A GUIDE FOR PRODUCT MANUFACTURERS INTENDING TO USE BIODEGRADABLE PACKAGING

UCL Plastic Waste Innovation Hub

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1.1 ABOUT THIS GUIDE

Biodegradables have a reputation of being good for the environment; however, there is little evidence for this, and there is a growing risk of moral hazard if the sector is not reformed. The use of biodegradable plastics can divert organisations from adopting more environmentally beneficial approaches to packaging such as designing for reduction, recycling, and reuse.

This guide is aimed at addressing the current questions and concerns from manufacturers and citizens about the manufacture, use, and disposal of biodegradable and compostable plastics. It contains an overview of the shortfalls in current UK infrastructure for biodegradable plastics disposal, collection, and processing, and summarises what steps would need to be taken to create a viable future biodegradables infrastructure in the UK.

Images
Big Compost Experiment citizen science composting experiments with biodegradable plastic packaging

1.2 WHAT ARE BIODEGRADABLE & COMPOSTABLE PLASTICS?

Biodegradable plastics are plastics that can be broken down into water, biomass, and gases such as carbon dioxide and methane. Biodegradability depends on environmental conditions such as temperature, humidity, the microorganisms present, and oxygen.

Compostable materials are a subset of biodegradable plastics that break down safely into water, biomass, and gases under favourable conditions. Industrial composting conditions are the most optimal: temperatures of 60–70°C, high humidity, and oxygen. Materials that break down in industrial composters may not break down under home composting conditions.

Not all bio-based plastics are biodegradable, and not all biodegradable plastics are bio-based. Bio-based plastics are made using polymers derived from plant-based sources such as starch, cellulose, or lignin. Bio-based plastics can be engineered to become biodegradable; equally, they can be made to function like conventional fossil-based plastics.

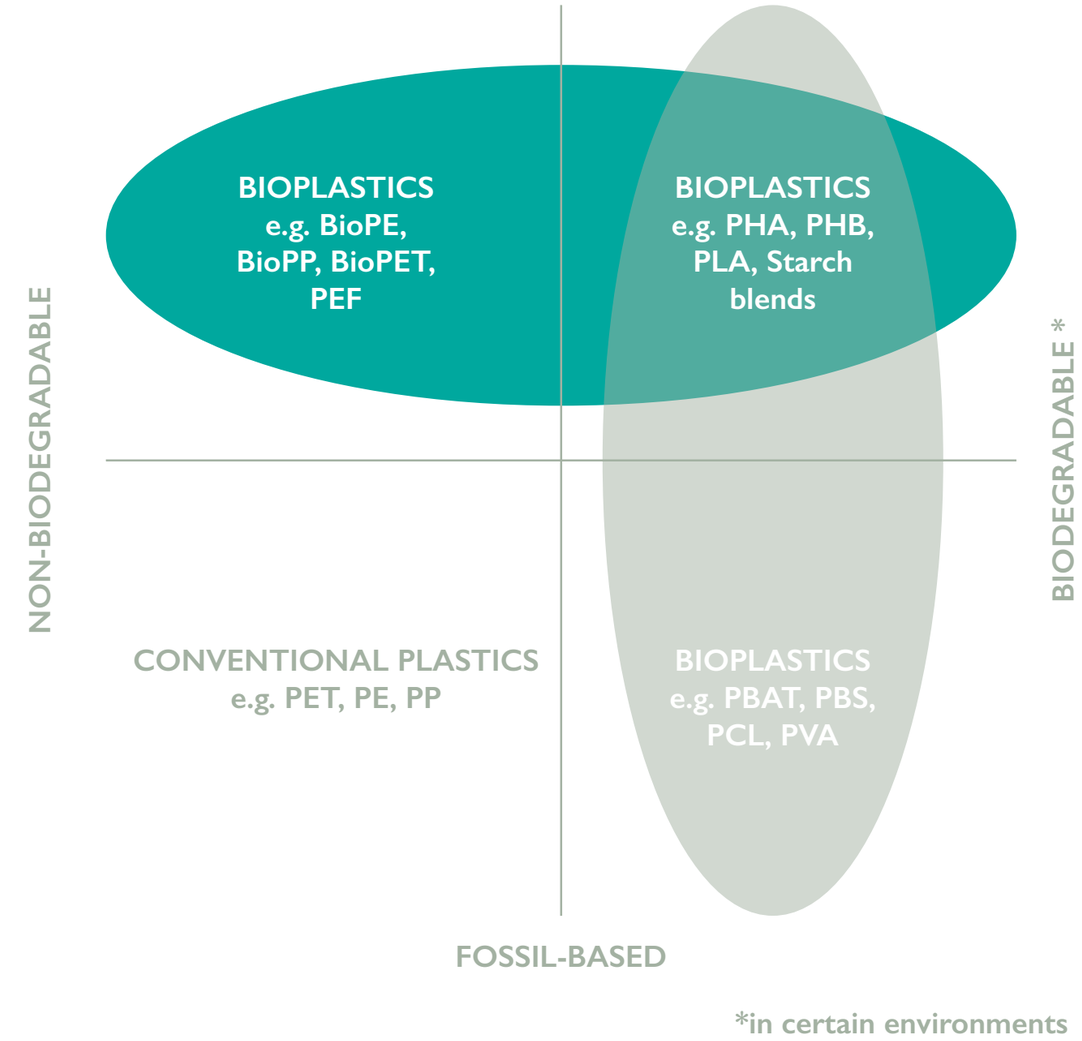


Image
Source: Eunomia (2018). Adapted from EPA, *Bio-based and Biodegradable Plastics in Denmark* (2020)

BioPE = Biomass derived Polyethylene
BioPP = Biomass derived Polypropylene
BioPET = Biomass derived Polyethylene terephthalate
PEF = Polyethylene Furanoate
PHA = Polyhydroxyalkanoate
PHB = Polyhydroxybutyrate
PLA = Polylactic acid
PBAT = Polybutylene adipate terephthalate
PBS = Polybutylene succinate
PCL = Polycaprolactone
PVA = Polyvinyl alcohol

1.3 WHAT ARE OXO-DEGRADABLE PLASTICS?

Oxo-degradable plastics are conventional polymers with chemical additives that accelerate the oxidation and fragmentation of the material under the action of UV light and/or heat and oxygen.

These materials are often marketed as a solution to plastic pollution and can be referred to using a range of confusing terminology, including 'oxo-biodegradable', 'photo/thermo-degradable', 'oxo-fragmentable' or 'pro-oxidant additive containing plastics'.

There is growing evidence that oxo-degradable plastics are not a solution to plastic packaging pollution, and that they are not suited for effective long-term reuse, recycling or composting. Evidence suggests that these materials contribute to microplastic pollution and increased environmental risk, and negatively impact existing waste infrastructures.

- Oxo-degradable plastic packaging is not designed for long-term durability and is therefore not suited for long-term reuse.
- Oxo-degradable plastics negatively affect the quality and economic value of plastic recyclates. These materials cannot be detected by current sorting technology sufficiently to be separated from conventional plastics, causing recylate contamination. Addition of stabilising additives to recyclate can help mitigate oxo-degradable chemical additive contamination. However, this is not a long term solution.
- Oxo-degradable plastics do not fulfill the requirements of international standards for plastic packaging and plastics recovery through composting, such as ISO18606, EN13432, ASTM D6400, AS4736 or GreenPla, as their biodegradation takes too long, and plastic fragments can remain in the compost. Oxo-degradable plastic packaging is not suitable to be processed via organic waste processing streams and is ultimately disposed of in landfill or incineration, therefore defeating its purpose.[1]

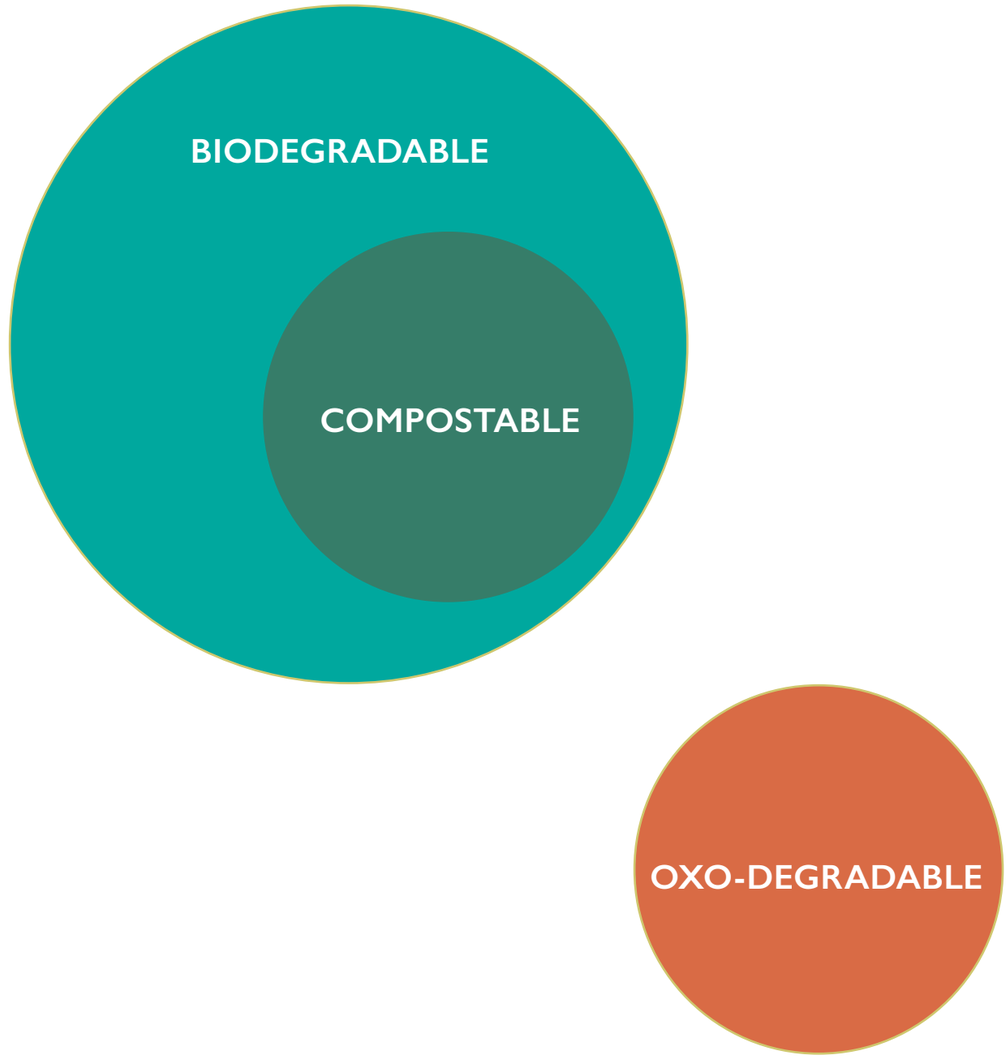


Image
Source: Adapted from Green Dot Bioplastics, *Note on oxo-degradable plastics* (2020).

