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GOVERNMENT NOTICES • GOEWERMENTSKENNISGEWINGS

DEPARTMENT OF ENVIRONMENT, FORESTRY AND FISHERIES

NO. 275

29 March 2021

NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008)**CONSULTATION ON THE DRAFT NATIONAL NORMS AND STANDARDS FOR THE TREATMENT OF ORGANIC WASTE**

I, Barbara Dallas Creecy, Minister of Forestry, Fisheries and the Environment, hereby consult on the draft National Norms and Standards for the treatment of organic waste, published under sections 7(1)(c), 7(2)(a) and read with section 7(6) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), for public comment, as set out in the Schedule hereto.

Members of the public are invited to submit, within thirty (30) days of the date of publication of this Notice in the Government Gazette, written representations or objections to the proposed amendments to the following addresses:

By post to: The Director-General
Attention: Mr Anben Pillay
Department of Environment, Forestry and Fisheries
Private Bag X447
PRETORIA
0001

By hand at: Reception, Environment House, 473 Steve Biko Road, Arcadia, 0083.

Please note that anyone entering the Department's building will be subjected to COVID 19 procedures. Due to the COVID 19 pandemic delivering comments by hand at the Department is being discouraged.

By e-mail at: APillay@environment.gov.za

Any inquiries in connection with the notice can be directed to: Mr Anben Pillay at (012) 399-9827 / 066 489 6132

A copy of the draft national norms and standards for the treatment of organic waste can also be accessed at <http://sawic.environment.gov.za> under "Draft documents for comment".

Comments received after the closing date may not be considered.



BARBARA DALLAS CREECY
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT

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1. DEFINITIONS AND ACRONYMS

1.1 Definitions

In these Norms and Standards, any word or expression to which a meaning has been assigned in the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), has the meaning so assigned, and unless the context otherwise indicates—

"biodegradable" means any substance or object capable of being decomposed by bacteria or other living organisms;

"biomass" means natural materials from living or recently dead plants, trees and animals, used as fuel and in industrial production, especially in the generation of electricity and the term refers to the total quantity or volume of organisms in a particular area;

"compost" means a stabilised, homogenous, fully decomposed substance of animal or plant origin to which no plant nutrients have been added and that is free of substances or elements that could be harmful to man, animal, plant or the environment;

"composting" means a controlled biological process in which organic materials are broken down by micro-organisms;

"digestate" means the material remaining after the anaerobic digestion of a biodegradable feedstock;

"feedstock" means the raw material required to supply or fuel a machine or industrial process. For the purpose of this document, feedstock includes any organic materials included in a specific treatment that is biodegradable or fermentable and this includes waste or non-waste organic material;

"fertiliser" means any substance which is intended or offered to be used for improving or maintaining the growth of plants or the productivity of the soil;

"handling" means functions associated with the movement of waste, including storage, treatment and ultimate disposal, by means of manual systems or automated systems;

"leachate" means an aqueous solution arising when water percolates through decomposing waste and / or as a result of the biodegradation of the waste and it contains final and intermediate products of decomposition, various solutes and waste residues;

"licensing authority" means the organ of state charged by the National Environmental Management: Waste Act, 2008, (Act No. 59 of 2008), as the licensing authority;

"monitoring" means continuous or non-continuous measurement of a concentration or other parameters for purpose of assessment or control of environmental quality or exposure and the interpretation of such measurements in order to identify changes in status or trends over a period of time, which may be achieved by compiling successive audits or analyses results;

"mortalities" means bodies of animals that have died from natural or accidental causes and that cannot be further utilised for human consumption;

“organic fertiliser” means a fertiliser manufactured from substances of animal or plant origin, or a mixture of such substances, and that is free of any substances that can be harmful to man, animal, plant or the environment containing at least 40g / kg prescribed nutrients;

“organics” means both processed and unprocessed compostable organic waste;

“pre-treatment” means a form of treatment that takes place prior to the utilisation of the technologies identified that may be required to minimise the risk associated with pathogens, bacteria or prions that could be hazardous to the environment and human health and can include sterilisation, pasteurisation, UV treatment or any similar process required for a specific period of time;

“riparian habitat” includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas; and

“watercourse” means -

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, pan, lake or dam into which, or from which water flows; and
- (d) any collection of water which the Minister may, by notice in the *Gazette*, declare to be a watercourse as defined in the National Water Act, 1998 (Act 36 of 1998),

and reference to a watercourse includes, where relevant, its bed and banks.

