



# Government Gazette Staatskoerant

REPUBLIC OF SOUTH AFRICA  
REPUBLIEK VAN SUID AFRIKA

Vol. 682

1

April  
April

2022

No. 46169



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ISSN 1682-5845



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**GOVERNMENT NOTICES • GOEWERMENTSKENNISGEWINGS**

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**DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT**

NO. 1984

1 April 2022

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

I, Barbara Dallas Creecy, Minister of Forestry, Fisheries and the Environment, in terms of sections 7(1)(c) and 7(2)(a) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), hereby give notice of my publication of the National Norms and Standards for the treatment of organic waste, for implementation, as set out in the Schedule hereto.

In terms of the National State of Waste Report, 2018, more than 50 percent of organic waste is disposed of at landfill sites throughout the country. The Norms and Standards are aimed at reducing the amount of organic waste that would normally go to landfill sites and, as such, waste will be diverted from landfill to facilities that will be treating it for beneficial use.

The National Norms and Standards for the treatment of organic waste are also aimed at controlling the processing of organic waste material at specific facilities in order to avoid, prevent or minimise potential negative impacts on the biophysical environment.

**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) and the National Environmental Management Act, 1998 (Act 107 of 1998, has the meaning so assigned, and unless the context otherwise indicates—

**"biodegradable"** means any substance or material that degrades by biological activity, resulting in a specific change in the chemical structure of the material where such degradation can occur under aerobic or anaerobic conditions with the end products being gas (carbon dioxide or methane), water, biomass and mineral components;

**"biomass"** means the total quantity or volume of organisms in a particular area including natural materials from living or recently dead plants, trees and animals, used as fuel in industrial production;

**"category 1 organic waste"** means organics that have the lowest environmental impact but have the potential to generate offensive odours. These include, but are not limited to, garden and landscaping organics, untreated timber (sawdust, shavings, timber offcuts, crates, pallets, wood packaging), natural fibrous organics (sugar bagasse, peat, straw, seed husks etc.), biodegradable and compostable single use products and packaging, processed fibrous organics (paper, cardboard, paper-processing sludge, non-synthetic textiles), and animal manure (excluding poultry manure);

**"category 2 organic waste"** means organics that have a greater environmental impact than category 1 organic waste and have the potential to attract vermin and vectors. These, but are not limited to, include natural or processed vegetable organics (vegetables, fruit and seeds and processing sludges and wastes, winery, brewery and distillery wastes, food organics, however, excluding those in category 3 and biosolids and manures (sewage biosolids, animal manure (including poultry manure) and mixtures of manure and biodegradable animal bedding organics);

**"category 3 organic waste"** means organics that may generate harmful leachate, which could contaminate surface water, groundwater and soil if not correctly managed. These include, but are not limited to, meat, fish and fatty foods (carcasses, parts of carcasses, blood, bone, fish, fatty processing or food), fatty and oily sludges and organics of animal and vegetable origin (dewatered grease trap, fatty and oily sludges of animal and vegetable origin), mixed residual waste containing putrescible organics (putrescible organics including household domestic waste, commerce and industry waste sent to municipal sites) and industrial waste organics (fish processing, paper pulp waste and sludges with high-organic/nitrogen loads);

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

**"composting"** means a controlled biological process in which organic materials are broken down by micro-organisms by means of aerobic and anaerobic processes;

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

**"estuarine functional zone"** has the same meaning as defined in the Environmental Impact Assessment Regulations Listing Notice 3 of 2014, published under Government Notice R985 in *Government Gazette* 38282 of 4 December 2014 as amended from time to time;

**"feedstock"** means any organic waste material stipulated in Table 1 that is used to supply or fuel a specific organic waste treatment process;

**"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;

**"hospitality sector"** means a sector that includes all the facilities that prepare and serve food out of home and comprises the commercial service sectors and institutional sectors;