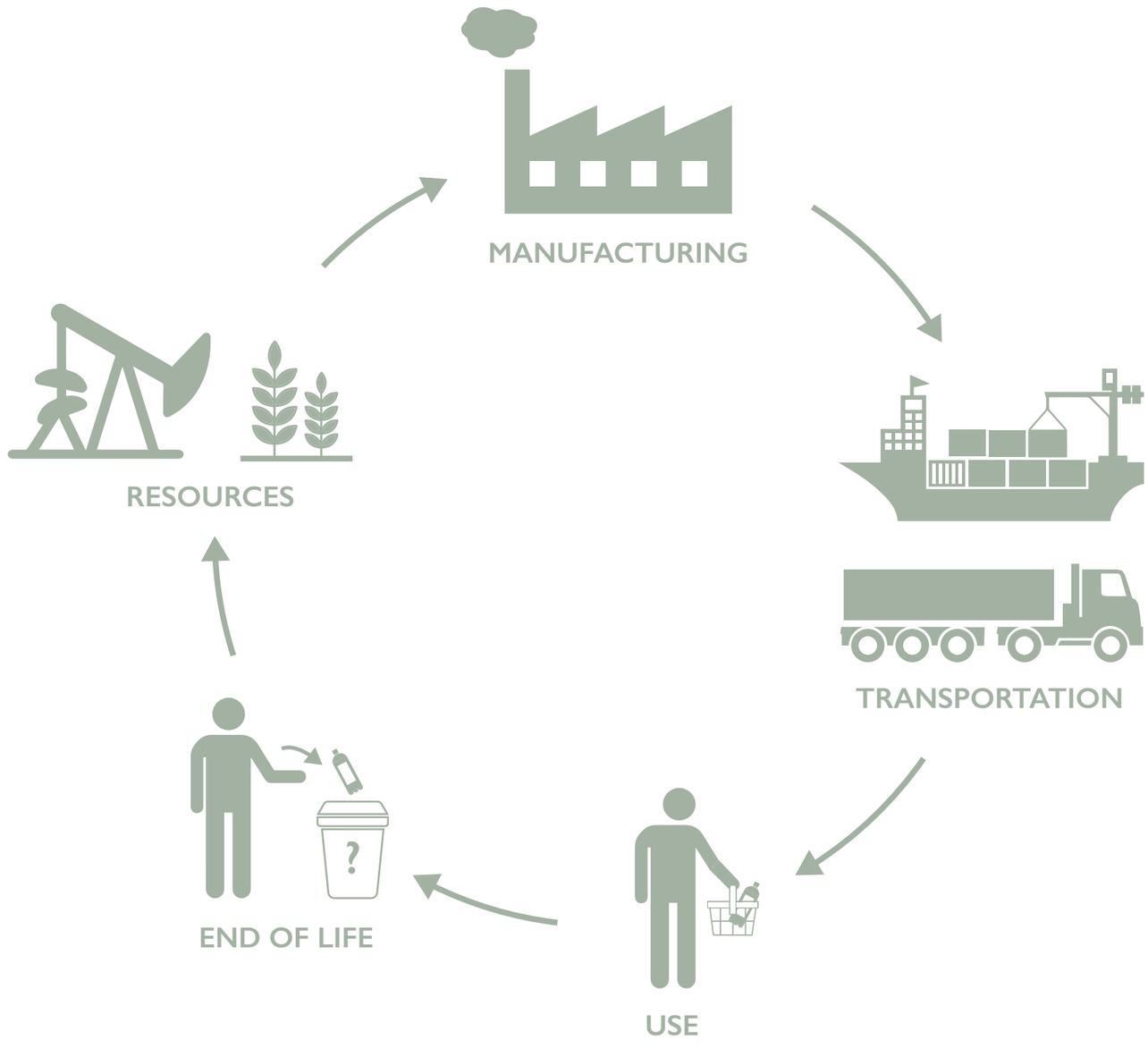
1. Ellen Macarthur Foundation (2018). *Oxo Statement.*

1.4 LIFE CYCLE THINKING

It is important to consider the whole life cycle environmental impacts of compostable plastics in order to assess their suitability for use.

Manufacturers can help environmentally by engaging with ‘life cycle’ thinking, in order to make better manufacturing choices to reduce waste and pollution, promote reduction/reuse/repair of products and materials, and design products and materials that can be recycled or composted.

Life Cycle Assessment (LCA) is a scientific methodology for assessing environmental impacts and/or costs associated with all the stages of the life cycle of a product, process, or service. By engaging with LCA manufacturers can make better material/product selections that help reduce climate impact and environmental pollution.



1.5 LIFE CYCLE IMPACTS OF COMPOSTABLE PLASTICS

- In most circumstances, the use of plant based feedstock has greater environmental impact on: soil acidification, ecotoxicity, eutrophication, and ozone depletion production. Therefore, the choice of replacing conventional plastics with bio-based plastics depends on which environmental impact category is of most concern. This will depend on the local environment in which processes are to be carried out, in order to determine which environmental impacts should be minimised.

- Compostable products such as packaging, cutlery, and containers can exhibit higher Global Warming Potential (GWP) than conventional plastics, even when taking into account their CO2 sequestration. This is because conventional plastics are optimised for their material properties, such as strength, therefore reducing overall volume and weight of material (reducing tranportation energy use) and requiring less production activites (reducing power consumption), equating to a lower GWP than compostable alternatives.

- LCA studies show that mechanical recycling of plastic (as an end-of-life option) has a lower Global Warming Potential than biodegradation. This is because recycling plastic has a lower GWP than manufacturing new plastic. When analyses consider the amount of greenhouse gas emissions that are avoided due to recycling, the net GWP associated with a product is lowered.

- Most compostable plastics require industrial composting to biodegrade. As with plastics collected for recycling, transport and energy are required for biodegradables' waste management, which results in additional CO2 emissions. Compostable plastics exposed to home composting conditions may not biodegrade properly within composting timeframes (see Citizen Science: Big Compost Experiment research for details).

- Biodegradability and compostability are dependent on environmental conditions; compostable plastics may behave like conventional plastics in uncontrolled environments (i.e. marine, soil) and simply fragment. Recent studies have shown that both conventional and biodegradable microplastics are harmful to the health and behaviour of small organisms such as earthworms and various marine organisms. In addition, because all plastics require additives to support their material functionality, it is uncertain whether their harmful effects are due to the additives or polymers themselves.

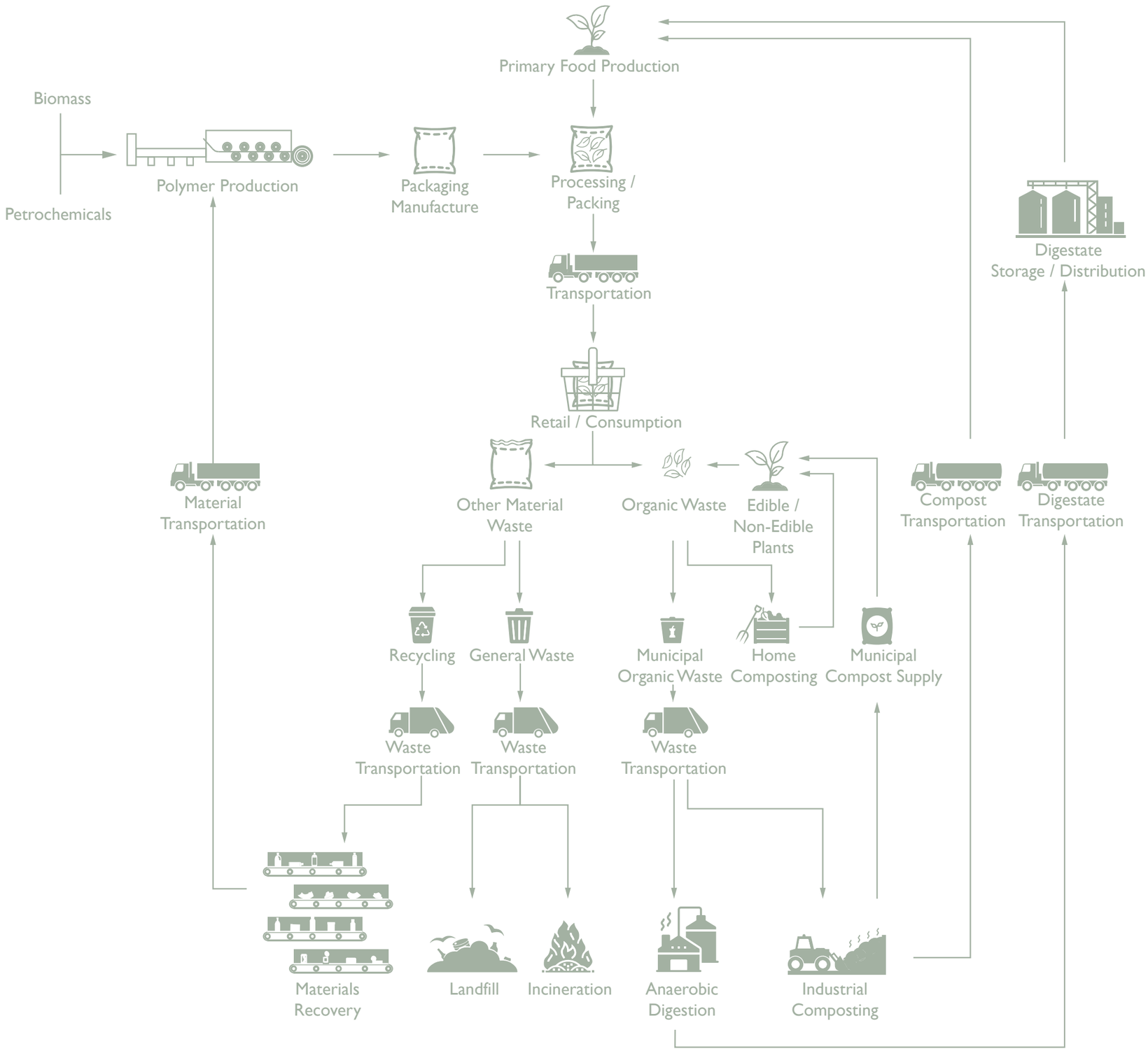
For details see *Biodegradable plastics: An assessment of their role in the plastic waste crisis.* Available at https://www.plasticwastehub.org.uk/news/plastic-waste-hub-submits-report-on-biodegradable-plastics-to-uk-governments-consultation

1.6 UK WASTE PROCESSING INFRASTRUCTURE

There are several waste systems currently used in the UK. Mixed recycling is generally transported to materials recovery facilities (MRFs) where materials are separated and sorted for processing and recycling through machine or human sorting.