1.2 Acronyms

DALRRD - Department of Agriculture, Land Reform and Rural Development

DWS - Department of Water & Sanitation

HTC - Hydrothermal Carbonisation

HTL - Hydrothermal Liquefaction

SANS - South African National Standards

SAWIS - South African Waste Information System

SCWG - Supercritical water gasification

2. PURPOSE

These Norms and Standards aim at controlling the processing of organic waste material at any facility that falls within the threshold as described in paragraph 3 of these Norms and Standards in order to avoid, prevent or minimise potential negative impacts on the biophysical environment.

3. APPLICATION

3.1 These Norms and Standards apply throughout the Republic of South Africa and are applicable to the following activities:

- 3.1.1 Recycling of organic waste at a facility that has an operational area in excess of 500m²;
- 3.1.2 Recovery of organic waste including the refining, utilisation or co-processing of organic waste in excess of 10 tons but less than 100 tons per day;
- 3.1.3 Construction and operation of any organic waste treatment facility that has the capacity to process in excess of 10 tonnes but less than 100 tonnes of organic waste material per day;
- 3.1.4 Construction of any organic waste facility where the capacity of the facility is able to process in excess of 10 tonnes but less than 100 tonnes of organic material per day;
- 3.1.5 Construction and operation of any organic waste facility processing animal matter not intended for human consumption for installations handling in excess of 1 ton of raw material per day; and
- 3.1.6 Construction and operation of any organic waste facility using applied heat (thermal treatment) in the treatment general waste exceeding 10kg per day.

4. FEEDSTOCKS AND TECHNOLOGIES

4.1 An organic waste treatment facility must comply with the treatment option for the following feedstocks contemplated in Table 1 below.

Table1: TYPES OF FEEDSTOCK AND TREATMENT OPTIONS					
Agriculture:	Mechanical	Chemical	Anaerobic	Aerobic	Thermal
Manure	✓		✓	✓	✓
Mortalities	✓	✓	✓	✓	✓
Biomass: Lignocellulose (woody)					
Agricultural crop residue	✓	✓		✓	✓
Invasive plant species	✓	✓		✓	✓
Plantation residue	✓	✓		✓	✓
Sawmill residue	✓	✓		✓	✓
Biomass: Low Lignocellulose (non woody)					
Agricultural crop residue	✓	✓	✓	✓	✓

Table1: TYPES OF FEEDSTOCK AND TREATMENT OPTIONS					
Agriculture:	Mechanical	Chemical	Anaerobic	Aerobic	Thermal
Sugar bagasse	✓	✓	✓	✓	✓
Food Processing:					
Abattoir	✓	✓	✓	✓	✓
Food Oils	✓	✓	✓	✓	✓
Organic Fraction of Municipal Solid Waste (MSW)	✓	✓	✓	✓	✓
Restaurant	✓	✓	✓	✓	✓
Agro-processing	✓	✓	✓	✓	✓
Sewage:					
Sludge	✓	✓	✓	✓	✓

4.2 The treatment options are described in detail in Annexure 1 to these Norms and Standards.

4.3 These Norms and Standards do not apply to any organic waste treatment facility treating the following:

- 4.1.1 Any infectious animal waste or mortalities classified as hazardous;
- 4.1.2 Raw sewage; or
- 4.1.3 Sewage sludge that does not meet the minimum quality standards for sludge as determined by the DWS in their National Water Act: National Norms and Standards for Domestic Water and Sanitation Services of Government Notice 982 in Government *Gazette* 41100, of 08 September 2017.

5. MINIMUM REQUIREMENTS FOR THE DESIGN AND PLANNING PHASE

5.1 These Norms and Standards do not apply to any organic waste treatment facility constructed or operated in the following areas or any other area that may be declared environmentally sensitive in terms of the National Environmental Management: Protected Areas Act 2003, (Act No. 57 of 2003) and the National Environmental Management: Biodiversity Act 2004 (Act No.10 of 2004), by the licensing authority:

- 5.1.1 Within natural watercourses and within 32m of a natural watercourse, measured from the edge of the watercourse as defined by its riparian habitat;
- 5.1.2 Within wetlands or floodplains, where the facility will be located inside of the 1 in 100 year floodline;
- 5.1.3 Within estuaries or within 100m inland of the high water mark of the sea or an estuary;

5.1.4 Shifting sand dunes or geologically unstable formations; and

5.1.5 Where the construction of the activity and associated infrastructure requires the removal of more than 300m² of endangered or critically endangered vegetation.

