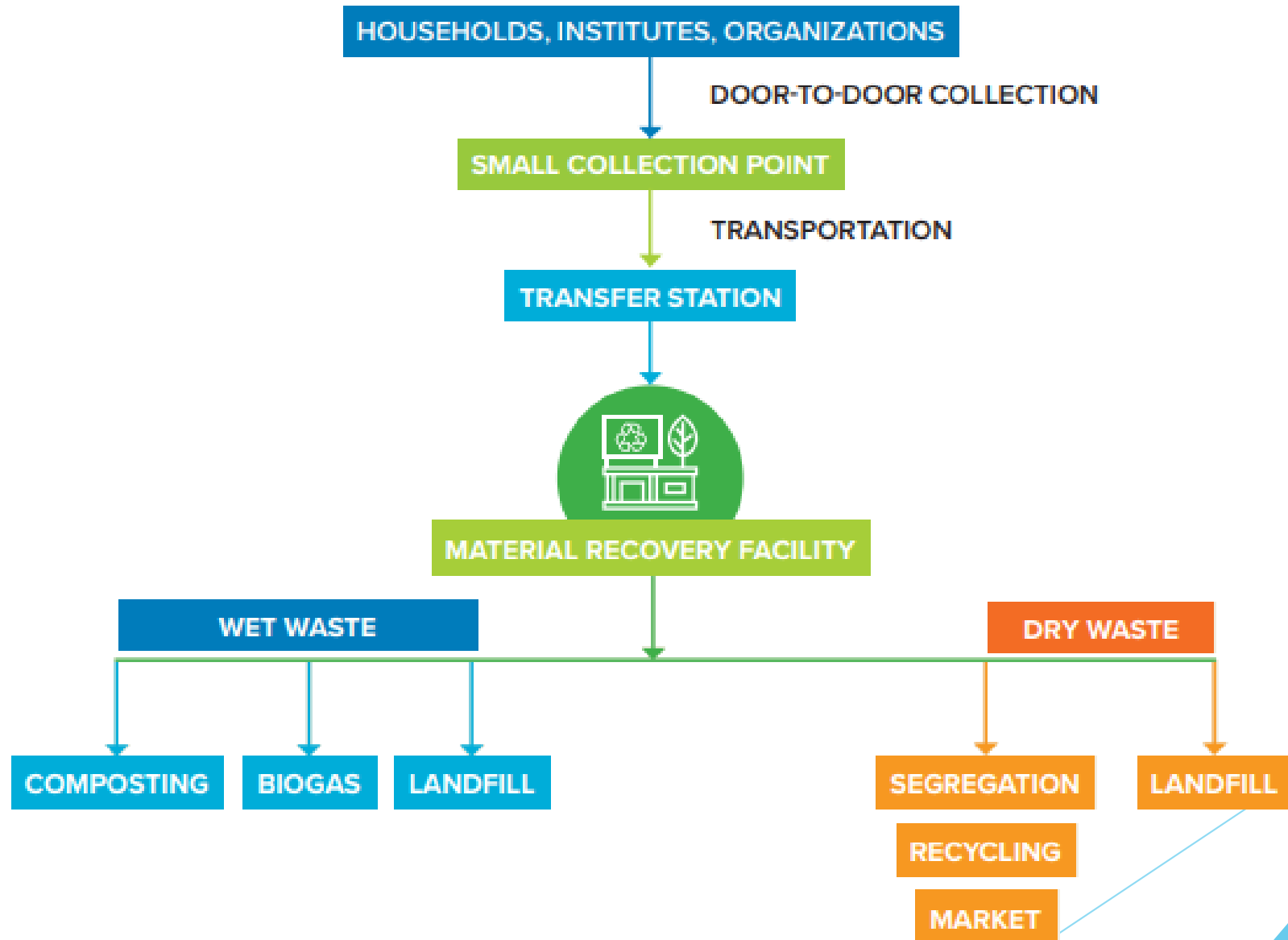
The littering of plastic is visually unattractive and has potential to impact GDP of countries dependent on tourism. The plastic pollution in oceans has economic impact across tourism, shipping, and fishing industries. Other than this sustainable plastic waste management can move plastic from 'waste' to a 'renewable resource'. Plastic pollution costs \$13 billion per year as economic damage to marine ecosystem.