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

**"low lignocellulose (non-woody)"** means plant material that gives plants their rigidity and structure and comprises of three main types of carbon-based polymers — cellulose, hemicellulose and lignin, however, the lignin content being lower than woody lignocellulose;

**"lignocellulose (woody)"** means plant material that gives plants their rigidity and structure and comprises of three main types of carbon-based polymers — cellulose, hemicellulose and lignin;

**"littoral active zone"** has the same meaning as defined in the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008);

**"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 to identify changes in status or trends over a period, 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;

**"operational area"** means an area where organic waste is stored, treated or disposed;

**"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 humans, animals, plants or the environment containing at least 40g / kg prescribed nutrients;

**"organics"** means both processed and unprocessed biodegradable organic material;

**"organic waste"** means waste of biological origin which can be broken down, in a reasonable amount of time, into its base compounds by micro-organisms and other living things;

**"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"** has the same meaning as defined in Environmental Impact Assessment Regulations Listing Notice 1 of 2014, published under Government Notice R. 983, in *Government Gazette* 38282 of 4 December 2014, as amended from time to time.

## 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 are aimed at controlling the treatment of organic waste at any facility that falls within the threshold as described in paragraph 3 of these Norms and Standards 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 any organic waste treatment facility that has the capacity to process in excess of 10 tonnes of organic waste per day.

3.2 These Norms and Standards do not replace the need to comply with any other legislation.

3.3 These Norms and Standards do not apply to:

3.4.1 the composting of organic waste;

3.4.2 the construction, operation and expansion of any organic waste treatment facility:

3.4.2.1 within natural watercourses or within 200m of a natural watercourse, measured from the edge of the watercourse as defined by its riparian habitat;

3.4.2.2 within wetlands or floodplains, where the organic waste treatment facility will be located inside of the 1 in 100-year floodline;

3.4.2.3 within estuaries, estuarine functional zones, littoral active zones or within 100m inland of the high-water mark of the sea or an estuary; or

3.4.2.4 that requires the removal of more than 300m<sup>2</sup> of plant and animal species that are listed as endangered or critically endangered in terms of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).

3.4.3 the construction, operation and expansion of any organic waste treatment facility in an area that has been declared a protected area in terms of the National Environmental Management: Protected Areas Act 2003, (Act No. 57 of 2003); or

- 3.4.4 the construction, operation and expansion of any organic waste treatment facility in ecosystems that are listed in terms of section 52(1) of the National Environmental Management: Biodiversity Act 2004 (Act No.10 of 2004) as threatened or in need of protection.

#### 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	Livestock Feed
			Anaerobic Composting	Anaerobic Digestion			
Manure	✓			✓	✓	✓	
Mortalities	✓	✓		✓	✓	✓	
Biomass: Lignocellulose (woody)							
Agricultural crop residue	✓	✓			✓	✓	✓
Invasive plant species	✓	✓			✓	✓	
Plantation residue	✓	✓			✓	✓	
Sawmill residue	✓	✓			✓	✓	
Garden Waste	✓	✓			✓	✓	
Biomass: Low Lignocellulose (non woody)							
Agricultural crop residue	✓	✓		✓	✓	✓	✓
Sugar bagasse	✓	✓		✓	✓	✓	
Invasive plant species	✓	✓		✓	✓	✓	
Garden Waste	✓	✓		✓	✓	✓	
Food Processing:							
Abattoir	✓	✓		✓	✓	✓	
Food Oils	✓	✓		✓	✓	✓	



Table1: TYPES OF FEEDSTOCK AND TREATMENT OPTIONS							
Agriculture:	Mechanical	Chemical	Anaerobic		Aerobic	Thermal	Livestock Feed
			Anaerobic Composting	Anaerobic Digestion			
Organic Fraction of Municipal Solid Waste (MSW)	✓	✓		✓	✓	✓	
Hospitality Sector	✓	✓		✓	✓	✓	✓
Agro-processing	✓	✓		✓	✓	✓	✓
<b>Sewage:</b>							
Sludge	✓	✓		✓	✓	✓	
<b>Biodegradable and Compostable Packaging and Products</b>							
Biodegradable and compostable single use products and packaging	✓		✓		✓	✓	

