



Document title	HELCOM Recommendation for amending the Annex III part II of the Helsinki Convention
Code	4-1
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Agenda Item	4 - Revision of part 2 of Annex III of the Helsinki Convention
Submission date	6.4.2021
Submitted by	Secretariat
Reference	

Background

The Contracting Parties agreed in the 2013 Ministerial Meeting to review [Part 2 of Annex III of the Helsinki Convention](#) "Prevention of Pollution from Agriculture", in order to better serve the purpose of reaching good environmental status.

The following scope for the revision was agreed by HOD 54-2018:

- Glossary of terms;
- Regulation 2 item 3 "Manure storage";
- Regulation 2 item 6 "Application of organic manures";
- Regulation 2 Item 7 "Application rates for nutrients" only starting from the sentence "The amount of livestock manure applied to the land each year...";
- New paragraph on nutrient recycling based on the outcome of MM 2018.

HOD 59-2020 approved the revised Regulation 2 Item 3, the revised Regulation 2 Item 6 and the glossary of terms based on the proposal by the Agri group.

HOD 59-2020 considered the proposed alternatives for revising Regulation 2 item 7 and did not come to an agreement on the selection of one of those alternatives. HELCOM 42-2021 took note that the positions of countries regarding regulation 2 item 7 of the revised part 2 of Annex III to the Helsinki Convention remain unchanged and consensus on the proposal to revise the regulation could not be found and thus the current version remains valid.

HOD 59-2020 in general supported the new paragraph on nutrient recycling, taking note of a study reservation by Denmark on the first two bullet points of the new paragraph on nutrient recycling and that Germany finds that it would be desirable for the paragraph to be formulated with the same ambition as the Nutrient Recycling Strategy and the currently proposed texts for the BSAP. HELCOM 42-2021 noted that Denmark is not in the position to lift their study reservation on the nutrient recycling paragraph of the revised Part 2 Annex III and that Denmark will provide written proposal on the issue to AGRI 11-2021.

HELCOM 42-2021 requested the Agri Group to draft the HELCOM Recommendation required for adopting the revised Part 2 of Annex III to the Helsinki Convention and to submit the draft Recommendation to HOD 60-2021 for endorsement with subsequent adoption at 2021 Ministerial Meeting together with the updated BSAP.

Please note that in the attached document the numbering of the items under Regulation 2 “Plant nutrients” has been corrected with track changes since item 4 was missing from the original text.

In line with common practice applied in e.g. Annexes IV and VI to the Helsinki Convention a specific regulation could be included in the Annex III part II to provide definitions used for the purposes of the Annex. The definitions are now included as “Regulation x” to provide an example. The glossary of terms containing these definitions is also included in the Attachment 2 to this document. The terms should still be checked when also the text of the new paragraph on nutrient recycling is finalized.

Action requested

The Meeting is invited to agree on the draft HELCOM Recommendation required for adopting the revised Part 2 of Annex III to the Helsinki Convention for submission to HOD 60-2021

HELCOM RECOMMENDATION 42E/x

Adopted 20 October 2021
having regard to Article 20, Paragraph 1 c)
of the Helsinki Convention

AMENDMENTS TO PART II ANNEX III “CRITERIA AND MEASURES CONCERNING THE PREVENTION OF POLLUTION FROM LAND-BASED SOURCES” OF THE 1992 HELSINKI CONVENTION

THE COMMISSION,

TAKING INTO CONSIDERATION the amendment procedure for the Annexes of the 1992 Helsinki Convention, as contained in Article 32 of that Convention,

RESOLVES:

- a) to amend part II Annex III of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992, in accordance with the Attachment to this Recommendation;
- b) to ask the Depositary Government to Communicate these amendments to the Contracting Parties with the Commission's Recommendation for acceptance; and
- c) to determine that the accepted amendments shall enter into force one year after the adoption of this HELCOM Recommendation,

REQUESTS the Governments of the Contracting Parties to report on the progress of implementation of the amendments to Annex III in accordance with the agreed deadlines and Article 16, Paragraph 1 of the 1992 Helsinki Convention.