HEALTH AND SOCIAL IMPACT








Instances of open burning of plastic waste leads to air pollution. In some developing countries, plastic is burnt for cooking or heating purposes causing health issues in vulnerable groups such as women, children, and the elderly. The littering at open spaces such as parks lead to welfare losses which accounts as indirect social cost of plastic pollution.










TECHNICAL MODEL



TECHNICAL MODEL

PET	HDPE	PVC	LDPE	PP	PS	OTHER
<p>POLYETHYLENE TEREPHTHALATE</p> <p>Plastic bottles for soft drinks, water, juice, beer</p> <p>Food jars for jelly and jam</p> <p>Microwavable food trays</p>	<p>HIGH DENSITY POLYETHYLENE</p> <p>Bottles for milk, cosmetics, shampoo, household cleaners</p> <p>Cereal box liners, oil bottles</p>	<p>POLYVINYL CHLORIDE</p> <p>Rigid packaging like blister packs</p> <p>Flexible packaging like blood bags, medical tubes,</p> <p>Food wrap, vegetable oil bottles</p>	<p>LOW DENSITY POLYETHYLENE</p> <p>Plastic bags for breads, frozen foods, household garbage</p> <p>Squeezable bottles</p> <p>Coating for paper milk cartons and beverage cups</p>	<p>POLYPROPYLENE</p> <p>Containers for takeout meals</p> <p>Medicine bottles</p> <p>Bottle caps</p> <p>Yogurt containers</p>	<p>POLYSTYRENE</p> <p>Food service items, cups, plates, bowls, cutlery, egg cartons</p>	<p>OTHER</p> <p>10 or 20 liters reusable water cans</p> <p>Custom packaging</p>
						

Plastic Resin Identification Codes

						
PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Polyethylene Terephthalate	High-Density Polyethylene	Polyvinyl Chloride	Low-Density Polyethylene	Polypropylene	Polystyrene	Other