5.2 The construction and operation of an organic waste treatment facility must conform to zoning requirements as determined by the relevant local authority.

6. MINIMUM REQUIREMENTS FOR THE CONSTRUCTION PHASE

6.1 Construction of an organic waste treatment facility may not commence without having complied with the following:

6.1.1 A new waste facility must be registered with the licensing authority in accordance with these Norms and Standards 90 days prior to commencement of construction;

6.1.2 An existing waste facility must register with the licensing authority in accordance with these Norms and Standards within 90 days of publication of these Norms and Standards in the *Government Gazette*;

6.1.3 Any other approvals required by law, including but not limited to the following:

(a) Planning, zoning and building plan approvals from the local municipality as is required;

(b) Any approvals in terms of local municipal by-laws such as storage, registration of waste contractors, flammable substances storage and transport, permitting of scheduled trades and trade effluent discharge;

(c) Registration in terms of the Fertiliser, Farm Feeds, Agricultural Stock Remedies Act 1947, (Act No.36 of 1947), for any facility producing organic fertiliser or protein for livestock use;

(d) Compliance with the Norms and Standards for the Storage of Waste, 2013, published under Government Notice No. R. 926 in *Government Gazette* No. 37088 of 29 November 2013; and

(e) Compliance with the Norms and Standards for the sorting, shredding, grinding, crushing, screening or bailing of general waste, 2017, published under Government Notice No. R. 1093 in *Government Gazette* No. 41175 of 11 October 2017.

6.2 An organic waste treatment facility must submit to the licensing authority, prior to construction, a standard operating procedure detailing the requirements as per Annexure 2 to these Norms and Standards for approval.

6.3 The registration application referred to in subparagraph 6.1.1 must as a minimum include the following:

6.3.1 the name of the waste facility;

6.3.2 the name of the owner and operator of the facility;

6.3.3 physical address of the owner and operator of the facility;

6.3.4 postal address of the owner and operator of the facility;

6.3.5 contact details of the owner and operator of the facility;

- 6.3.6 the geographical area where the facility is situated;
- 6.3.7 the location of the facility in terms of the name of the local municipality, erf number and geographic co-ordinates;
- 6.3.8 land use or zoning of the waste facility location area;
- 6.3.9 the size of the operational facility, including entire footprint of the facility;
- 6.3.10 a layout plan including all operational facets of the facility;
- 6.3.11 the proximity of the facility to the nearest residential area;
- 6.3.12 distance of any buffers that may be required:
 - (a) 60 - 150m for Category 1 & 2 materials; and
 - (b) 450m+ for Category 3 materials;
- 6.3.13 the types and maximum quantities of waste to be processed at the waste facility;
- 6.3.14 the sources of waste to be processed at the waste facility; and
- 6.3.15 the approved civil engineering designs, where applicable in terms of relevant building Regulations and bylaws.

7. MINIMUM REQUIREMENTS FOR SECURITY AND ACCESS CONTROL

7.1 Any organic waste treatment facility complying with these Norms and Standards must keep records of the following:

- 7.1.1 Details of waste generators from whom organic waste material originate;
- 7.1.2 Details of transport operators delivering organic waste material;
- 7.1.3 Type, volume and source of all organic waste material accepted onto the waste management site; and
- 7.1.4 If a weighbridge is installed for measuring quantity, it must be correctly installed, certified and must, where practicable, be operational at all times.

7.2 The facility owner must put into place provisions ensuring strict access control to the following areas:

- 7.2.1 Areas used for receiving, storing and processing of organics, process residuals and contaminated materials; and
- 7.2.2 All areas used to store flammable materials or chemicals.

7.3 The facility owner / management must put into place provisions related to:

- 7.3.1 Problem animals, birds and / or vermin that may be attracted to the feedstock storage areas;
- 7.3.2 Wind-blown litter; and
- 7.3.3 Fire management.

- 7.4 A notice board should be placed at all entrances to the waste facility detailing the name of the waste facility, accepted waste type(s), operating hours, contact details, including contact details in emergency situations. All notice boards must be written in at least two languages, one of which should be the predominant local language of the area.

8 OPERATION

- 8.1 An organic waste treatment facility must comply with the technology type as contemplated in Annexure 3 to these Norms and Standards, where applicable.

9 GENERAL REQUIREMENTS

- 9.1 Any organic waste treatment facility must be compliant with:

- 9.1.1 the provisions of the National Dust Control Regulations published in terms of section 53(o), read with section 32 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), where applicable;
- 9.1.2 the provisions of the National Greenhouse Gas Emission Reporting Regulations published in terms of section 53(aA), (o) and (p), read with section 12 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), where applicable; and
- 9.1.3 the National Ambient Air Quality Standards published in terms of section 9(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004).