Revised Annex III “Criteria and Measures Concerning the Prevention of Pollution from Land-Based Sources”

Part II: Prevention of Pollution from Agriculture

Regulation 1: General provisions

In accordance with the relevant parts of this Convention, the Contracting Parties shall apply the measures described below and take into account Best Environmental Practice (BEP) and Best Available Technology (BAT) to reduce the pollution from agricultural activities. The Contracting Parties shall elaborate Guidelines containing items specified below and report to the Commission.

Regulation X: Definitions

For the purposes of the Annex III part II [Regulation 2], the following definitions are used:

1. “Environmentally friendly way” means ways (of doing something) that ensure minimal or least negative effects on adjacent waters, soils, atmospheric environments and habitats
2. “Nutrient” means chemical element necessary for plant growth and/or plant metabolism. In its absence, the plant is unable to complete a normal life cycle or the element is part of some essential plant constituent or metabolite. There are numerous nutrients for plants, of which carbon, hydrogen, oxygen (CHO) and nitrogen, phosphorus and potassium (NPK) are considered the main components and primary macronutrients, respectively.
3. “Nutrient surplus” means the positive saldo of a nutrient balance equates to the difference between nutrient inputs and nutrient outputs in relation to the utilized agricultural area (UAA). Input can contain N/P of crop residues, seed bound N/P, atmospheric N, N binding from legumes as well as mineral and organic fertilizers etc., while output consists of harvested crops/grass.
4. “Nutrient loss means” (unintentional) (co-)transport of nutrients beyond the reach of plants in a production system by/in water, air or particles to the atmos- or hydrosphere
5. “Nutrient status” (of fields) means the amount of plant available nutrients in the soil (within a field), taking readily plant available and potentially plant available nutrient pools into consideration. Nutrient status can differ considerably for the various nutrients at a time (within one field/soil) and should hence be determined for the individual nutrients.
6. “Fertilizer” means any matter or product containing one or more nutrients to enhance the growth of vegetation.
7. “Organic fertilizer” means any fertilizer product containing organic matter and nutrients, may be based on livestock manure, sewage sludge or other organic residual materials. Examples for organic fertilizer are compost or digestate.
8. “Mineral fertilizer” means any fertilizer product free of organic matter, but containing nutrients, also sometimes referred to as “chemical fertilizer” or “inorganic fertilizer”. May also be produced by processing organic fertilizers, resulting in inorganic products such as ammonia sulphate or struvite.
9. “Livestock” means domesticated animals raised in an agricultural setting to produce labour and commodities, e.g. meat, eggs, milk, fur, leather and wool.
10. “Livestock manure” means any liquid or solid organic material from livestock production, including excreta (faeces and urine), bedding material etc.
11. “Solid livestock manure” means any manure from housed livestock that has a high dry matter content (typically above 12%), does not flow under gravity, cannot be pumped and hence can be stacked in a heap. It may contain bedding material and/or fodder residues.
12. “Liquid livestock manure/Slurry” means any manure from housed livestock that flows under gravity or can be pumped It may contain some bedding material or cleaning water from the housing unit or the milking system. Dry matter content is low (typically below 12%).