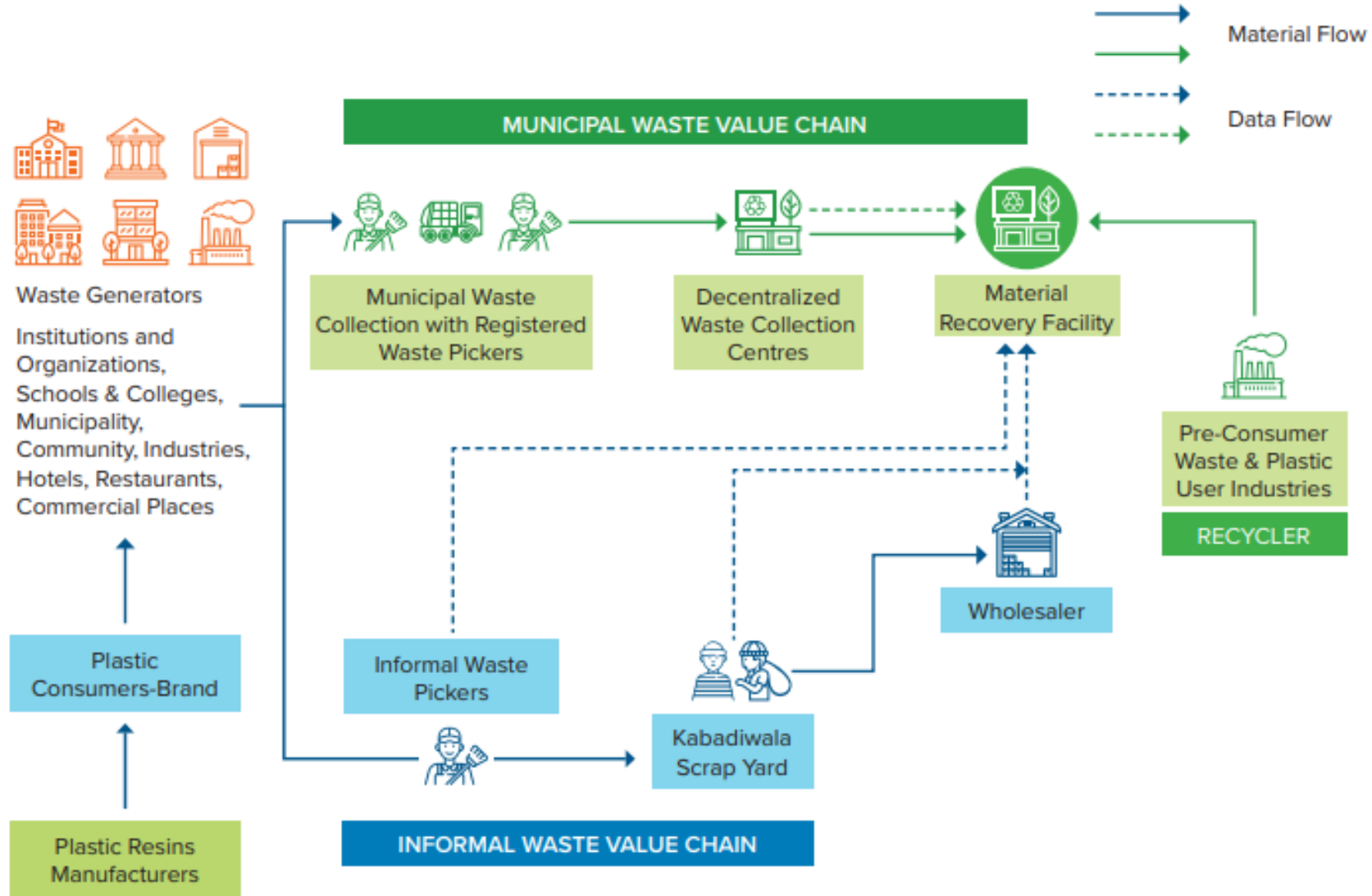


TECHNICAL MODEL

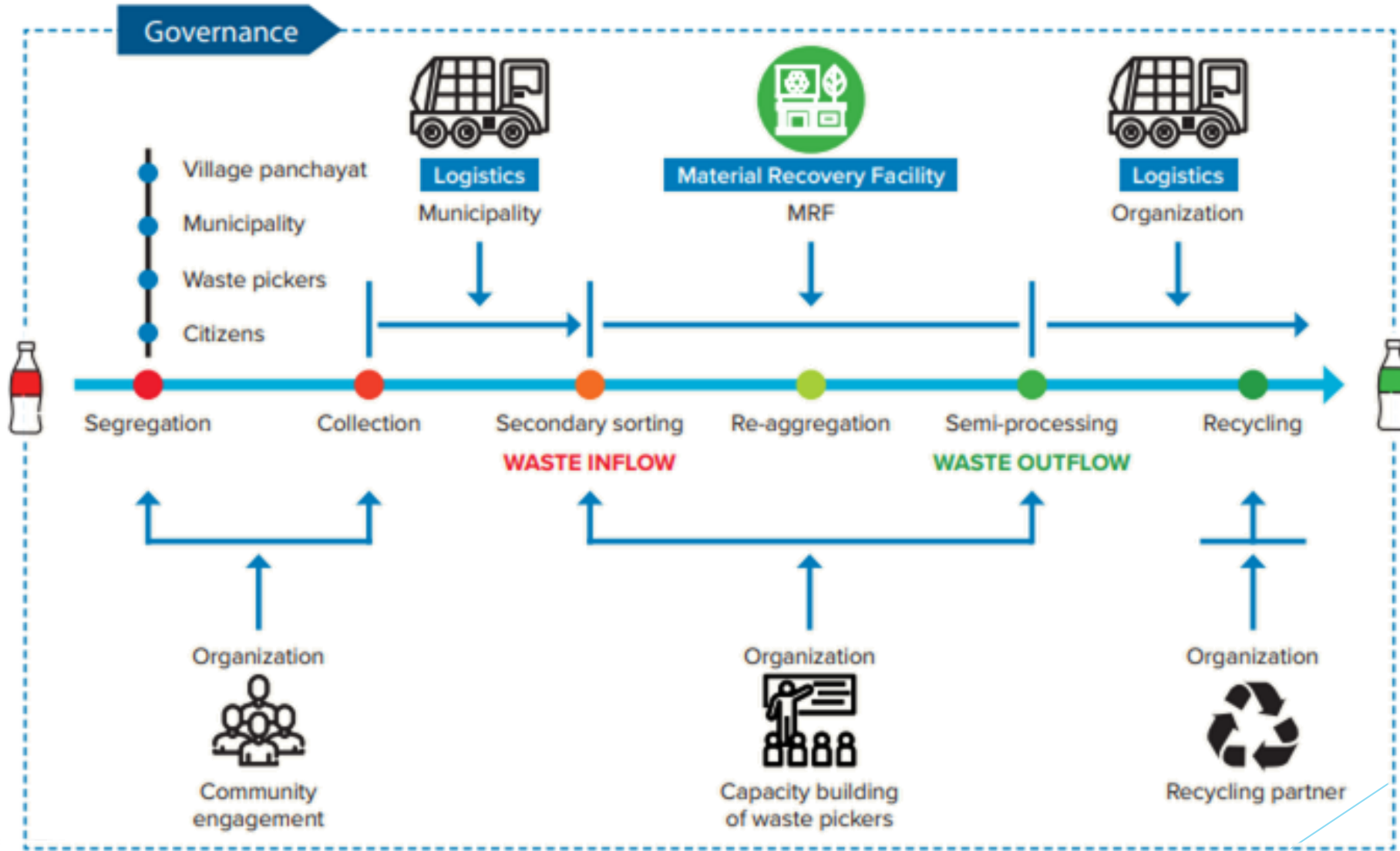


THE PROCESS

MATERIAL RECOVERY FACILITY WASTE ECO-SYSTEM



THE PROCESS



INFLOW & OUTFLOW

- Municipal Collection System
- Dry Waste Collection Centre
- Aggregators (Kabadiwala)
- Independent Waste Pickers
- Bulk Generators (Companies, Hotels, Markets, Shops)
- Pre-consumer Waste and Plastic User Industries
- Religious Places
- Educational Institutes
- Commercial Activities






MATERIAL RECOVERY FACILITY

- Baled PET
- PET recycler to yarns
- Shredded HDPE
- HDPE to Granules
- Shredded LDPE
- Road Laying Composite
- Gatta Material
- Agri-pipe Making Process
- Baled MLP, HDPE, LDPE
- Cement Kilns
- Co-processing
- Rejects
- Safe Disposal to Landfill
- Other Dry Waste
- Connect to Appropriate Recyclers



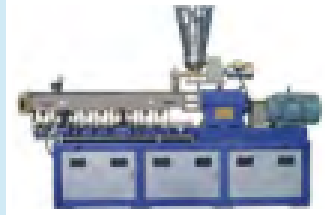
PROPOSED INFRASTRUCTURE

Equipment	Uses
Conveyor Belt 	A conveyor belt eases the process of segregation and reduces workload for waste pickers.
Air Blower 	An air blower is used to dry clean thin plastic/MLPs by removing dust and moisture. Air is blown through a channel to separate the dirty material and remove dust and moisture from the waste.
Shredder 	Dry and dust-free thin plastic is shredded into 2–4 mm flakes. These shredders tear up the plastic into small pieces/flakes, preparing them for recycling into other products.



PROPOSED INFRASTRUCTURE

Agglomeration and Extrusion



The material is agglomerated with frictional heat within a fraction of a second, right below the melting point, and this is a process of surface fusing. Valuable lightweight fused plastic particles are produced with minimum heat and thermo-degradable damage.

Fused plastic produced from the agglomeration stage is fed through the feed hopper into the barrel of the extruder. The material is gradually melted by the heaters arranged along the barrel and is pushed forward by a mechanical screw inside the barrel. The molten polymer is collected as a lump, cooled and stored.

Bailing Machine



A baling machine is used to compress high volumes of plastic waste/PET bottles into rectangular bales, which helps bind them. Bales are easy and safe to transport.