Organic waste is generally processed by Anearobic Digestor (AD) or Industrial Composting (In-Vessel or Open Windrow) where it is composted under controlled conditions. According to WRAP Local Authority Collection Data (2019) around 62% of UK households have access to separate food waste collection, 82% have access to organics waste collection.[1] Organic waste can also be processed privately using a variety of small scale home composting methods. Around 1 in 3 households with access to a garden use home composting.[2]

General waste and contamination from other waste streams is generally transported to either landfill or incineration.



1 https://laportal.wrap.org.uk/

2 DEFRA (2009) *WR1204 Household Waste Evidence Review- A report for Defra L3 m3-5 (T) Attitudes and behaviour- home composting* [Online]. Available at randd.defra.gov.uk (Accessed 1 April 2020)

1.7 INFRASTRUCTURE ISSUES

Currently waste disposal of compostable plastics assumes the use of industrial and home composting, and places significant responsibility on citizens to correctly identify biodegradable or compostable materials and to dispose of them correctly according to manufacturer guidelines.

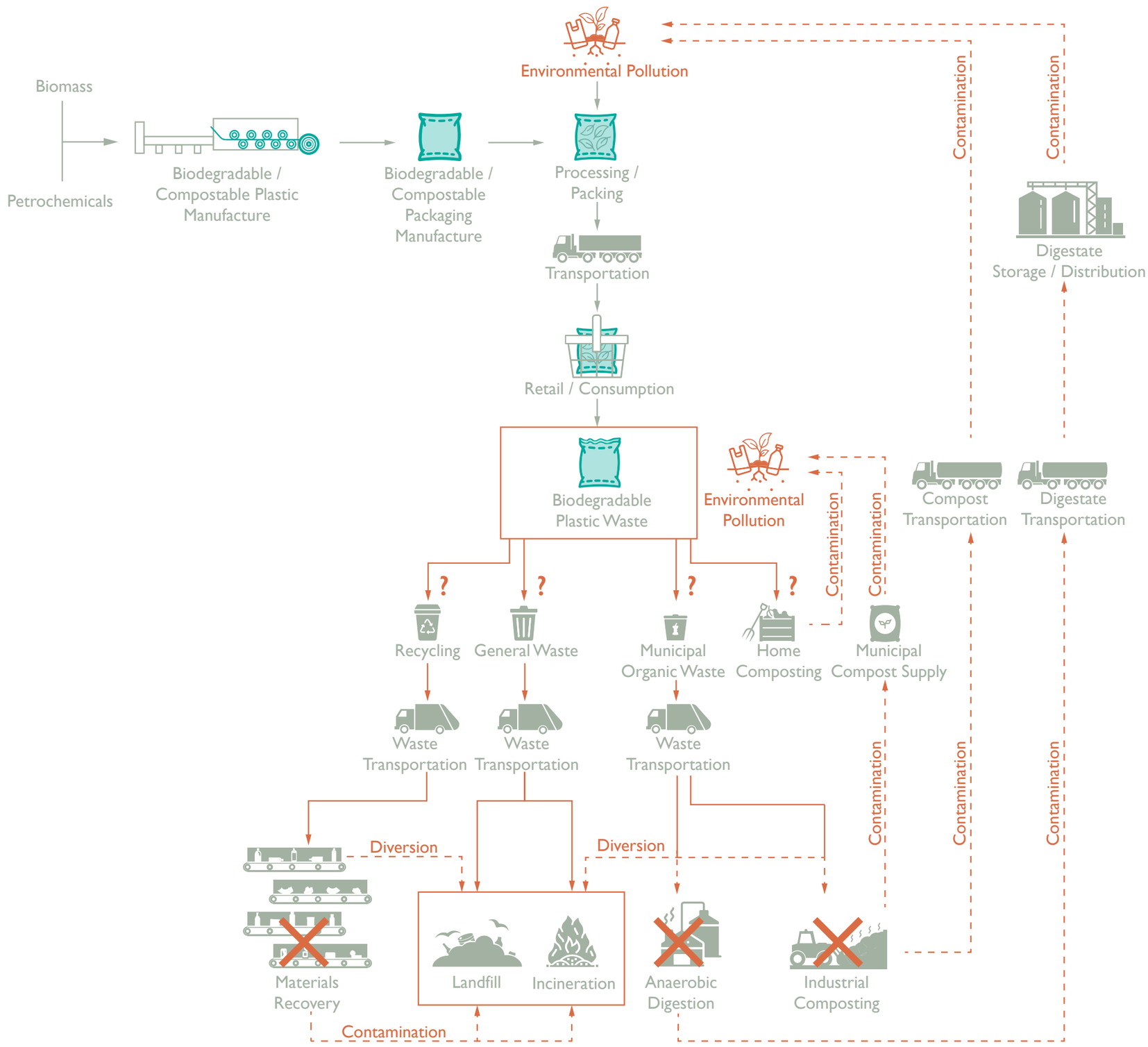
- Currently no UK-wide system for the collection and processing of compostable plastics.

- Insufficient instructions and labelling to indicate what citizens should do with them; most biodegradable plastics are burnt, or thrown in landfill, which defeats their purpose.

- If introduced into food waste collection, they are mostly rejected because anearobic digesters and industrial composting processes are not optimised to process them.

- There is confusion over whether biodegradable plastics can be put into domestic compost and whether they even compost in a reasonable timescale.

- Risk of environmental contamination as these materials are not processed sufficiently in existing waste systems.



1.8 ENVIRONMENTAL CONSEQUENCES

Studies show that compostable plastics often survive intact in the environment for years, or, depending on their composition, release harmful microplastics and other substances into the environment.

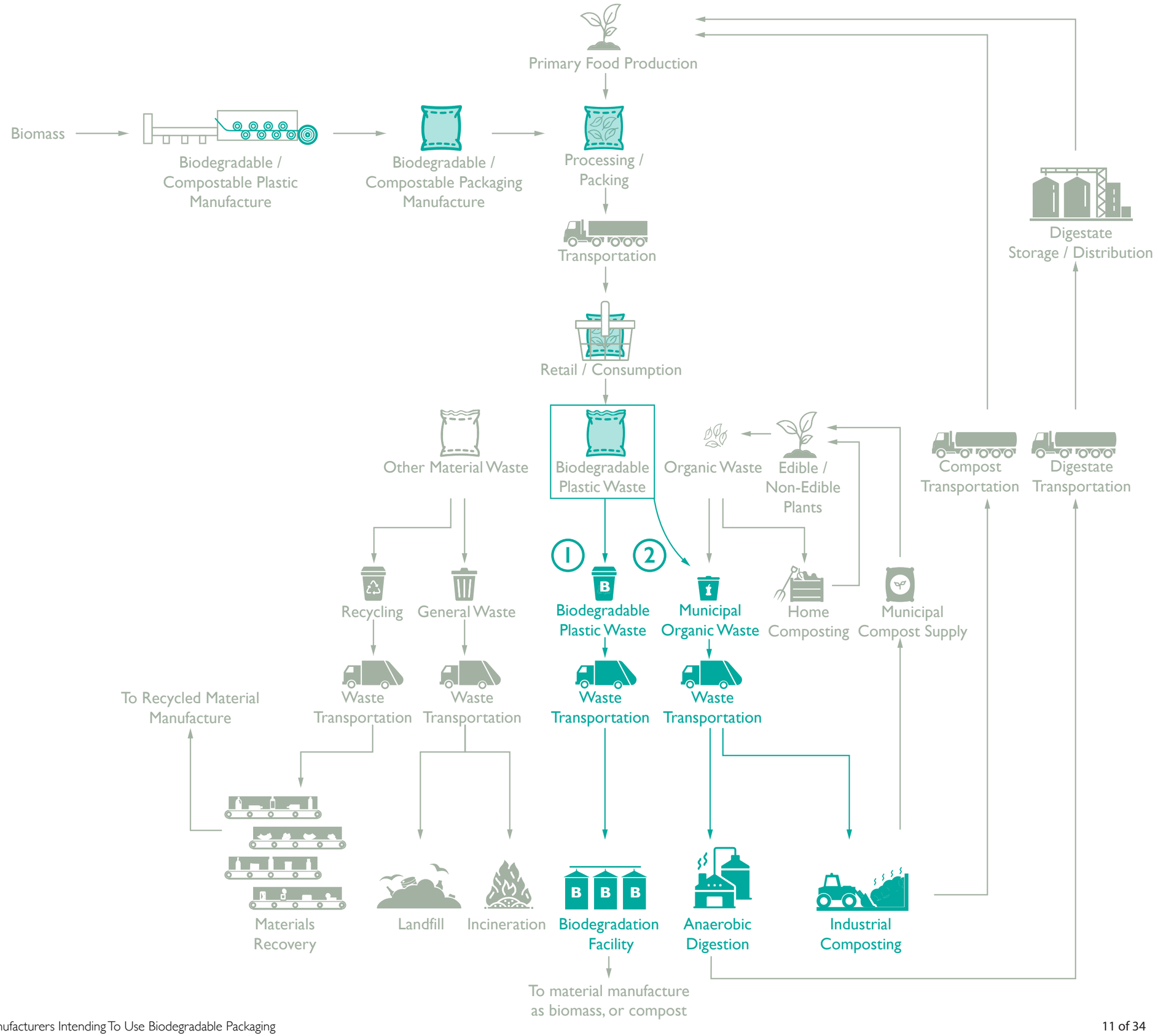
The danger of the growth of the biodegradables sector is that proportionally more biodegradables will end up in the environment, or contaminating recycling systems, to the detriment of both the environment and the recycling sector.