13. "Organic residual materials" means any organic material that supplies organic matter together with nutrients to soils, including livestock manure, sewage sludge, organic waste, industrial sludge, crop residues.
14. "Sewage sludge" means residual sludge from urban waste water treatment plants.
15. "Total nitrogen in livestock manure" means the sum of both the organic and inorganic nitrogen in readily plant available pools and in the organic matter, which will mineralize with time. Total nitrogen in livestock manure is determined by methods including complete decomposition, e.g. of organic matter by the Kjeldahl total nitrogen method or by total combustion (Dumas method).
16. "Phosphorus in livestock manure" means the sum of both the organic and inorganic phosphorus in readily plant available pools and in the organic matter, which will mineralize with time. Total phosphorus in livestock manures is determined by methods including complete decomposition.
17. "Utilisation efficiency" means, in the case of nitrogen, the percentage of total nitrogen content in an organic fertilizer or an organic residual material that is and will become utilized by plants. Reflects that the total nitrogen content in organic fertilizers and organic residual materials is not immediately accessible to plant consumption. Utilization efficiency is considered to be "high" if the (utilization) percentage considerably exceeds the ammoniacal/mineral nitrogen share of the total nitrogen content.
18. "Phytoavailability" means "Plant availability": (degree of) a plants' possibility to uptake a compound, e.g. nutrient, (harmful) substance, etc., via sub- or above-surface parts of a plant.
19. "Bioavailability" means (degree of) an organisms' possibility to uptake a compound, e.g. nutrient, (harmful) substance, etc.
20. "Harmful substance" means any substance that can disturb, reduce, deteriorate or destroy the metabolism of one or more organisms or the equilibrium of an ecosystem.
21. "Storage capacity" means the total volume of storage for liquid and solid manure living up to the criteria for environmentally favourable storing. Sufficient capacity includes the volume of waters from sources such as facility cleaning etc., and (depending on whether the storage container is sheltered from rain or not) the maximal volume of rainwater entering the storage.
22. "Best available application technique" means the application technique, which – at the current state of technology development – results in the lowest (nutrient) loss and emissions, respectively.
23. "Application/Spreading" means addition of fertilizer to land, including spreading on the soil, injection into the soil or mixing with the surface soil layers
24. "(coherent) mitigation measures" mean (a suited set of) measures, which limit, stop or reverse the magnitude and/or rate of environmental contamination.
25. "Emission(s)" means loss of substances to the air/atmosphere, for example of gaseous nutrient-containing compounds such as ammonia or greenhouse gases (e.g. methane).
26. "Mineralisation" [in soil science] is the decomposition of organic matter in soil by microorganisms to simple inorganic substances and minerals, which may be available to plants. Its rate depends on the material to be mineralised, and the living conditions for the microorganisms such as temperature, oxygen availability, soil moisture etc.
27. "Leaching" means the loss of plant nutrients by gravimetric water transport from the soil's root zone, due to rain, snowmelt and/or irrigation, resulting in a downward water movement.
28. "Soil characteristics" mean entity of soil properties, such as texture, structure, porosity, pH, nutrient stocks, sorption and desorption, soil organic matter content, bulk density, etc. , which determine the processes in soil and soil functions with regard to supporting plant growth, filtering water, suitability as habitat, etc.
29. "Bare soil" means soil without any plant cover.
30. "Humus" means all dead organic material in soil originating from the decay of plants and animals, being natural or anthropogenically added. Humus is mainly amorphous, causes greyish to black colours, and is relatively stable to decomposition by microorganisms. Humus can be persistent for many years. Standard measuring is the determination of organic carbon (Corg; Corg content [% by

weight] x 1.72 = Humus content [% by weight]; in some cases the factor 2.0 is used). Humus normally decreases bulk density of soil and increases retention of water and nutrients, so it is valuable for plant growth and soil fertility.

31. "Growing season" means the period of the year where conditions allow for plant growth. The (climate-dependent) growing season does not necessarily coincide with periods of plant nutrient uptake during a crop's growing cycle (crop-dependent).

Regulation 2: Plant nutrients

The Contracting Parties shall integrate the following basic principles into national legislation or guidelines and adapt them to the prevailing conditions within the country to reduce the adverse environmental effects of agriculture. Specified requirement levels shall be considered to be a minimum basis for national legislation.

1. Animal density

To ensure that manure is not produced in excess in comparison to the amount of arable land, there must be a balance between the number of animals on the farm and the amount of land available for spreading manure, expressed as animal density. The maximum number of animals should be determined with consideration taken of the need to balance between the amount of phosphorus and nitrogen in manure and the crops' requirements for plant nutrients.