10 MANAGEMENT OF INCIDENTS

- 10.1 Incidents must be dealt with in accordance with section 30 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).
- 10.2 To minimise environmental impacts, an organic waste treatment facility must have an emergency preparedness plan which must include the following as a minimum:
 - 10.2.1 Hazard identification;
 - 10.2.2 Prevention measures;
 - 10.2.3 Emergency planning;
 - 10.2.4 Emergency response; and
 - 10.2.5 Remedial actions.

11 OPERATIONAL MONITORING, AUDITING AND REPORTING

- 11.1 A facility registered on SAWIS, or a provincial waste information system if one is available, must provide quarterly reporting information in the format required on registration.
- 11.2 The licensing authority must be given access, to audit or inspect the site, at any time and at such frequency as the authority may decide.
- 11.3 The audit or inspection reports by the authority must be made available to the facility owner within sixty (60) days of the audit or inspection.
- 11.4 Any records or documentation pertaining to the management of the organic waste treatment facility must be made available to the licensing authority or any other relevant authority upon request during an audit or inspection, as well as any other information which may be required.
- 11.5 A certificate of compliance with the relevant SANS standards must be kept on file at the site at all times regarding the installation of above ground or underground waste storage containers, above ground or underground supplies storage containers, processing machinery and equipment and any other infrastructure that may be used in a specified form of treatment/storage of organic waste.
- 11.6 A record of any non-compliance findings by the licensing authority or any other relevant authority and the manner which non-compliance was addressed must be kept on file at the site at all times.
- 11.7 Internal audits detailing environmental performance of the facility must be conducted bi-annually and official reports thereof must be prepared. Each of the internal audits must be made available to the external auditor referred to in subparagraph 11.8 and to the licensing authority or any relevant authority on request.
- 11.8 External audits of the facility must be conducted biennially by an independent auditor and the auditor must prepare an official audit report documenting the audit findings. The external audit report must be submitted to the licensing authority upon request and must include but not be limited to the following:
 - 11.8.1 An indication of compliance of the facility to these Norms and Standards;
 - 11.8.2 An indication of compliance to any relevant legislative requirements regulating the treatment of organic waste;
 - 11.8.3 An interpretation of all available data and test results regarding the operation of the facility and its impacts on the environment;
 - 11.8.4 Target dates for the implementation of any remediation or recommendations to achieve compliance;
 - 11.8.5 An indication of compliance to any section 30 incidents that occurred and details of the manner in which the incidents were addressed;
 - 11.8.6 An indication of compliance that hazardous waste is separated from non-hazardous waste and that hazardous waste is removed by a registered waste handling company for either recycling or disposal at a licensed disposal facility;

- 11.8.7 An indication of compliance to the presence of records of safe disposal certificates for all hazardous waste removed from the facility; and
- 11.8.8 An indication of compliance that non-organic solid waste that is not considered hazardous must be disposed at a registered waste facility.

12 MINIMUM REQUIREMENTS DURING DECOMMISSIONING PHASE

12.1 For the purpose of decommissioning, all facilities that fall within the scope as described in paragraph 3 of these Norms and Standards must, prior to closure of such facility, inform the licensing authority and provide a decommissioning plan. The following information must, as a minimum, be included in the decommissioning plan:

- 12.1.1 Timetable for staged remediation;
- 12.1.2 Re-vegetation or stabilisation program; and
- 12.1.3 Proposed post-closure monitoring, maintenance and use.

13 TRAINING AND CAPACITY BUILDING

- 13.1 An organic waste treatment facility must, during the safety, health and environmental induction, train any new employee or employees on waste management in order to identify, prevent, minimise or manage actions or behaviour that is likely to cause adverse impacts on the environment as a result of construction, operation and decommissioning of the facility.
- 13.2 Training must be provided continuously to all employees working with waste and to all contract workers that might be exposed to the waste.
- 13.3 Members of staff must be trained to manage all types of organic waste in accordance with the provisions of these Norms and Standards and any other relevant legislative requirements applicable to treatment of organic waste materials.