Images
Big Compost Experiment citizen science composting experiments with biodegradable plastic packaging

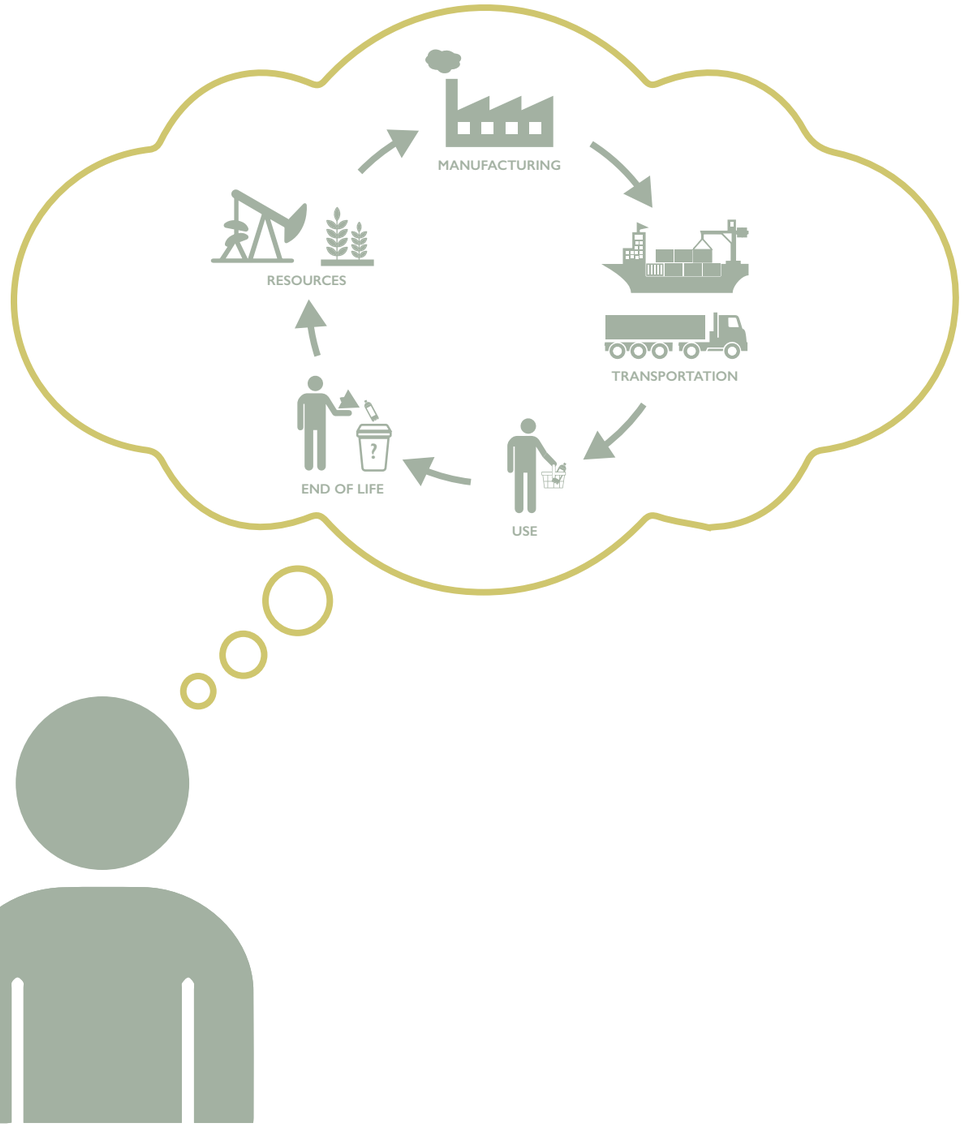
1.9 A FUTURE FOR BIODEGRADABLE PLASTICS?

Biodegradable plastics could be part of a sustainable UK packaging system, but only with strong government intervention and the development of technical solutions and financial incentives that make them part of a biodegradable plastic circular economy. This would require:

- Regulation, testing, and labelling of biodegradable plastics.
- A new automated method of sorting biodegradable plastics from non-biodegradable plastics.
- A UK-wide system of industrial composters for biodegradable plastics.
- A UK-wide system of collection for biodegradable plastics.
- A set of PRN taxes that give biodegradable plastics value as they travel through the biomass circular economy.
- A public campaign that makes it clear how citizens can dispose of biodegradable plastics.



1.10 CONSIDERATIONS FOR MANUFACTURERS



Key considerations for manufacturers are;

- Use LCA whole life cycle approach to assessing the environmental impact of material and packaging choices.
- Prioritise reduction, reuse, and recycling when considering alternative material or packaging choices.
- Consider using material or packaging choices which have established UK recycling systems.
- Consider recycling viability trials to etablish the end-of-life recyclability of material and packaging choices.

COMPOSTABLE PLASTICS EXPLAINED

2.1 GLOSSARY

ANAEROBIC DIGESTION is a series of processes by which microorganisms break down biodegradable material in the absence of oxygen. Such processes are used for industrial or domestic purposes to manage waste, or to produce fuel (methane also known as biogas), and compost.

BIODEGRADABLE PLASTIC can be broken down into water, biomass, and gases such as carbon dioxide and methane. Biodegradability depends on environmental conditions such as temperature, humidity, the presence of oxygen, and microorganisms.

BIOGASIFICATION is an industrial process whereby biomass is converted into biogas, which can then be used as fuel.

BIOPLASTICS is a rather confusing term that encompasses a range of different materials that are either bio-based, biodegradable, or both. Bio-based bioplastics are made using polymers derived from plant-based or microorganism sources such as starch, cellulose, lignin, or polylactate. Biobased bioplastics can be engineered to be biodegradable; equally they can be engineered to be chemically identical to petroleum-based plastics such as non-biodegradable polyethylene.

CARBON SEQUESTRATION is the removal and storage of carbon dioxide from the atmosphere by natural or artificial processes.

COMPOSTBLE MATERIALS are a subset of biodegradable plastics that break down safely into water, biomass, and gases under composting conditions. Industrial composting conditions are the most favourable: temperatures of 60-70 °C, high humidity, and oxygen. Materials that break down in industrial composters may not break down under home composting conditions.

END-OF-LIFE is a term used to indicate the stage of a product, process, or system when it is disposed of and/or recycled.

GLOBAL WARMING POTENTIAL (GWP) is a measure of greenhouse gas emissions in terms of their potential to trap heat in the earth's atmosphere, relative to carbon dioxide, in a specific time horizon.

HOME COMPOSTING is a general term for the process by which biodegradable garden waste or domestic food waste is collected and placed in either a container or heap to allow natural processes to turn it into compost. It is a manual process whereby the composition and process temperatures remain largely unregulated. Both aerobic and anaerobic conditions can occur in home composting, although aerobic conditions are more normal. The time frame for home composting depends on personal preference and the use to which the compost is put, but 3-12 months is typical.

INDUSTRIAL COMPOSTING is a controlled biotechnological process for transforming biodegradable waste of biological origin into stable, sanitised products to be used in agriculture. It generally describes a series of methods that confine the composting materials within a building, container, or vessel. In-vessel composting systems consist of metal or plastic tanks, or concrete bunkers in which airflow and temperature can be controlled, following the principles of a "bioreactor". Generally, air is metered in via buried tubes that enable it to be injected under pressure, the exhaust is extracted through a biofilter, and the temperature and moisture conditions are monitored using probes in the mass that allow for the maintenance of optimum aerobic decomposition conditions.

LIFE CYCLE ASSESSMENT (LCA) is an environmental assessment methodology used to analyse the environmental impacts associated with resource utilisation and emissions at each stage of a product, process, or system's life cycle.

NEAR-INFRARED TECHNOLOGY is the use of the near-infrared light that is invisible to the human eye. Near-infrared emitters and detectors are typically used to obtain information such as the material, shape and size of an object subjected to the light.

2.2 THE SCIENCE OF PLASTIC BIODEGRADATION

Under aerobic (with oxygen) conditions microorganisms use oxygen to metabolise (biodegrade) the carbon in polymers which is then mineralised into CO2 and water. This biodegradation takes place on the surface as the enzymes cannot penetrate the polymer. This is why thicker material biodegrades more slowly.

Anaerobic degradation is similar, but requires specific strains of microorganism which can sustain growth in the absence of oxygen. Without oxygen, organisms metabolise carbon and hydrogen in the polymer to produce CH4 (methane) rather than CO2 and water. This is the same process that occurs in landfill when organic matter biodegrades in the absence of oxygen.

Methane is around 30 times more harmful as a greenhouse gas than carbon dioxide, and is a significant factor of climate change if released into the atmosphere.

AEROBIC BIODEGRADATION

$$C_{polymers} + O_2 \rightarrow C_{monomers} \rightarrow CO_2 + H_2O$$

ANAEROBIC BIODEGRADATION

$$C_{polymers} \rightarrow C_{monomers} \rightarrow H_2 + CO_2 + \text{acetic acid} \rightarrow CH_4 + CO_2$$

Image
Source: Adapted from EPA, *Bio-based and Biodegradable Plastics in Denmark* (2020)

2.3 ENVIRONMENTAL FACTORS

Different environments lead to faster or slower biodegradation rates. The prevalance of microorganisms and temperature (which directly affects microorganism activity) are key factors in plastic biodegradation. Here is a summary of environments that biodegradable plastics may end up in and the common conditions found there.

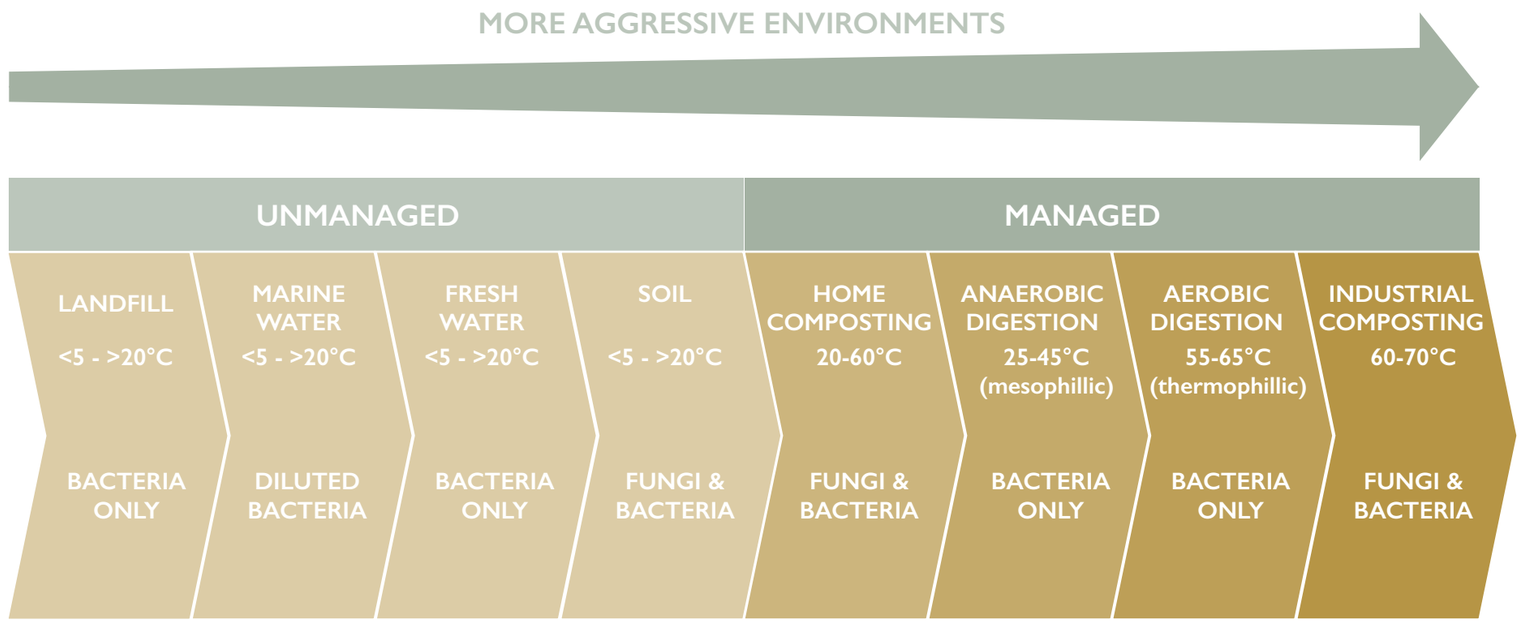


Image
Source: Adapted from EPA, *Bio-based and Biodegradable Plastics in Denmark* (2020)