2. Location and design of farm animal houses

Farm animal houses and similar enclosures for animals should be located and designed in such a way that ground and surface water will not be polluted.

3. Construction of livestock manure storage

Livestock manures must be stored in environmentally friendly way and should be handled in such a way that it promotes as high utilisation efficiency as possible. Co-operation among farmers in the use of livestock manures has to be encouraged.

Storage capacity shall be at least 6 months and sufficiently large to store livestock manures that accumulate during the longest period when land application is prohibited. Livestock manure processing, and/or transfer to other farms for immediate application or for sufficient storage when land application is prohibited, may be taken into account when required capacity is determined.

Livestock manure storage facilities should be constructed and regularly inspected to safeguard against spillages and be of such a quality that prevents losses. With regard to different types of livestock manures, the following principles should be considered:

- solid livestock manure should be stored in places with watertight floor and side walls;
- liquid livestock manure should be stored in containers whose bottoms and walls are made of material impermeable to moisture and resistant to impacts of livestock manure handling operations;
- manure storages should preferably be covered to prevent emissions.

It is possible to temporarily store solid livestock manure directly on utilised agricultural area, but it requires a set of coherent mitigation measures on site, which prevents nutrient losses under specific local conditions. The interim storage of livestock manure cannot be a part of required storage capacity of the farm.

These storage requirements should preferably be considered also for other types organic fertilizers.

4. Agricultural wastewater, manure and silage effluents

Wastewater from animal housing should either be stored in urine or slurry stores or else be treated in some suitable manner to prevent pollution. Effluents from manure or from preparation and storage of silage should be collected and directed to storage units for urine or liquid manure.

5. Application of organic fertilisers and organic residual materials

Organic fertilisers and organic residual materials are valuable sources of nitrogen, phosphorous, potassium and organic carbon which are required for the replenishment of nutrients and humus in soil.

In addition to the amount of these nutrients, amounts of harmful substances, phyto-/ bioavailability and mineralisation rate of different organic fertilizers types should also be considered in order to ensure the optimal supply of the plants and to avoid eutrophication and contamination.

In order to facilitate high utilization efficiency, the best available application technique should be used, depending on the type of fertilizer, crop and location characteristics.

Organic fertilisers and organic residual materials should be incorporated as soon as possible after spreading and always in case of application on bare soils.

The nutrients should be available to the plants during the growing season taking into account the turnover rate of different fertilizers. If soils are frozen, water saturated, flooded or covered with snow no application of organic fertilisers and organic residual materials is permitted. Further periods with high risk of leaching shall be defined when no application is accepted.

6. Application rates for nutrients

The application of nutrients in agricultural land shall be limited, based on a balance between the foreseeable nutrient requirements of the crops and the nutrient supply to the crops from the soil and the nutrients with a view to minimise eutrophication.

National guidelines should be developed with fertilising recommendations and they should make reference to:

- soil conditions, soil nutrient content, soil type and slope;
- climatic conditions and irrigation;
- land use and agricultural practices, including crop rotation systems;
- all external potential nutrient sources

The amount of livestock manure applied to the land each year including by the animals themselves should not exceed the amount of manure containing:

- 170 kg/ha nitrogen
- 25 kg/ha phosphorus

with a view to avoiding nutrient surplus, taking soil characteristics, agricultural practices and crop types into account.

7. Winter crop cover

In relevant regions the cultivated area should be sufficiently covered by crops in winter and autumn to effectively reduce the loss of plant nutrients

8. Water protection measures and nutrient reduction areas

Protection measures should be established to prevent nutrient losses to water particularly as regards

- Surface water: buffer zones, riparian zones or sedimentation ponds should be established, if necessary.
- Groundwater: Groundwater protection zones should be established if necessary. Appropriate measures such as reduced fertilisation rates, zones where manure spreading is prohibited and permanent grassland areas should be established.
- Nutrient reduction areas: Wetland areas should be retained and where possible restored, to be able to reduce plant nutrient losses and to retain biological diversity.