14 TRANSITIONAL ARRANGEMENTS

- 14.1 Any person who lawfully conducted an organic waste treatment activity in a facility that falls within the scope as described in paragraph 3 of these Norms and Standards, prior to and on the date of coming into operation of these Norms and Standards, may continue with the activity for the duration as stipulated in the approval, authorisation or license and after the expiry of the approval, authorisation or license, must comply with the provisions of these Norms and Standards.
- 14.2 Where no validity period has been specified in the approval, authorisation or licence, a person who has been lawfully operating an organic waste treatment facility that falls within the scope as described in section 3 of these Norms and Standards, must register in terms of paragraph 6 of, and must comply with, these Norms and Standards within 90 days of publication of these Norms and Standards in the *Government Gazette*.

15 ANNEXURE 1: ORGANIC WASTE TREATMENT TECHNOLOGIES

Mechanical:	
Briquetting	A briquette (or briquet) is a compressed block of coal dust or other combustible biomass material such as charcoal, sawdust, wood chips, peat, or paper used for fuel and kindling to start a fire. Biomass briquettes are a biofuel substitute to coal and charcoal.
Centrifuge	A centrifuge is a device, which employs a high rotational speed to separate components of different densities. This becomes relevant in the majority of industrial jobs where solids, liquids and gases are merged into a single mixture and the separation of these different phases is necessary. A decanter centrifuge separates solid materials from liquids in slurry and therefore plays an important role in wastewater treatment, chemical, oil and food processing industries. There are several factors that affect the performance of a decanter centrifuge and some design heuristics to be followed which are dependent upon given applications.
Chipping	Chipping is the process of reducing woody waste to smaller pieces mechanically in order to speed up decomposition of the material. Once chipped, the woody material can be used as mulch, for composting, as a fuel source or even compressed for a slower burning fuel source.
Pelleting	Compressing of organic matter to create a dense, low moisture fuel source. Pellets can be made from industrial waste and co-products, food waste, agricultural residues, energy crops, and virgin lumber.
Sonification	Sonication is the act of applying sound energy to agitate particles in a sample, for various purposes.
Chemical:	
Chemical hydrolysis	Hydrolysis is a type of decomposition reaction where one reactant is water. Typically, water is used to break chemical bonds in the other reactants. Sometimes this addition causes both substance and water molecule to split into two parts. In such reactions, one fragment of the target molecule (or parent molecule) gains a hydrogen ion.

Chemical oxidation	Chemical oxidation is a process involving the transfer of electrons from an oxidising reagent to the chemical species being oxidised. Oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. The oxidizing agents most commonly used are ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide. In water and wastewater engineering, chemical oxidation serves the purpose of converting putrescible pollutant substances to innocuous or stabilised products.
Transesterification	Animal and plant fats and oils are composed of triglycerides, which are esters formed by the reactions of three free fatty acids and the trihydric alcohol, glycerol. In the transesterification process, the added alcohol (commonly, methanol or ethanol) is deprotonated with a base to make it a stronger nucleophile.
Saponification	Soaps are sodium or potassium salts of long chain fatty acids. When triglycerides in fat/oil react with aqueous NaOH or KOH, they are converted into soap and glycerol. This is called alkaline hydrolysis of esters. Since this reaction leads to the formation of soap, it is called the Saponification process.
Anaerobic:	
Anaerobic digestion	Anaerobic digestion is a fermentation process that causes the breakdown of organic compounds without the presence of oxygen. This process reduces nitrogen to organic acids and ammonia. Carbon from organic compounds is released mainly as methane gas (CH ₄). A small portion of carbon may be respired as CO ₂ . The decomposition occurs as four stages namely: hydrolysis, acidogenesis, acetogenesis, and methanogenesis.
Aerobic:	
Aerobic digestion	Aerobic digestion is a process in sewage treatment designed to reduce the volume of sewage sludge and make it suitable for subsequent use. More recently technology has been developed that allows the treatment and reduction of other organic waste, such as food, cardboard and horticultural waste. It is a bacterial process occurring in the presence of oxygen. Bacteria rapidly consume organic matter and convert it into carbon dioxide, water and a range of lower molecular weight organic compounds. Naturally, one of the most