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:

- 4.3.1 Any infectious animal waste;
- 4.3.2 Raw sewage; or
- 4.3.3 Sewage sludge that does not meet the minimum quality standards for sludge as determined by the DWS in their 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 The construction and operation of an organic waste treatment facility must conform to land use, zoning and consent use 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 An organic waste treatment facility must be registered with the relevant Competent Authority in accordance with these Norms and Standards, ninety (90) days prior to commencing with construction;**
- 6.1.2 The registration application referred to in subparagraph 6.1.1 must as a minimum include the following:**
- (a) the name of the organic waste treatment facility;**
  - (b) the company registration number of the organic waste treatment facility**
  - (c) the name of the owner and operator of the organic waste treatment facility;**
  - (d) physical address of the owner and operator of the organic waste treatment facility;**
  - (e) postal address of the owner and operator of the organic waste treatment facility;**
  - (f) contact details of the owner and operator of the organic waste treatment facility;**
  - (g) the name of the landowner;**
  - (h) contact details of the landowner;**
  - (i) the physical address of the organic waste treatment facility;**
  - (j) the location of the organic waste treatment facility in terms of the name of the local municipality, erf number and geographic co-ordinates;**
  - (k) land use or zoning of the property on which the organic waste treatment facility is located;**
  - (l) the size of the operational area of the organic waste treatment facility;**
  - (m) the physical footprint of the organic waste treatment facility;**
  - (n) a layout plan including all operational facets of the organic waste treatment facility;**
  - (o) the proximity of the organic waste treatment facility to the nearest residential area, schools, tertiary institutions and hospitals;**
  - (p) the category and maximum quantities of waste to be processed at the organic waste treatment facility;**
  - (q) distance of buffer zones to the following categories of organic waste:**
    - i. a minimum of 60m for Category 1 organic wastes;**
    - ii. a minimum of 150m for Category 2 organic wastes; and**
    - iii. a minimum of 450m for Category 3 organic wastes.**
  - (r) the category and maximum quantities of waste to be processed at the organic waste treatment facility;**
  - (s) the sources of waste to be processed at the organic waste treatment facility; and**
  - (t) the approved civil engineering designs, where applicable in terms of relevant building Regulations and bylaws.**

6.1.3 The registration application referred to in subparagraph 6.1.1 must be in a form determined by the relevant Competent Authority.

6.1.4 Any other approvals required by law, where relevant, including but not limited to the following:

- (a) Planning, zoning, consent use and building plan approvals from the local municipality as 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 feed 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 relevant Competent Authority, ninety (90) days prior to commencing with construction, a standard operating procedure detailing the requirements as per Annexure 2 to these Norms and Standards.

## **7. MINIMUM REQUIREMENTS FOR RECORDS AND ACCESS CONTROL**

7.1 Any organic waste treatment facility must keep records of the following:

- 7.1.1 Contact details of waste generators from whom organic waste originate;
- 7.1.2 Contact details of transport operators delivering organic waste;
- 7.1.3 Contact details of recipients of the treated organic material;
- 7.1.4 Category, tonnages and source of all organic waste accepted onto the organic waste treatment facility;
- 7.1.5 Tonnages of treated organic material exiting the organic waste treatment facility; and
- 7.1.6 Tonnages of non-organic waste, removed from organic waste, that exit the organic waste treatment facility.

7.2 Records contemplated in 7.1.1 – 7.1.6 must be kept at the organic waste treatment facility for a minimum of five (05) years.