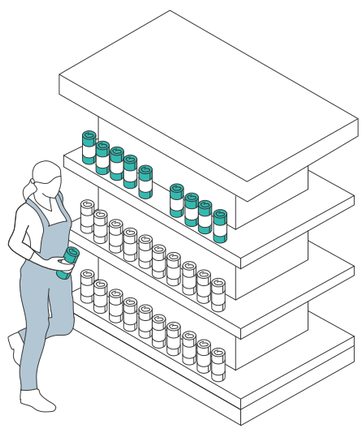
2.4 STANDARDS & LABELLING

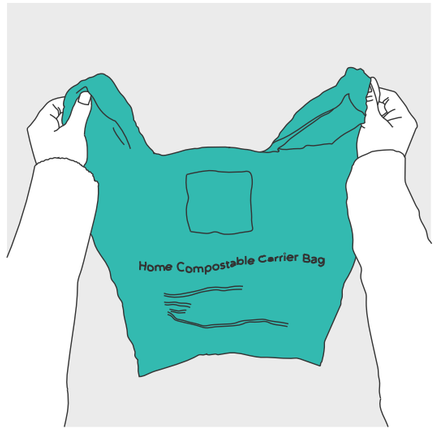
Item compostability is generally categorised as either 'home compostable' and/or 'industrial compostable. For an item to be deemed compostable in practice it must be certified to EN13432 (requirement for packaging recoverable through composting and biodegradation) or meet requirements of an appropriate home composting specification.

There are several overarching international standards for compostable & biodegradable plastics, but these do not reflect the practice that currently takes place in UK organic waste treatment systems. International and european third-party certification schemes are available, but there is no UK certification scheme at present.

Certification schemes use standardised test methods, but the test threshold is independantly set by each verification body. It is these test thresholds that are potentially contentious, as they allow materials to be certified as biodegradable even if they do not reflect the variety of environmental conditions of different countries and their waste treatment systems.

Type	Industrial Compostability					Home Compostability		
Region	Europe			USA	Australasia	Europe		Australasia
Logo								
Verification Body	DIN CERTCO	DIN CERTCO	TUV AUSTRIA	DIN CERTCO	DIN CERTCO/ Australasian Bioplastics Association	DIN CERTCO	TUV AUSTRIA	Australasian Bio plastics association / DIN CERTCO
Overarching Standard	EN13432	EN13432	EN13432	ASTM D6400 / ASTM D6868	AS4736	AS5810/NF T 51-800	EN13432 / EN 14995	AS5810





2.5 WASTE PROCESSING FACTORS

Mechanical Identification & Sorting

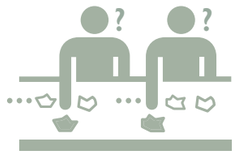
- Waste processing requires significant mechanical separation and cleaning/ decontamination in order to extract valuable recyclable materials for reprocessing.

Temperature

- Optimum operational temperature for organic waste processing varies depending on system used.

Humidity

- Optimum operational humidity levels for organic waste processing varies depending on system used.

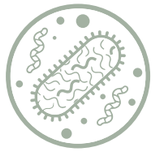


Human Identification & Sorting (Industrial)

- Waste streams may require human identification and sorting (where automated processes are insufficient) in order to extract valuable recyclable materials for

Oxygen

- Optimum operational oxygen level for organic waste processing varies depending on system used.



Microorganisms

- Optimum microorganism presence and activity varies depending on type of organic waste processing system.

Human Identification & Sorting (Domestic)

- Product language and labelling required to identify materials at home and to dispose of materials correctly.

pH

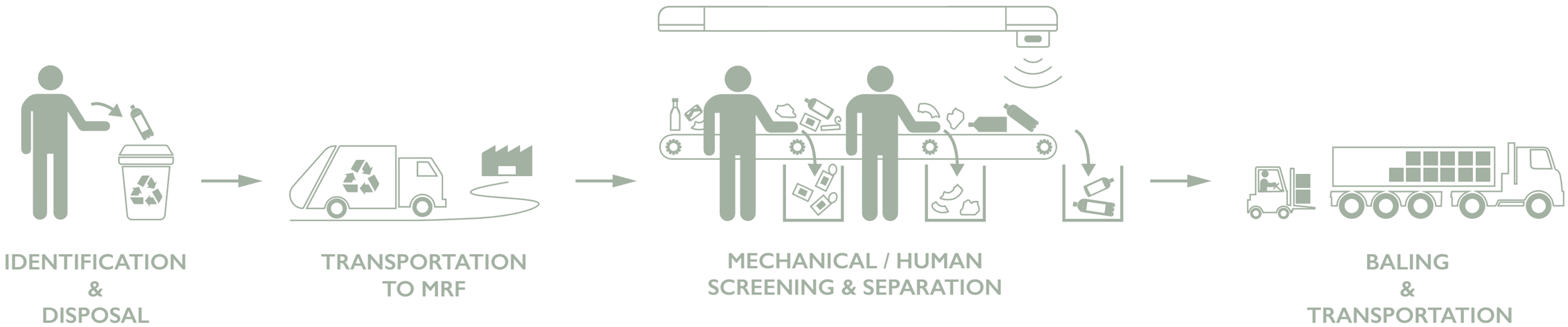
- Optimum operational pH level for organic waste processing varies depending on system used.

Carbon:Nitrogen Ratio

- Optimum carbon to nitrogen ratio for organic waste processing varies depending on system used.

2.6 MATERIAL RECYCLING

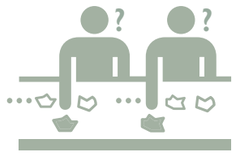
- **Illustration of a ‘closed loop’ recycling processes**



2.7 MATERIAL RECYCLING: ISSUES WITH COMPOSTABLE PLASTICS

Human Identification & Sorting (Domestic)

- **Currently biodegradable plastic labelling and language is not clear or consistent leading to incorrect disposal and contamination of other waste streams.**



Human Identification & Sorting (Industrial)

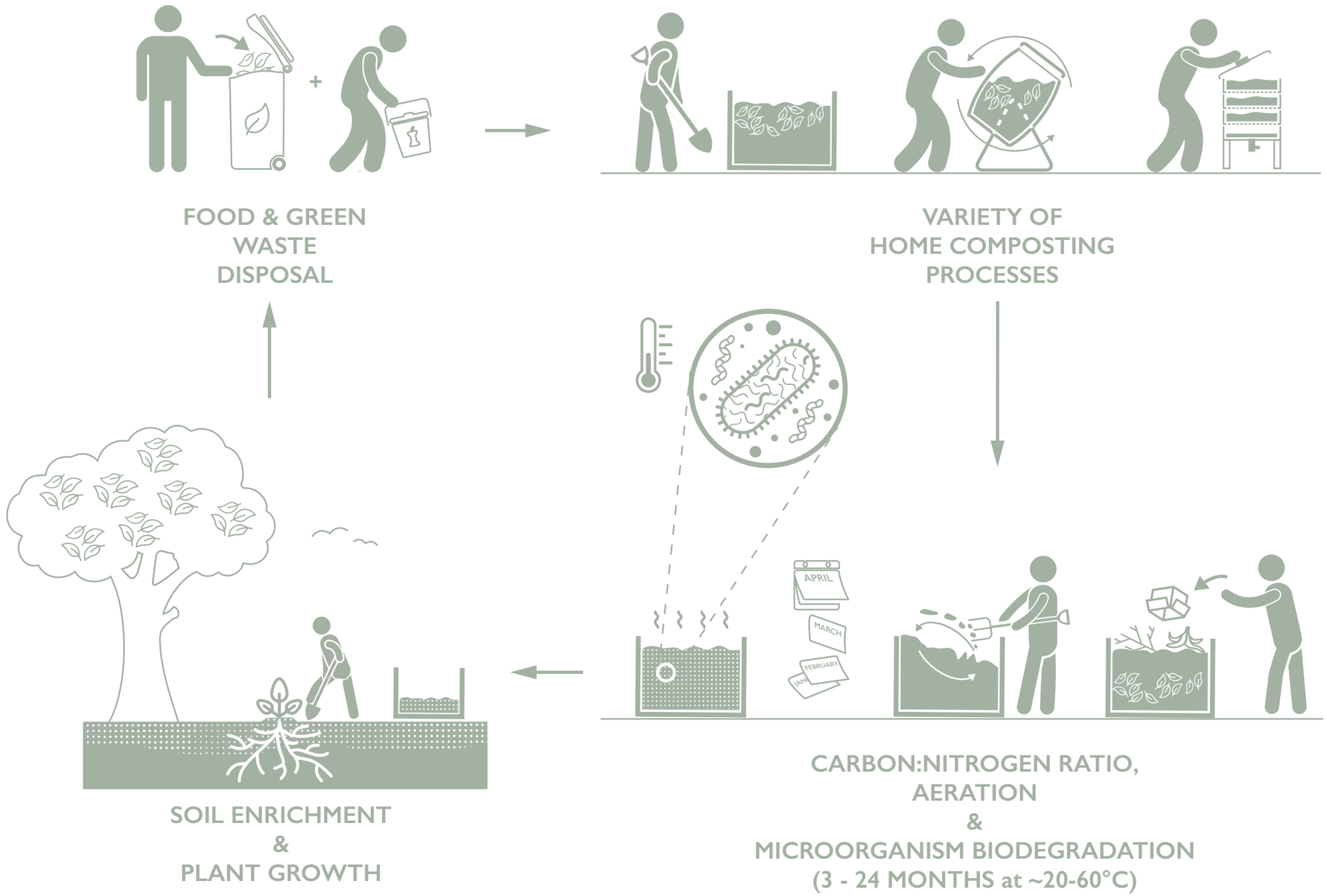
- **Identifying biodegradables is difficult due to the similar weight, density, and visual appearance with other non-biodegradable materials.**

Mechanical Identification & Sorting

- **Currently commercial identification technology is not optimised to distinguish biodegradable from non-biodegradable plastics, leading to contamination of non-biodegradable recycled plastics. High levels of contamination may cause reduced performance of recycled materials or material/product failure.**

2.8 HOME COMPOSTING

- **Illustration of home composting processes**



2.9 HOME COMPOSTING: ISSUES WITH COMPOSTABLE PLASTICS

Human Identification & Sorting (Domestic)

- Biodegradable plastics designed for industrial composting conditions do not degrade sufficiently under home composting conditions due to differences in temperature, oxygen levels, and pH. Identifying biodegradables is difficult due to the similar weight, density, and visual appearance with other non-biodegradable materials Clear material identification and disposal instructions are needed for correct disposal of biodegradable plastics in home composting.