		Important benefits of aerobic composting is that the heat which is produced during the decomposition process is great enough that it kills harmful bacteria and pathogens within the pile.
Black soldier fly larvae		Valorisation of organic waste through larval feeding activity of the black soldier fly, <i>Hermetia illucens</i> provides waste reduction and stabilisation while providing a product in form of the last larval stage, the so-called prepupae, which offers a valuable additive in animal feed.
Composting		A controlled biological process in which organic materials are broken down by micro-organisms in the presence of oxygen.
Vermicomposting		Vermicompost (or vermi-compost) is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process of producing vermicompost is called vermicomposting.
Thermal:		
Aqueous reforming	phase	The reaction of biomass-derived oxygenated compounds (e.g. glycerol) in aqueous solution at low temperature in the presence of a platinum catalyst to produce hydrogen.
Combustion		Combustion is a chemical reaction that produces heat and light. The most common form of combustion is fire. Most forms of combustion happen when the gas oxygen joins with another substance. For example, when wood burns, oxygen in the air joins with carbon in wood.
Drying		Application of heat to evaporate water from biosolids. Either direct or indirect heating methods are used. In the most common case, a gas stream, e.g., air, applies the heat by convection and carries away the vapor as humidity. Other possibilities are vacuum drying, where heat is supplied by conduction or radiation (or microwaves), while the vapor thus produced is removed by the vacuum system. Another indirect technique is drum drying (used, for instance, for manufacturing potato flakes), where a heated surface is used to provide the energy, and aspirators draw the vapor outside the room. In contrast, the

	mechanical extraction of the solvent, e.g., water, by centrifugation, is not considered "drying" but rather "draining".
Gasification	<p>Gasification is a process that converts organic or fossil fuel based carbonaceous materials such as coal, petroleum coke (petcoke), biomass or waste, into carbon monoxide, hydrogen and carbon dioxide (synthesis gas or syngas). This is achieved by reacting the material at high temperatures (>700 °C), without combustion, with a controlled amount of oxygen and/or steam.</p> <p>The syngas can be burned to produce electricity or further processed to manufacture chemicals, fertilizers, liquid fuels, substitute natural gas (SNG), or hydrogen</p>
Hydrothermal Carbonisation (HTC)	Is a chemical process for the conversion of organic compounds to structured carbons. It can be used to reduce the water content from the digestate / fertilizer and convert the solid fraction into "green coal" or brown coal formation (coalification)
Hydrothermal Liquefaction (HTL)	Hydrothermal liquefaction of biomass is the thermochemical conversion of biomass into liquid fuels by processing in a hot, pressurized water environment for sufficient time to break down the solid biopolymeric structure to mainly liquid components. Typical hydrothermal processing conditions are 523–647 K of temperature and operating pressures from 4 to 22 MPa of pressure.
Pressure heating / Supercritical water gasification (SCWG)	Mechanism using heat and pressure to improve char and lighter gases in biomass.
Pyrolysis	Pyrolysis is a thermochemical decomposition of organic material at elevated temperatures in the absence of oxygen (or any halogen). It involves the simultaneous change of chemical composition and physical phase, and is irreversible. The word is coined from the Greek-derived elements pyro "fire" and lysis "separating". This reaction involves molecular breakdown of larger molecules into smaller molecules in presence of heat. Pyrolysis is also known as thermal cracking, cracking, thermolysis, depolymerization, etc.
Rendering	Rendering is a process that converts waste animal tissue into stable, value-added materials. The rendering process simultaneously dries the material and separates the fat from the bone and protein. A rendering process yields a fat

	<p>commodity (yellow grease, choice white grease, bleachable fancy tallow, etc.) and a protein meal (meat and bone meal, poultry by-product meal, etc.).</p> <p>Rendering plants often also handle other materials, such as slaughterhouse blood, feathers and hair, but do so using processes distinct from true rendering.</p>
Torrefaction	<p>A thermal process to convert biomass into a coal-like material, which has better fuel characteristics than the original biomass. Torrefied biomass is more brittle, making grinding easier and less energy intensive.</p>

16 ANNEXURE 2: ITEMS TO BE INCLUDED IN A STANDARD OPERATING PROCEDURE

Principle Component	Subparagraph
Siting	<ul style="list-style-type: none"> • locality map showing the siting of the facility and location of environmentally sensitive areas, including residential zones, dwellings, schools and hospitals • ground plan of facility, including location of monitoring points/equipment • natural characteristics of site (local meteorology (wind and rain patterns), soil morphology, geology, hydrogeology and surface waters) • facility environmental policy (including protection of environmentally sensitive areas) • business plans (type and quantity of organics to be processed now and in future, and type and quality of products) • staffing (organisation, headcount, skills, responsibilities, training and proposed working hours)
Water management	<ul style="list-style-type: none"> • surface water controls • leachate controls and handling • water monitoring and assessment • leachate monitoring and assessment • contaminated water remediation
Gas and odour management	<ul style="list-style-type: none"> • process controls and monitoring • odour and weather monitoring • management of rapidly biodegradable organics • gas containment and extraction (where applicable) • gas monitoring • remediation of uncontrolled gas emissions • gas oxidation controls and monitoring
Incoming organics management	<ul style="list-style-type: none"> • screening and recording of organics received • organics handling and storage
Product quality assurance	<ul style="list-style-type: none"> • feedstock selection • process controls and monitoring • product testing and monitoring – physical, chemical and biological • management of contaminated organics and products
Noise management	<ul style="list-style-type: none"> • scheduling of the operation of noisy equipment and heavy transport vehicles • noise monitoring
Housekeeping practices	<ul style="list-style-type: none"> • dust and litter control • pest, weed and vermin control • site security • disposal of wastes and contaminated products