9. Ammonia emissions

In order to reduce ammonia emissions from animal husbandry, a surplus of nitrogen in the manure should be avoided by adjusting the composition of the diet to the requirements of the individual animal. In poultry production, emissions should be brought down by reducing the moisture content of the manure or by removal of manure to storage outside the housing system as soon as possible.

Programmes including strategies and measures for reducing ammonia volatilisation from animal husbandry should be developed.

Urine and slurry stores should be covered or handled by a method that efficiently reduces ammonia emissions.

10. Nutrient recycling

In order to reduce nutrient loss to the Baltic Sea and to achieve nutrient saving, efficient use of nutrient resources in agriculture and recovery of nutrients from various flows in society back to agriculture, countries are encouraged to design and implement nutrient recycling strategies, which should include:

- providing current sub-national level information about production of organic residual materials, especially livestock manure and sewage sludge;
- providing current sub-national level information of the nutrient status of fields, and national soil maps particularly in regard to phosphorus;
- enabling the development of markets for recycled organic fertilizers with the aim of promoting sub- and/or transnational level reallocation of nutrients, including replacement of mineral fertilizers;
- developing actions for improved recycled fertilizer production, including information of product safety, usability, production technologies and logistical solutions;
- encouraging close cooperation between livestock and crop producers to use nutrients efficiently and to secure soil fertility.

Regulation 3: Plant protection products

Plant protection products shall only be handled and used according to a national risk reduction strategy which shall be based on BEP. The strategy should be based on an inventory of the existing problems and define suitable goals. It shall include measures such as:

1. Registration and approval

Plant protection products shall not be sold, imported or applied until registration and approval for such purposes has been granted by the national authorities.

2. Storage and handling

Storage and handling of plant protection products shall be carried out so that the risks of spillage or leakage are prevented. Some crucial areas are transportation and filling and cleaning of equipment. Other dispersal of plant protection products outside the treated agricultural land area shall be prevented. Waste of plant protection products shall be disposed of according to national legislation.

3. Licence

A licence shall be required for commercial use of plant protection products. To obtain a licence, suitable education and training on how to handle plant protection products with a minimum of impact on health and the environment shall be required. The users' knowledge regarding the handling and usage of plant protection products shall be updated regularly.

4. Application technology

Application technology and practice should be designed to prevent unintentional drift or runoff of plant protection products. Establishment of protection zones along surface waters should be encouraged. Application by aircraft shall be forbidden; exceptional cases require authorisation.

5. Testing of spraying equipment

Testing of spraying equipment at regular intervals shall be promoted to ensure a reliable result when spraying with plant protection products.

6. Alternative methods of control

Development of alternative methods for plant protection control should be encouraged.

Regulation 4: Environmental permits

Farms with livestock production above a specified size should require approval with regard to environmental aspects and impacts of the farms.

Installations for the intensive rearing of poultry, pigs and cattle with more than 40,000 places for poultry, 2,000 places for production pigs (over 30 kg), 750 places for sows or 400 animal units cattle shall have a permit fully co-ordinated by the relevant authorities.

The permits must take into account the whole environmental performance of the enterprise, covering e.g. emissions to air, water and land, generation of waste and prevention of environmental accidents. The permit conditions must be based on BAT.

The competent authorities, in determining permit conditions, can take into account the technical characteristics of the enterprise, its geographical location and the local environmental conditions.

These large animal enterprises shall be considered as point sources and shall have adequate measures.

For installations with more than 100 AU the Contracting Parties shall put in practice general rules or a system corresponding to a simplified permit system to ensure the implementation of the requirements in this Annex.

Both of these permit systems shall be applied to existing installations and new installations and existing installations which are subject to substantial changes by 2012.