Temperature

- Home composter temperatures vary considerably depending on method used ~20-60°C. This may lead to incomplete plastic biodegradation in home composting timeframes.

Oxygen

- Oxygen levels in home compsoters vary considerably depending on method used. This may lead to incomplete plastic biodegradation in home composting timeframes.

pH

- pH levels in home composters vary considerably due to method and types of organic waste. This may lead to incomplete plastic biodegradation in home composting timeframes.

Humidity

- Humidity levels in home composters vary considerably depending on method. This may lead to incomplete plastic biodegradation in home composting timeframes.

Microorganisms

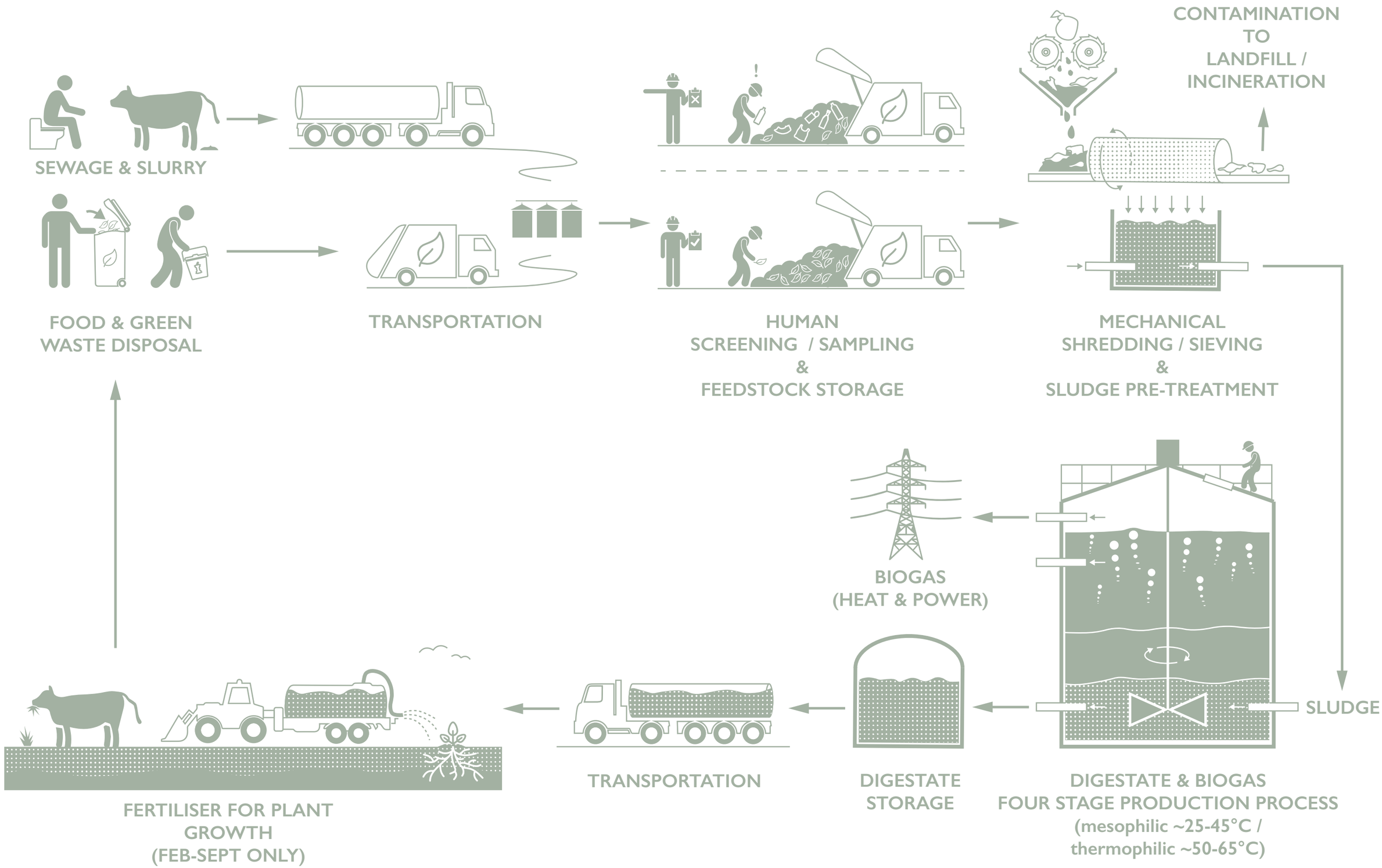
- Microorganisms vary depending on whether compost pile is aerobic (oxygenated) or anearobic (without oxygen). This may lead to incomplete plastic biodegradation in home composting timeframes.

Carbon:Nitrogen Ratio

- Compost carbon to nitrogen ratio is effected by types of organic waste processed. This may lead to incomplete plastic biodegradation in home composting timeframes.

2.10 ANAEROBIC DIGESTERS

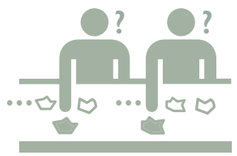
- **Illustration of anearobic digester processes**



2.11 ANEAROBIC DIGESTERS: ISSUES WITH COMPOSTABLE PLASTICS

Mechanical Identification & Sorting

- Identifying biodegradables is difficult due to the similar weight, density, and visual appearance with other non-biodegradable materials, and limitations of mechanical and human identification and sorting. Biodegradable plastics, especially films, can damage moving parts in Anearobic Digesters if insufficiently broken down first. Currently most biodegradable plastics are removed at screening stage alongside other non-biodegradable plastic contamination and redirected to landfill or incineration.



Human Identification & Sorting (Industrial)

Temperature

- AD operating temperatures vary ~25-65°C. Currently digester environments are not optimised to process biodegradable plastics.

Oxygen

- ADs operate anearobically (without oxygen). Currently digester environments are not optimised to process biodegradable plastics.

pH

- AD system environments are highly acidic ~pH4 due to anearobic operation. Currently digester environments are not optimised to process biodegradable plastics.

Humidity

- ADs are largely closed mechanical systems requiring high digestate water content to operate. Currently digester environments are not optimised to process biodegradable plastics.

Microorganisms

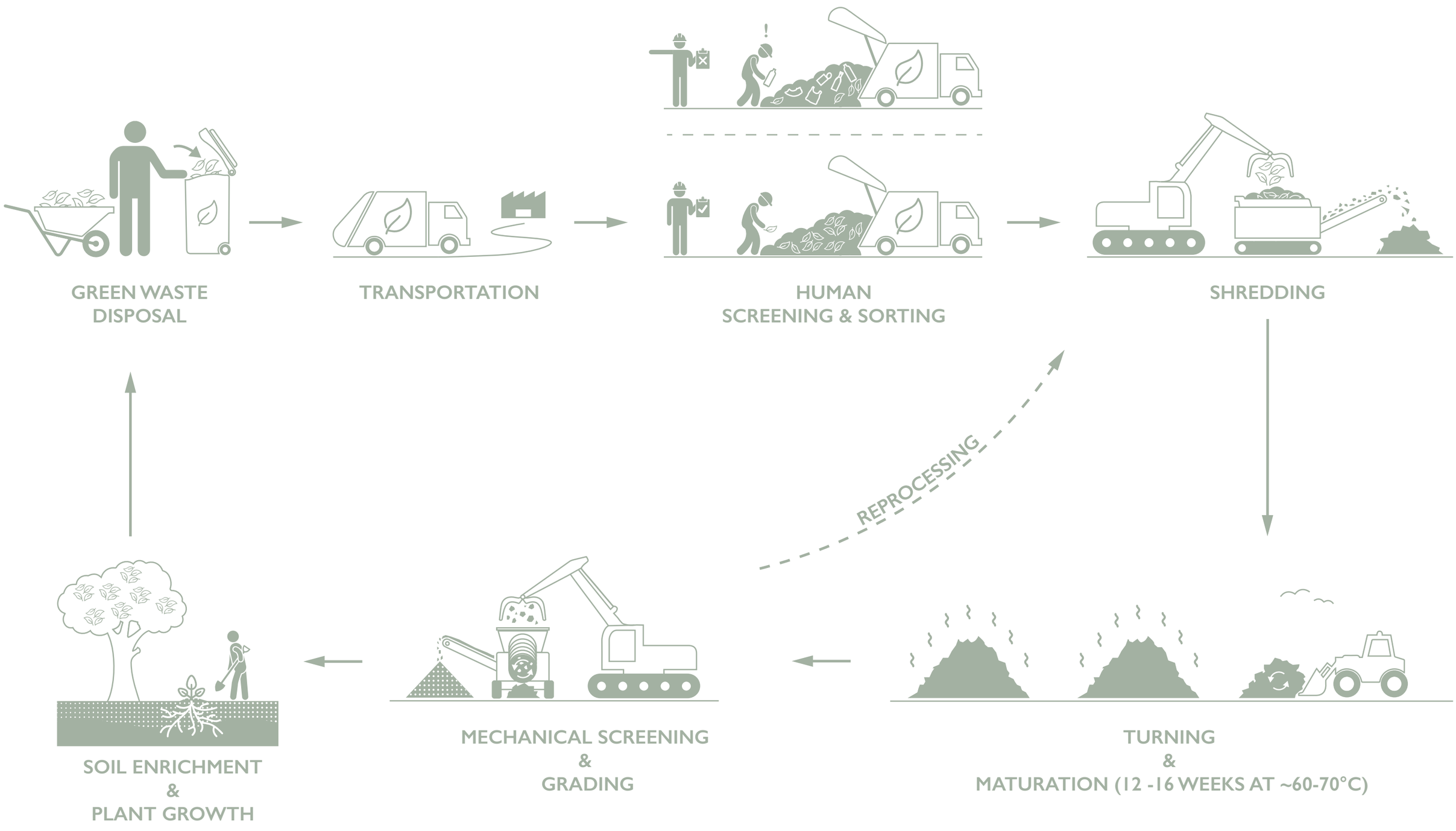
- Polymer breakdown is microbe specific. Currently a variety of polymers are used in biodegradable plastics. Further research is needed to establish optimal microbial communities to process biodegradable plastics in ADs.