	<ul style="list-style-type: none">• maintenance of facility and equipment• stock controls
Fire-fighting and prevention	<ul style="list-style-type: none">• fire prevention• fire-fighting provisions

17 ANNEXURE 3: GENERAL REQUIREMENT FOR ORGANIC WASTE TREATMENT FACILITIES

Technology	Transport	Storage	Operation	Residue / Product
Mechanical				
Briquette	<ul style="list-style-type: none"> - Mobile plants minimise transportation impacts -All vehicles must be regularly maintained and roadworthy -Ensure emissions filters are fitted on vehicles and machinery -Potentially use rail for transport if possible -Cover dusty materials during transit 	<ul style="list-style-type: none"> -Storage must comply with the Waste Storage N&S -Storage on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas -Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises -No long term storage i.e. feedstock must be used within 90 days - The quantity of Category 2 and Category 3 organics awaiting processing should not exceed one day's production, unless it is stored in a manner that prevents the release of odours -Good housekeeping on site to prevent pests and malodours -Correct management of stock piles to prevent fires -Avoid shredding on windy days 	<ul style="list-style-type: none"> -Ensure aeration of material to prevent methane generation, unless specifically required -Prevent waterlogging -Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas - Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises -Good housekeeping on site to prevent pests and malodours -Install and maintain silencers on vehicles and equipment -Where possible, noisy equipment should be housed within a building or similar structure -Provide noise attenuation screens such as earth berms or trees -Restrict operating hours 	<ul style="list-style-type: none"> -Prevent waterlogging of finished product -Cover dusty materials
Centrifuge				
Chipping				
Pelleting				
Sonification				

Technology	Transport	Storage	Operation	Residue / Product
		-Ensure good record keeping for type and volume of feedstock entering the premises	-Maintain designated buffer distances where applicable -Provide fire safety protocol	
Chemical				
Chemical hydrolysis	-Mobile plants minimise transportation impacts	-Storage must comply with the Waste Storage N&S	-Storage of chemicals must be done in terms of the Hazardous Substances Act	-Prevent waterlogging of soil with digestate
Chemical oxidation	-All vehicles must be regularly maintained and roadworthy	-Storage on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Avoid over fertilising soils
Transesterification	-Ensure emissions filters are fitted on vehicles and machinery	-Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises	- Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises	-Compliance with DWS & DAFF guidelines for use of organic fertilisers to soil
Saponification	-Potentially use rail for transport if possible -Cover dusty materials during transit	-No long term storage i.e. feedstock must be used within 90 days - The quantity of Category 2 and Category 3 organics awaiting processing should not exceed one day's production, unless it is stored in a manner that prevents the release of odours -Good housekeeping on site to prevent pests and malodours -Correct management of	-Good housekeeping on site to prevent pests and malodours -Install and maintain silencers on vehicles and equipment -Where possible, noisy equipment should be housed within a building or similar structure -Provide noise attenuation screens such as earth berms or trees -Restrict operating hours	-Storage of biofuels must not lead to leachates polluting soils or waterways

Technology	Transport	Storage	Operation	Residue / Product
		<ul style="list-style-type: none"> stock piles to prevent fires -Avoid shredding on windy days -Ensure good record keeping for type and volume of feedstock entering the premises 	<ul style="list-style-type: none"> -Maintain designated buffer distances where applicable -Provide fire safety protocol 	
Anaerobic				
Anaerobic digestion	<ul style="list-style-type: none"> -Mobile plants minimise transportation impacts -All vehicles must be regularly maintained and roadworthy -Ensure emissions filters are fitted on vehicles and machinery -Potentially use rail for transport if possible -Cover dusty materials during transit 	<ul style="list-style-type: none"> -Storage must comply with the Waste Storage N&S -Storage on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas -Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises -No long term storage i.e. feedstock must be used within 90 days - The quantity of Category 2 and Category 3 organics awaiting processing should not exceed one day's production, unless it is stored in a manner that prevents the release of odours 	<ul style="list-style-type: none"> -Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas - Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises -Good housekeeping on site to prevent pests and malodours -Install and maintain silencers on vehicles and equipment -Where possible, noisy equipment should be housed within a building or similar structure -Provide noise attenuation screens such as earth berms or trees -Restrict operating hours 	<ul style="list-style-type: none"> -Prevent waterlogging of soil with digestate -Avoid over fertilising soils -Compliance with DWS & DAFF guidelines for use of organic fertilisers to soil