Regulation 5: Monitoring and evaluation

The Contracting Parties shall describe the implementation and monitoring of measures in this Annex in their national programmes.

To evaluate the effectiveness of the measures, the Contracting Parties shall develop projects to assess the effects of measures and the impacts of the agricultural sector on the environment.

Regulation 6: Education, information and extension service

The Contracting Parties shall promote systems for education, information and extension (advisory service) on environmental issues in the agricultural sector.

Attachment 2. Glossary of terms

Term	descriptions within the context of the revised parts of the Annex	Occurrence in HELCOM Annex III, part 2, item #
Environmentally friendly way	ways (of doing something) that ensure minimal or least negative effects on adjacent waters, soils, atmospheric environments and habitats	3
Nutrient	Chemical element necessary for plant growth and/or plant metabolism In its absence, the plant is unable to complete a normal life cycle or the element is part of some essential plant constituent or metabolite. There are numerous nutrients for plants, of which carbon, hydrogen, oxygen (CHO) and nitrogen, phosphorus and potassium (NPK) are considered the main components and primary macronutrients, respectively.	3, 6, 7, new paragraph on nutrient recycling
Nutrient surplus	The positive saldo of a nutrient balance equates to the difference between nutrient inputs and nutrient outputs in relation to the utilized agricultural area (UAA). Input can contain N/P of crop residues, seed bound N/P, atmospheric N, N binding from legumes as well as mineral and organic fertilizers etc., while output consists of harvested crops/grass.	7
Nutrient loss	(unintentional) (co-)transport of nutrients beyond the reach of plants in a production system by/in water, air or particles to the atmos- or hydrosphere	7 & new paragraph on nutrient recycling
Nutrient status (of fields)	Amount of plant available nutrients in the soil (within a field), taking readily plant available and potentially plant available nutrient pools into consideration Nutrient status can differ considerably for the various nutrients at a time (within one field/soil) and should hence be determined for the individual nutrients.	7 & new paragraph on nutrient recycling
Fertilizer	Any matter or product containing one or more nutrients to enhance the growth of vegetation	3, 6 & new paragraph on nutrient recycling
Organic fertilizer	Any fertilizer product containing organic matter and nutrients, may be based on livestock manure, sewage sludge or other organic residual materials Examples for organic fertilizer are compost or digestate.	3, 6
Mineral fertilizer	Any fertilizer product free of organic matter, but containing nutrients, also sometimes referred to as “chemical fertilizer” or “inorganic fertilizer”	new paragraph on nutrient recycling

	[May also be produced by processing organic fertilizers, resulting in inorganic products such as ammonia sulphate or struvite]	
Livestock	Domesticated animals raised in an agricultural setting to produce labour and commodities, e.g. meat, eggs, milk, fur, leather and wool	3, 7 & new paragraph on nutrient recycling
Livestock manure	Any liquid or solid organic material from livestock production, including excreta (faeces and urine), bedding material etc.	3, 6, 7 & new paragraph on nutrient recycling
Solid livestock manure	Any manure from housed livestock that has a high dry matter content (typically above 12%), does not flow under gravity, cannot be pumped and hence can be stacked in a heap It may contain bedding material and/or fodder residues.	3
Liquid livestock manure/Slurry	Any manure from housed livestock that flows under gravity or can be pumped It may contain some bedding material or cleaning water from the housing unit or the milking system. Dry matter content is low (typically below 12%).	3, 6
Organic residual materials	Any organic material that supplies organic matter together with nutrients to soils, including livestock manure, sewage sludge, organic waste, industrial sludge, crop residues	6 (& (potentially) new paragraph on nutrient recycling)
Sewage sludge	Residual sludge from urban waste water treatment plants	new paragraph on nutrient recycling
Urban waste water	Mixture of domestic waste water, industrial waste water and/or run-off rain water	Nowhere, but used in other description
Total nitrogen in livestock manure	The sum of both the organic and inorganic nitrogen in readily plant available pools and in the organic matter, which will mineralize with time Total nitrogen in livestock manure is determined by methods including complete decomposition, e.g. of organic matter by the Kjeldahl total nitrogen method or by total combustion (Dumas method).	7
Phosphorus in livestock manure	The sum of both the organic and inorganic phosphorus in readily plant available pools and in the organic matter, which will mineralize with time Total phosphorus in livestock manures is determined by methods including complete decomposition.	7
Dry matter content	The dry fraction of the organic residual material remaining after evaporation of water until constant mass	Nowhere, but used in other descriptions
Utilisation efficiency	In the case of nitrogen, the percentage of total nitrogen content in an organic fertilizer or an	6