Carbon:Nitrogen Ratio

- Commercial ADs rely on optimised carbon:nitrogen ratios. An increase of carbon rich biodegradable plastic materials in organic waste may have commercial implications.

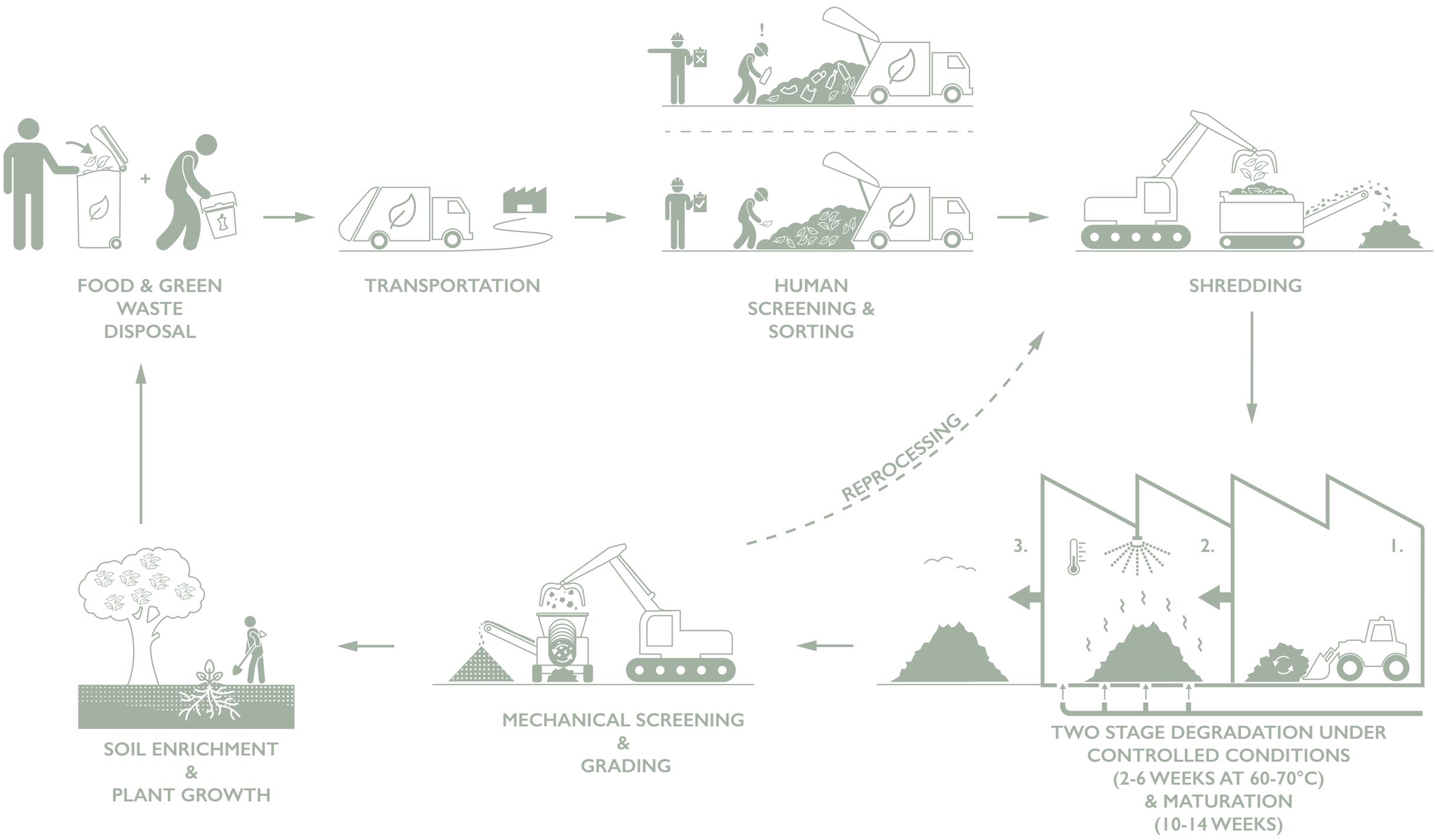
2.12 INDUSTRIAL COMPOSTING - OPEN WINDROW

- **Illustration of open windrow composting processes**



2.13 INDUSTRIAL COMPOSTING - IN VESSEL

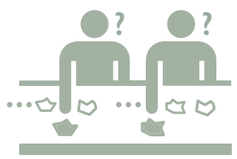
- **Illustration of in-vessel composting processes**



2.14 INDUSTRIAL COMPOSTING: ISSUES WITH COMPOSTABLE PLASTICS

Mechanical Identification & Sorting

- Identifying biodegradables is difficult due to the similar weight, density, and visual appearance with other non-biodegradable materials, and limitations of mechanical and human identification and sorting. Currently most biodegradable plastics are removed at screening stage alongside other non-biodegradable plastic contamination and redirected to landfill or incineration.



Human Identification & Sorting (Industrial)

Temperature

- Composting temperatures may vary depending on system used ~60-70°C, effecting biodegradation rates. This may lead to incomplete plastic biodegradation and environmental pollution.

Oxygen

- Composting oxygen levels may vary depending on system used, effecting biodegradation rates. This can lead to incomplete plastic biodegradation and environmental pollution.

pH

- Aerobic and anearobic pH levels vary effecting biodegradation rate. This can lead to incomplete plastic biodegradation and environmental pollution.

Humidity

- Humidity levels may vary depending on system used, effecting biodegradation rates. This may lead to incomplete plastic biodegradation and environmental pollution.

Microorganisms

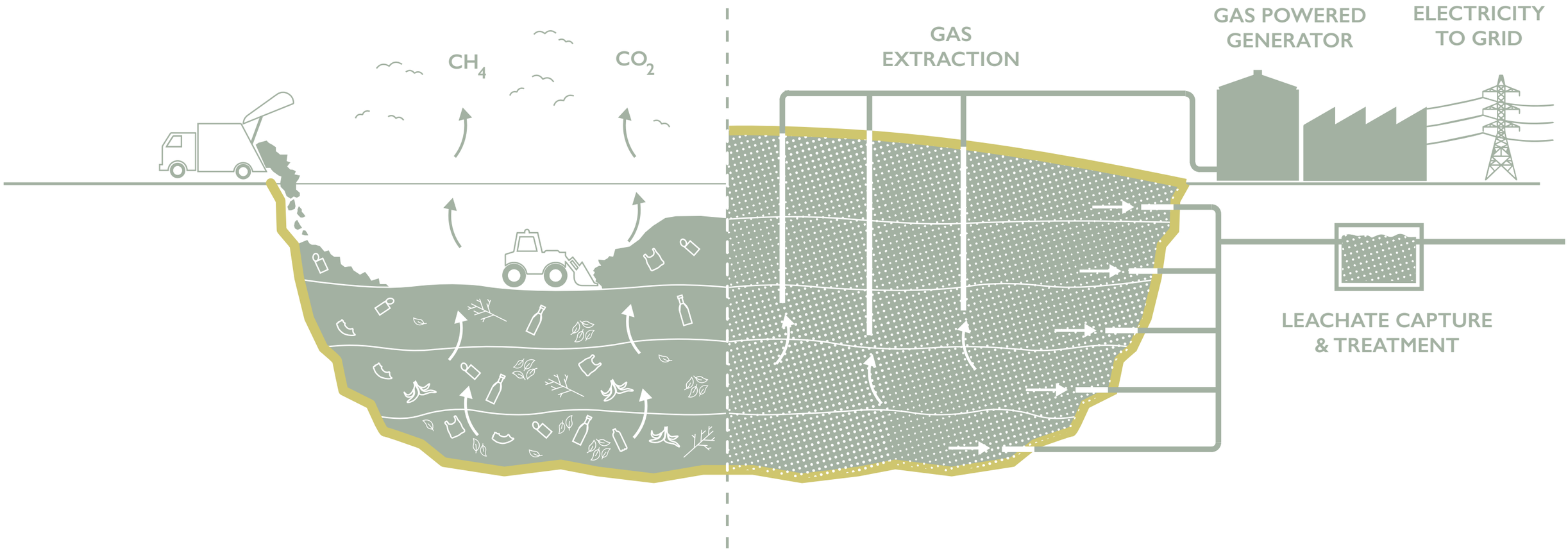
- Microorganisms vary vary depending on system used, effecting biodegradation rates. This may lead to incomplete plastic biodegradation and environmental pollution.

Carbon:Nitrogen Ratio

- Commercial composters rely on optimised carbon:nitrogen ratios. An increase of carbon rich biodegradable plastic materials in organic waste may have commercial implications.

2.15 RESIDUAL WASTE - LANDFILL: ISSUES WITH COMPOSTABLE PLASTICS

- Illustration of landfill processes
- Compostable plastics biodegrade anearobically in landfill conditions releasing harmful greenhouse gases.
- Landfill is expensive.