7.3 The facility owner must put into place provisions ensuring strict access control to the organic waste treatment facility, including the following areas:

7.3.1 Areas used for receiving, storing and processing of organics, process residuals and contaminated materials; and

7.3.2 All areas used to store flammable materials or chemicals.

7.4 The facility owner / management must put in measures to control:

7.4.1 Scavenging animals, birds, flies and / or vermin that may be attracted to the feedstock storage areas;

7.4.2 Wind-blown litter;

7.4.3 Fire management;

7.4.4 Stormwater management; and

7.4.5 Odour management.

7.5 A notice board must be placed at all entrances to the organic waste treatment facility detailing the name of the organic waste treatment 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.

7.6 Safe disposal certificates, including waste manifests, must be kept on site at all times and retained for a minimum of five (5) years.

7.7 If a weighbridge is installed for measuring quantity, it must be correctly installed, calibrated, certified and must, where practicable, be operational at all times.

## **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 An organic waste treatment facility must be compliant with all applicable environmental legislation, including, but not limited to:

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).

**9.2 Waste generated during the construction, operation and decommissioning phases of the organic waste treatment facility must be disposed at a facility licenced to accept such waste.**

## **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 in place prior to commencing 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 An organic waste treatment facility must register on SAWIS, or a provincial waste information system if one is available, and must provide quarterly reporting information in the format required on registration.**

**11.2 The relevant Competent Authority must be given access, to audit or inspect the site, at any time and at such frequency as the relevant Competent Authority may decide.**

**11.3 Any records or documentation pertaining to the management of the organic waste treatment facility must be made available to the relevant Competent Authority upon request during an audit or inspection, as well as any other information which may be required.**

**11.4 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.**

**11.5 A record of any non-compliance findings by the relevant Competent Authority and the manner in which the non-compliance was addressed must be kept on file at the site at all times.**

**11.6 Internal audits detailing the environmental performance of the organic waste treatment 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 11.7 and to the relevant Competent Authority or any relevant authority on request.**

**11.7 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 relevant Competent Authority within one (1) of completion of the report and must include, but not be limited to, the following:**

- 11.7.1 The extent of compliance or non-compliance of the organic waste treatment facility to these Norms and Standards;**
- 11.7.2 The extent of compliance or non-compliance to any relevant legislative requirements regulating the treatment of organic waste;**
- 11.7.3 An interpretation of all available data and test results regarding the operation of the organic waste treatment facility and its impacts on the environment;**
- 11.7.4 Target dates for the implementation of any remediation or recommendations to achieve compliance;**
- 11.7.5 The extent of compliance or non-compliance to the provisions of section 30 of the NEMA for any incidents that occurred and details of the manner in which the incidents were addressed;**
- 11.7.6 The extent of compliance or non-compliance that hazardous waste is separated from non-hazardous waste and that the hazardous waste is removed to a facility authorised to accept such waste;**
- 11.7.7 The extent of compliance or non-compliance to the presence of records of safe disposal certificates for all hazardous waste removed from the organic waste treatment facility; and**
- 11.7.8 The extent of compliance or non-compliance that non-organic solid waste that is not considered hazardous must be disposed at a facility authorised to accept such waste.**

## **12. MINIMUM REQUIREMENTS DURING THE DECOMMISSIONING PHASE**

**12.1 For the purpose of decommissioning, all organic waste treatment facilities that fall within the scope as described in paragraph 3 of these Norms and Standards must, ninety (90) days prior to commencing with decommissioning of such facility, inform the relevant Competent 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 and contract workers, prior to such persons working on site, on**

waste management 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 and contract workers must be trained to manage the category of waste being processed at the organic waste treatment facility in accordance with the provisions of these Norms and Standards and any other relevant legislative requirements applicable to treatment of organic waste.

#### **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 register in terms of, and must comply with, these Norms and Standards within ninety (90) days of the expiry of the approval, authorisation or license.

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 paragraph 3 of these Norms and Standards, must register in terms of, and must comply with, these Norms and Standards within 90 days of publication of these Norms and Standards in the *Government Gazette*. Upon receipt of confirmation of registration, the organic waste treatment facility must deem the approval, authorisation or licence to have been surrendered.