Weighing Machine



This is a platform weighing scale with a built-in thermal printer and an auto print facility. This means that this machine will provide a slip after weighing the waste with the details fed by the operators (e.g., operator's name/seller's name/product name along with the details of rate and cost).



PROJECT EXECUTION PLAN

THE PROCESS

PROCESS	DETAILS	OWNERSHIP
Collection & Distribution	<p>The first step is the collection of post-consumer materials from homes, businesses, and institutions. This will be done by the Municipality.</p> <p>Another option is taking plastics to communal collection points such as designated recycling bins or facilities. This may be as simple as a bottle bank on a street corner or as complex as a local waste site with large areas for various recyclable and non-recyclable municipal solid waste (MSW).</p>	Municipality
Sorting & Categorizing	<p>The next step in the plastic recycling process is sorting. There are several different types of plastic (see below), which need to be separated from each other by recyclers. Further to that, plastics might be sorted by other properties such as color, thickness, and use. This is done by machines at the recycling plant and is an important step to increase the efficiency of plants and avoid the contamination of end products.</p>	Municipality
Washing	<p>Washing is a crucial step in the plastic recycling process since it removes some of the impurities that can impede the operation, or completely ruin a batch of recycled plastic. The impurities targeted in this step commonly include things such as product labels and adhesives as well as dirt and food residue. While plastic is often washed at this stage, it is important to remember that this doesn't take away from the importance of ensuring plastics are as free from impurities as possible before disposal and collection.</p>	Service Provider
Shredding	<p>The plastic is then fed into shredders, which break it down into much smaller pieces. These smaller pieces, unlike formed plastic products, can be processed in the next stages for reuse. Additionally, the resized plastic pieces can be used for other applications without further processing, such as an additive within asphalt or simply sold as a raw material.</p> <p>Breaking down the plastic into smaller pieces also allows for any remaining impurities to be found. This is especially true of contaminants such as metal, which may not have been removed by washing but can be easily collected with a magnet at this stage.</p>	Service Provider



PROJECT EXECUTION PLAN

THE PROCESS

PROCESS	DETAILS	OWNERSHIP
Identification and separation of plastics	Here, the plastic pieces are tested for their class and quality. First, they are segregated based on density, which is tested by floating the particles of plastic in a container of water. This is followed by a test for what is known as the “air classification”, which determines the thickness of the plastic pieces. It is done by placing the shredded plastic into a wind tunnel, with thinner pieces floating while larger/thicker pieces stay at the bottom.	Service Provider
Extruding & compounding	This final plastic recycling process step is where the particles of shredded plastic are transformed into a usable product for manufactures. The shredded plastic is melted and crushed together to form pellets. It is worth noting that it is not always possible to compound all types, classification, and qualities of plastic at a single plant, so different grades of plastic are sometimes sent to other recycling facilities for this final step.	Service Provider



PROPOSED PPP MODEL

COMPONENTS	DETAILS	RESPONSIBILITY
LAND	Approx 3000 Sq. Ft of Land with Boundary and Gate to be provided by Municipality on Lease of min 10 Years.	Municipality
BUILDING & SHED	Permanent Sheds to be build by the Agency on the leased land with complete ownership.	Agency
ELECTRICITY	Electricity Connection to be provided by the Municipality and the Consumption Charges to be paid by the Agency	Municipality
EQUIPMENTS	Required Equipment to be installed by the Agency on the leased land with complete ownership.	Agency
SEGREGATED PLASTIC WASTE	Waste Collection and Delivery of the segregated plastics will be the responsibility of the Municipality.	Municipality
WASTE PROCESSING	The entire processing of the Segregated Plastic Waste will be the sole responsibility of the Agency.	Agency
BYE PRODUCT	The Profit Margin of the Bye Product after deduction of all the recurring cost will be shared between Municipality & Agency on the agreed Percentage.	Municipality & Agency



PROPOSED MILESTONE

ACTIVITY	MILESTONE (M=MONTH)				
	M1	M2	M3	M4	M5
Lease Agreement	■				
Land Handover	■				
Construction of Shed		■	■		
Installation of Equipment			■	■	
Production					■