	<p>organic residual material that is and will become utilized by plants</p> <p>Reflects that the total nitrogen content in organic fertilizers and organic residual materials is not immediately accessible to plant consumption</p> <p>Utilization efficiency is considered to be “high” if the (utilization) percentage considerably exceeds the ammoniacal/mineral nitrogen share of the total nitrogen content.</p>	
Phytoavailability	= “Plant availability”: (degree of) a plants’ possibility to uptake a compound, e.g. nutrient, (harmful) substance, etc., via sub- or above-surface parts of a plant	6
Bioavailability	(degree of) an organisms’ possibility to uptake a compound, e.g. nutrient, (harmful) substance, etc.	6
Harmful substance	Any substance that can disturb, reduce, deteriorate or destroy the metabolism of one or more organisms or the equilibrium of an ecosystem	6
Storage capacity	Storage capacity is the total volume of storage for liquid and solid manure living up to the criteria for environmentally favourable storing. Sufficient capacity includes the volume of waters from sources such as facility cleaning etc., and (depending on whether the storage container is sheltered from rain or not) the maximal volume of rainwater entering the storage.	3
Best available application technique	The application technique, which – at the current state of technology development – results in the lowest (nutrient) loss and emissions, respectively	6
Application/Spreading	Addition of fertilizer to land, including spreading on the soil, injection into the soil or mixing with the surface soil layers	3, 6, 7 & new paragraph on nutrient recycling
(coherent) mitigation measures	(a suited set of) measures, which limit, stop or reverse the magnitude and/or rate of environmental contamination	3
Emission(s)	Loss of substances to the air/atmosphere, for example of gaseous nutrient-containing compounds such as ammonia or greenhouse gases (e.g. methane)	3
Mineralisation	<p>Mineralisation [in soil science] is the decomposition of organic matter in soil by microorganisms to simple inorganic substances and minerals, which may be available to plants.</p> <p>Its rate depends on the material to be mineralised, and the living conditions for the</p>	6

	microorganisms such as temperature, oxygen availability, soil moisture etc.	
Leaching	The loss of plant nutrients by gravimetric water transport from the soil's root zone, due to rain, snowmelt and/or irrigation, resulting in a downward water movement	6
Soil characteristics	Entity of soil properties, such as texture, structure, porosity, pH, nutrient stocks, sorption and desorption, soil organic matter content, bulk density, etc. , which determine the processes in soil and soil functions with regard to supporting plant growth, filtering water, suitability as habitat, etc.	7
Bare soil	Soil without any plant cover	6
Humus	All dead organic material in soil originating from the decay of plants and animals, being natural or anthropogenically added Humus is mainly amorphous, causes greyish to black colours, and is relatively stable to decomposition by microorganisms. Humus can be persistent for many years. Standard measuring is the determination of organic carbon (Corg; Corg content [% by weight] x 1.72 = Humus content [% by weight]; in some cases the factor 2.0 is used). Humus normally decreases bulk density of soil and increases retention of water and nutrients, so it is valuable for plant growth and soil fertility.	6
Growing season	The period of the year where conditions allow for plant growth The (climate-dependent) growing season does not necessarily coincide with periods of plant nutrient uptake during a crop's growing cycle (crop-dependent).	6