**15. ANNEXURE 1: ORGANIC WASTE TREATMENT TECHNOLOGIES**

<b>Mechanical:</b>	
<b>Briquetting</b>	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 containing untreated biomass waste.
<b>Centrifuge</b>	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.
<b>Chipping</b>	Chipping is the process of reducing woody waste to smaller pieces mechanically 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.
<b>Pelleting</b>	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.
<b>Sonification</b>	Sonication is the act of applying sound energy to agitate particles in a sample, for various purposes.
<b>Chemical:</b>	
<b>Chemical hydrolysis</b>	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.



<b>Chemical oxidation</b>	Chemical oxidation is a process involving the transfer of electrons from the chemical species being oxidized to the oxidizing agent. 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.
<b>Transesterification</b>	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.
<b>Saponification</b>	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.
<b>Anaerobic:</b>	
<b>Anaerobic digestion</b>	Anaerobic digestion is a fermentation process that causes the breakdown of organic compounds without the presence of oxygen. This process reduces nitrogen to ammonia and produces organic acids. Carbon from organic compounds is released mainly as methane gas (CH <sub>4</sub> ). A small portion of carbon may be respired as CO <sub>2</sub> . The decomposition occurs as four stages namely: hydrolysis, acidogenesis, acetogenesis, and methanogenesis.
<b>Anaerobic Composting</b>	Anaerobic composting is an anaerobic process that uses microorganisms to ferment organic waste in an acidic environment and prevent the putrefaction of such waste. The Bokashi treatment process is one such process that has an initial stage of anaerobic composting where a specifically selected group of microorganisms is added to the organic waste through a dry carrier such as an inoculated carbon source (e.g. wheat bran) or via a liquid form such as a microbial spray which ferments the organic waste in a closed system and avoids the production of unfavourable by-products.

Aerobic:	
<b>Aerobic digestion</b>	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.
<b>Black soldier fly larvae</b>	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.
<b>Vermicomposting</b>	When a variety of worms, including earthworms, digest organic, mainly food waste, the product is called vermicompost, which consists of partially decomposed food waste, organic bedding material and vermicast
Thermal:	
<b>Aqueous reforming</b> 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.
<b>Combustion</b>	Combustion is an exothermic 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.
<b>Drying</b>	Application of heat to evaporate water from organic waste. 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".
<b>Gasification</b>	<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 (&gt;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>
<b>Hydrothermal Carbonisation (HTC)</b>	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)
<b>Hydrothermal Liquefaction (HTL)</b>	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.
<b>Pressure heating / Supercritical water gasification (SCWG)</b>	Mechanism using heat and pressure to improve char and lighter gases in biomass.
<b>Pyrolysis</b>	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.

<b>Rendering</b>	<p>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 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>
<b>Torrefaction</b>	<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>
<b>Livestock Feed</b>	
<b>Bio-processing (feeding of organic waste to domestic and livestock animals)</b>	<p>Livestock animals function as bio-processors for converting organic waste, including food waste, into meat, eggs, and milk. Organic waste and food waste possess nutritive properties and hence can be used as feed for domestic and livestock animals. Heat treatment of food waste prior to animal feeding is a global requirement with temperature and duration varying by country as well as depending on specific treatment processes. There are three broad treatment categories: wet-based, dry-based, and ensiling/fermentation. Wet-based methods typically include a simple heating step to sterilize the raw organic waste, rendering it safe for feeding to animals. Dry-based treatment combines heating (sterilization) with a drying step to produce feeds with an extended shelf life that are easier to handle. Ensiling/fermentation treatment typically consists of the heating-sterilization process followed by the addition of prescribed microbial/yeast agents. The latter utilizes readily degradable substrates, stabilizing the material while helping retain the nutrients.</p>