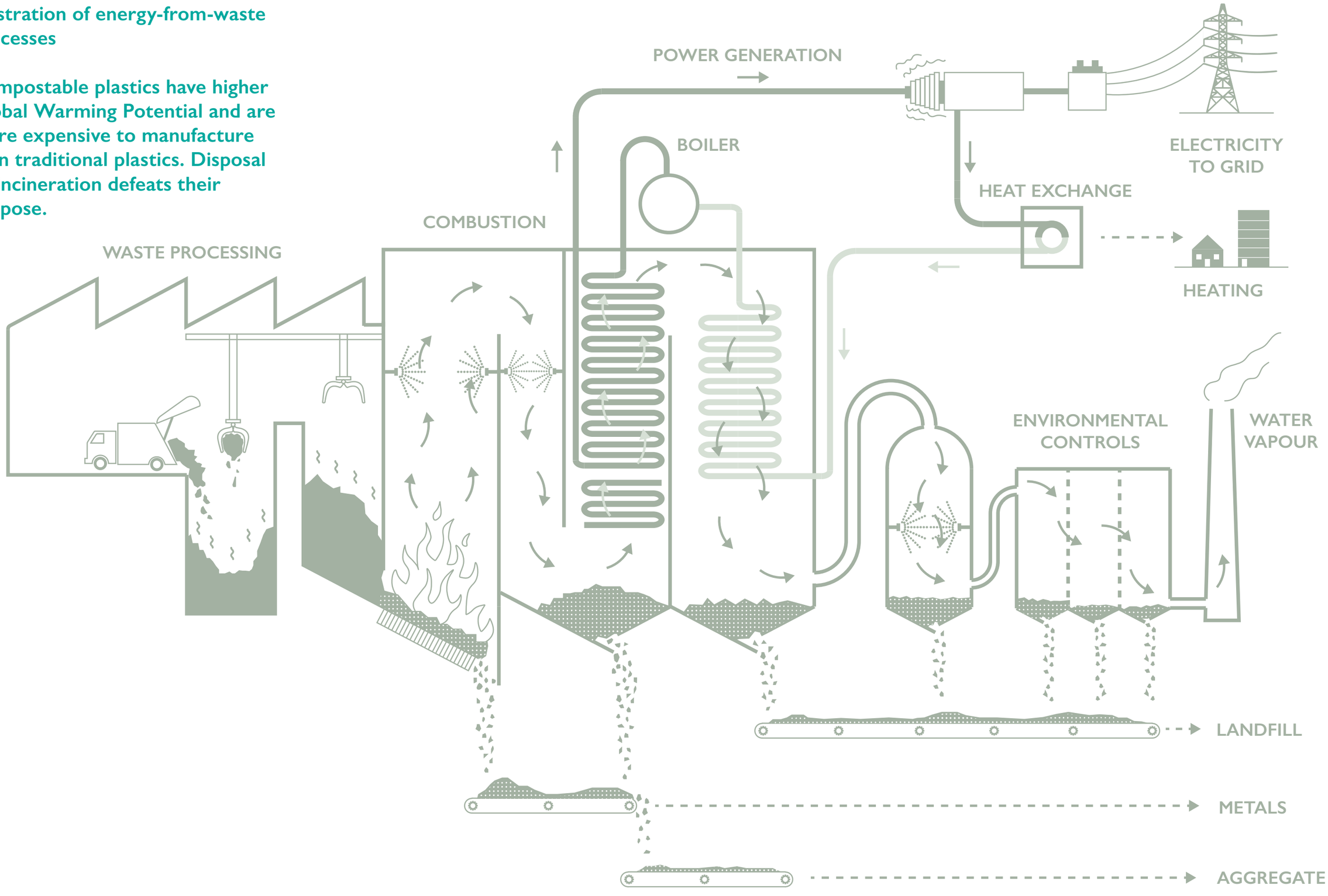
ORGANIC & NON-ORGANIC WASTE IS COMPACTED & BEGINS TO BIODEGRADE ANAEROBICALLY, GREENHOUSE GASES RELEASED

LANDFILL MANAGEMENT INCLUDES CAPTURE & TREATMENT OF LEACHATE RUN-OFF AND METHANE EXTRACTION FROM WASTE BIODEGRADATION

2.16 RESIDUAL WASTE - INCINERATION: ISSUES WITH COMPOSTABLE PLASTICS

- **Illustration of energy-from-waste processes**

- **Compostable plastics have higher Global Warming Potential and are more expensive to manufacture than traditional plastics. Disposal by incineration defeats their purpose.**

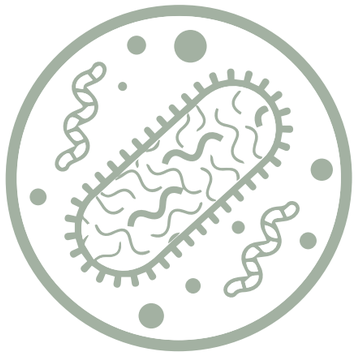


PLASTIC WASTE INNOVATION HUB

RESEARCH

3.1 BIODEGRADABLES RESEARCH

ENVIRONMENTAL IMPACT ASSESSMENT OF COMPOSTABLE PLASTICS

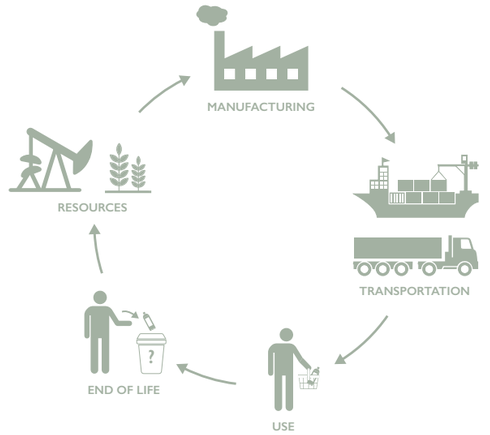


The biodegradation process for compostable plastics within an anearobic digester is complex and presents challenges to operators. A significant challenge is the diverse composition of compostable plastics on the market and thus the complex mix of polymers arriving in waste processing facilities. Different plastics degrade at different rates because the microorganisms required are normally polymer specific. The microbial communities present within digesters depends on the composition of the available waste. Therefore testing is required to identify the microbes needed to optimise treatment conditions and ratios for compostable plastics.

MATERIALS & DESIGN: DETECTION & LABELLING

Depacking systems are utilised in composting plants to remove any possible contaminants, including plastics. These systems are not able to differentiate between compostable and non-compostable plastics due to their similar weights, densities, and visual appearance. Consequently compostable plastics are generally excluded from existing anaerobic digestion plants and industrial composters. Therefore it is important to study the effectiveness of different automatic sorting technologies for industrially compostable plastics, in particular when co-mingled with food waste. In addition to this, it will be important to investigate how product labelling can help citizens understand which home waste stream to place compostable packaging in.

SYSTEMS DESIGN: POLICY & REGULATION



Many companies have swapped to packaging they describe as ‘biodegradable’ or ‘compostable’ under a misconception that a material can be sustainable. Only a system of production, collection, and reprocessing of a material can be sustainable. Further investigation is needed into what UK waste processing system needs to be in place for such products to be sustainable, how such a system might operate, and how it could be economically viable. In particular, assessment is needed of the feasibility of using a UK food waste collection system as the means to harvest compostable plastics from domestic households.

3.2 CITIZEN SCIENCE: BIG COMPOST EXPERIMENT

The Big Compost Experiment is an ongoing citizen science project in compostable and biodegradable plastics;

- To help investigate the role and effectiveness of biodegradable and compostable packaging in the UK
- To gather information and public opinion on biodegradable and compostable plastics and domestic composting habits and environments in the UK
- To interface with the public and raise awareness of plastic waste issues

The project has recieved over 6000 survey responses and has under 1000 home compost experiments underway across the UK. Analysis from this study will help inform future UK biodegradables policy and infrastructure.

www.bigcompostexperiment.org.uk

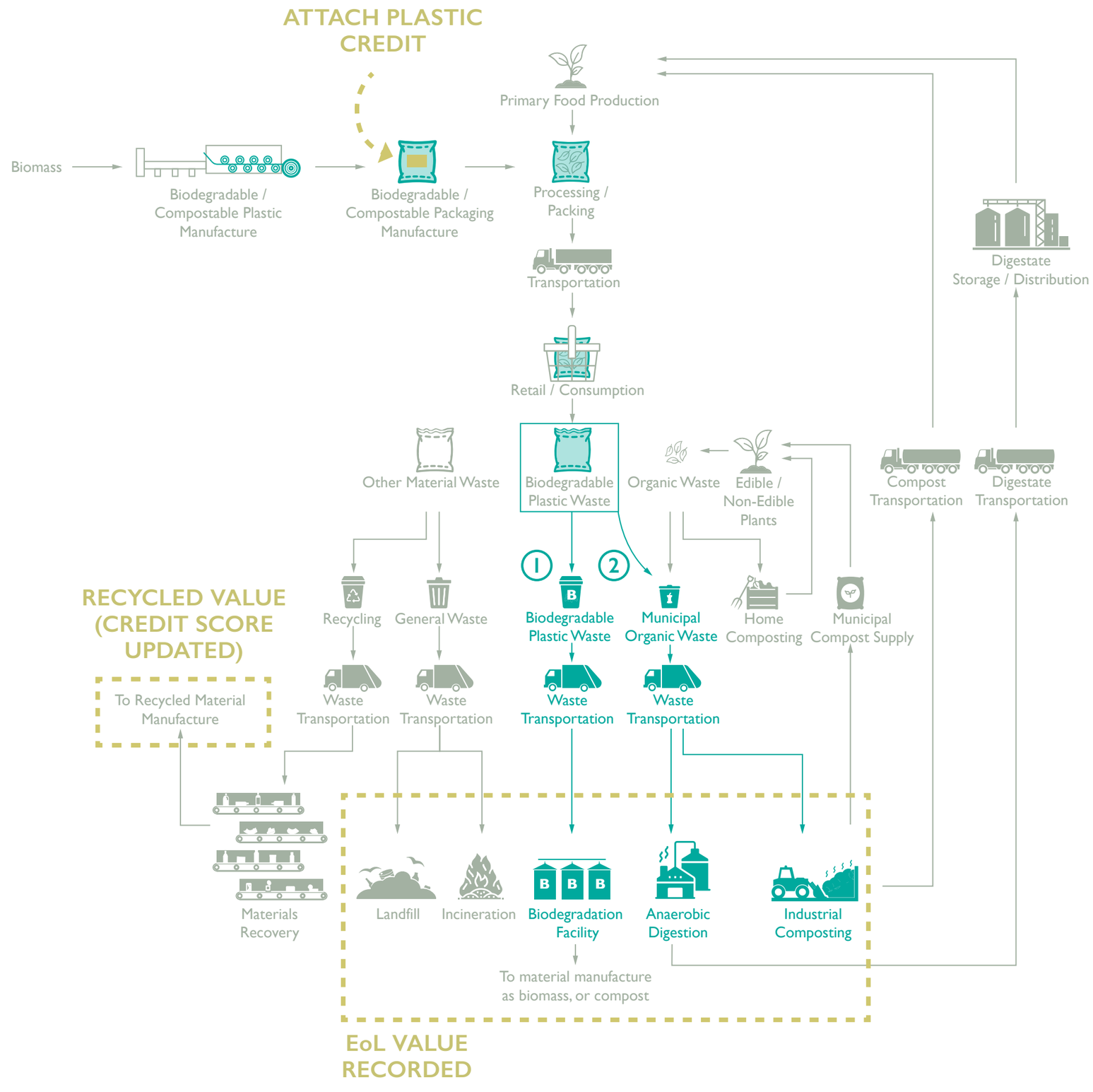
Images
Live compost experiment map and participant image gallery

3.3 NOVEL SYSTEMS: PLASTIC CREDIT

The PWIH is working to develop novel systems using Blockchain technology to help reduce plastic packaging waste, by;

- Attaching 'plastic credit' to product packaging, for sale or distribution in the 'plastic market', and recording plastic credit information on Blockchain.

- Creating 'plastic credit ratings' through end-of-life treatment and recycled contents analysis from waste management companies.



3.4 WANT TO FIND OUT MORE?

If you would be interested to find out what you or your organisation can do to help combat plastic waste, please get in touch.

hello@plasticwastehub.org.uk
www.plasticwastehub.org.uk