Technology	Transport	Storage	Operation	Residue / Product
		<ul style="list-style-type: none"> -Good housekeeping on site to prevent pests and malodours -Correct management of stock piles to prevent fires -Ensure good record keeping for type and volume of feedstock entering the premises 	<ul style="list-style-type: none"> -Maintain designated buffer distances where applicable -Provide fire safety protocol 	
Aerobic				
Aerobic digestion Black soldier fly larvae Composting Vermicomposting	<ul style="list-style-type: none"> -Mobile plants minimise transportation impacts -All vehicles must be regularly maintained and roadworthy -Ensure emissions filters are fitted on vehicles and machinery -Potentially use rail for transport if possible -Cover dusty materials during transit 	<ul style="list-style-type: none"> -Storage must comply with the Waste Storage N&S -Storage on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas -Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises -No long term storage i.e. feedstock must be used within 90 days -The quantity of Category 2 and Category 3 organics awaiting processing should not exceed one day's production, unless it is stored in a manner that 	<ul style="list-style-type: none"> -Ensure aeration of material to avoid methane generation -Prevent waterlogging -Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas -Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises -Good housekeeping on site to prevent pests and malodours -Install and maintain silencers on vehicles and equipment -Where possible, noisy equipment should be housed 	<ul style="list-style-type: none"> -Prevent waterlogging of soil with digestate -Avoid over fertilising soils -Compliance with DWS & DAFF guidelines for use of organic fertilisers to soil -Compliance with DAFF guidelines for feed protein in livestock

Technology	Transport	Storage	Operation	Residue / Product
		<p>prevents the release of odours</p> <p>-Good housekeeping on site to prevent pests and malodours</p> <p>-Correct management of stock piles to prevent fires</p> <p>-Avoid shredding on windy days</p> <p>-Ensure good record keeping for type and volume of feedstock entering the premises</p>	<p>within a building or similar structure</p> <p>-Provide noise attenuation screens such as earth berms or trees</p> <p>-Restrict operating hours</p> <p>-Maintain designated buffer distances where applicable</p>	
Thermal				
Aqueous phase reforming	-Mobile plants minimise transportation impacts	-Storage must comply with the Waste Storage N&S	-Ensure that air scrubbers are utilised for technologies where gas capture cannot take place (combustion & drying)	-Prevent waterlogging of soil with digestate
Combustion	-All vehicles must be regularly maintained and roadworthy	-Storage on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Avoid over fertilising soils
Drying		- Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises		-Compliance with DWS & DAFF guidelines for use of organic fertilisers to soil
Gasification	-Ensure emissions filters are fitted on vehicles and machinery			
Hydrothermal carbonisation (HTC)	-Potentially use rail for transport if possible	-No long term storage i.e. feedstock must be used within 90 days	- Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises	-Storage of biofuels must not lead to leachates polluting soils or waterways
Hydrothermal liquefaction (HTL)	-Cover dusty materials during transit			
Pressure heating				
Pyrolysis				
Rendering				
Torrefaction		- The quantity of Category 2 and Category 3 organics awaiting processing should not exceed	-Good housekeeping on site to prevent pests and malodours	

Technology	Transport	Storage	Operation	Residue / Product
		<p>one day's production, unless it is stored in a manner that prevents the release of odours</p> <p>-Good housekeeping on site to prevent pests and malodours</p> <p>-Correct management of stock piles to prevent fires</p> <p>-Avoid shredding on windy days</p> <p>-Ensure good record keeping for type and volume of feedstock entering the premises</p>	<p>-Install and maintain silencers on vehicles and equipment</p> <p>-Where possible, noisy equipment should be housed within a building or similar structure</p> <p>-Provide noise attenuation screens such as earth berms or trees</p> <p>-Restrict operating hours</p> <p>-Maintain designated buffer distances where applicable</p> <p>-Provide fire safety protocol</p>	

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