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

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

	<ul style="list-style-type: none"><li>• maintenance of the organic waste treatment facility and equipment</li><li>• stock controls</li></ul>
<b>Fire-fighting and prevention</b>	<ul style="list-style-type: none"><li>• fire prevention</li><li>• fire-fighting provisions</li></ul>
<b>Change of Ownership or Landowner</b>	<ul style="list-style-type: none"><li>• notification of change of ownership of the organic waste treatment facility or landowner to the relevant Competent Authority</li></ul>

**17. ANNEXURE 3: GENERAL REQUIREMENT FOR ORGANIC WASTE TREATMENT FACILITIES**

Technology	Transport	Storage	Operation	Residue / Product
<b>Mechanical</b>				
Briquette Centrifuge Chipping Pelleting Sonification	<p>-All vehicles must be regularly maintained and roadworthy</p> <p>-Ensure emissions filters are fitted on vehicles and machinery</p> <p>-Potentially use rail for transport if possible</p> <p>-Cover dusty materials during transit</p>	<p>-Storage must comply with the Waste Storage N&amp;S</p> <p>-Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises unless authorised by the relevant authority</p> <p>-No long-term storage i.e., feedstock must be used within 90 days</p> <p>- 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</p> <p>-Good housekeeping on site to prevent pests and malodours</p> <p>-Correct management of stockpiles 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>-Ensure aeration of material to prevent methane generation, unless specifically required</p> <p>-Prevent waterlogging</p> <p>-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas</p> <p>- Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises</p> <p>-Good housekeeping on site to prevent pests and malodours</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>-Maintain designated buffer distances where applicable</p>	<p>-Prevent waterlogging of finished product</p> <p>-Cover dusty materials</p>



Technology	Transport	Storage	Operation	Residue / Product
			-Provide fire safety protocol	
<b>Chemical</b>				
Chemical hydrolysis	-All vehicles must be regularly maintained and roadworthy	-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	-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 unless authorised by the relevant authority	-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Avoid over fertilising soils
Transesterification				-Compliance with DWS & DALRR 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 stockpiles to prevent fires  -Avoid shredding on windy days  -Ensure good record keeping for type and	- 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  -Maintain designated buffer distances where applicable  -Provide fire safety protocol	-Storage of biofuels must not lead to leachates polluting soils or waterways



Technology	Transport	Storage	Operation	Residue / Product
		volume of feedstock entering the premises		
<b>Anaerobic</b>				
Anaerobic digestion	<ul style="list-style-type: none"> <li>-All vehicles must be regularly maintained and roadworthy</li> <li>-Ensure emissions filters are fitted on vehicles and machinery</li> <li>-Potentially use rail for transport if possible</li> <li>-Cover dusty materials during transit</li> </ul>	<ul style="list-style-type: none"> <li>-Storage must comply with the Waste Storage N&amp;S</li> <li>-Minimising, containing and re-using contaminated stormwater and leachate so there is no discharge of contaminated wastewater from the premises unless authorised by the relevant authority</li> <li>-No long-term storage i.e., feedstock must be used within 90 days</li> <li>- 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</li> <li>-Good housekeeping on site to prevent pests and malodours</li> <li>-Correct management of stockpiles to prevent fires</li> <li>-Ensure good record keeping for type and volume of feedstock entering the premises</li> </ul>	<ul style="list-style-type: none"> <li>-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas</li> <li>- Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises</li> <li>-Good housekeeping on site to prevent pests and malodours</li> <li>-Install and maintain silencers on vehicles and equipment</li> <li>-Where possible, noisy equipment should be housed within a building or similar structure</li> <li>-Provide noise attenuation screens such as earth berms or trees</li> <li>-Maintain designated buffer distances where applicable</li> <li>-Provide fire safety protocol</li> </ul>	<ul style="list-style-type: none"> <li>-Prevent waterlogging of soil with digestate</li> <li>-Avoid over fertilising soils</li> <li>-Compliance with DWS &amp; DALRR guidelines for use of organic fertilisers to soil</li> </ul>

Technology	Transport	Storage	Operation	Residue / Product
<b>Aerobic</b>				
Aerobic digestion	-All vehicles must be regularly maintained and roadworthy	-Storage must comply with the Waste Storage N&S	-Ensure aeration of material to avoid methane generation	-Prevent waterlogging of soil with digestate
Black soldier fly larvae	-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 unless authorised by the relevant authority	-Prevent waterlogging	-Avoid over fertilising soils
Vermicomposting	-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 stockpiles to prevent fires  -Avoid shredding on windy days  -Ensure good record keeping for type and volume of feedstock	-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  -Maintain designated buffer distances where applicable	-Compliance with DWS & DALRR guidelines for use of organic fertilisers to soil  -Compliance with DALRR guidelines for animal feed for livestock

Technology	Transport	Storage	Operation	Residue / Product
		entering the premises		
<b>Thermal</b>				
Aqueous phase reforming	-All vehicles must be regularly maintained and roadworthy	-Storage must comply with the Waste Storage N&S	-Treatment must take place on impermeable surfaces (concrete, clay or heavy duty plastic) with run off collection areas	-Prevent waterlogging of soil with digestate
Combustion	-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 unless authorised by the relevant authority	- Minimising, containing and re-using wastewater so there is no discharge of contaminated wastewater from the premises	-Avoid over fertilising soils
Drying				-Compliance with DWS & DALRR guidelines for use of organic fertilisers to soil
Gasification	-Potentially use rail for transport if possible			
Hydrothermal carbonisation (HTC)	-Cover dusty materials during transit	-No long-term storage i.e., feedstock must be used within 90 days	-Good housekeeping on site to prevent pests and malodours	-Storage of biofuels must not lead to leachates polluting soils or waterways
Hydrothermal liquefaction (HTL)				
Pressure heating		- 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	-Install and maintain silencers on vehicles and equipment	
Pyrolysis			-Where possible, noisy equipment should be housed within a building or similar structure	
Rendering			-Provide noise attenuation screens such as earth berms or trees	
Torrefaction		-Good housekeeping on site to prevent pests and malodours	-Maintain designated buffer distances where applicable	
		-Correct management of stockpiles to prevent fires	-Provide fire safety protocol	
		-Avoid shredding on windy days		

Technology	Transport	Storage	Operation	Residue / Product
		-Ensure good record keeping for type and volume of feedstock entering the premises		
<b>Livestock Feed</b>				
Bio-processing (feeding of organic waste to domestic and livestock animals)	<p>-Separation at source of organic waste that is to be used as livestock feed</p> <p>-Health and safety standards must be adhered to during collections of the organic waste to minimise risk of pathogen proliferation</p> <p>-During transportation and handling of organic waste for livestock feed, leakage must be avoided and transportation containers must be leak proof</p> <p>-The weight of bins must be considered at all times which must not exceed 80kgs as this would be too heavy to transport and risks breakage and leakage</p> <p>-Between collections of organic waste for livestock feed, bins/storage receptacles must be thoroughly cleaned</p>	<p>-Animal-based organic waste must be removed from the organic waste stream where such waste is destined for pig feeding</p> <p>-Wheelie bins should be the preferred storage bins as these are leak-proof</p>	<p>-Thermal treatment of organic waste prior to feeding to livestock</p> <p>-Registration of plant-based organic waste to be used as livestock feed with FFFASR Act</p> <p>-Organic waste of animal origin to be used as livestock feed must be treated prior to feeding to livestock</p> <p>-Organic waste destined for livestock feed must be blended with other materials to ensure a nutritionally balanced livestock feed</p>	







Printed by and obtainable from the Government Printer, Bosman Street, Private Bag X85, Pretoria, 0001  
Contact Centre Tel: 012-748 6200. eMail: [info.egazette@gpw.gov.za](mailto:info.egazette@gpw.gov.za)  
Publications: Tel: (012) 748 6053, 748 6061, 748 6065