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Submitted by	Sweden and Germany
Reference	2013 Ministerial Declaration

Background

Nutrients, in particular phosphorus, are needed for effective husbandry. They are applied in agriculture, horticulture as well as in many cases in forestry. But the access of virgin phosphorus with low contamination is not endless. To be able to produce food in the future without polluting the arable land we need to act now and start reuse the phosphorus that is already in use. When the waste water treatment plant works properly the sewage sludge from the treatment contains nutrients, micronutrients and particles that increases the content of humus in the soil. These substances are needed in production of food from arable land.

At the same time sewage sludge can be contaminated with heavy metals and many other unwanted or even harmful organic and inorganic substances. The other restriction in application the sewage sludge for increasing soil productivity is possible bacteriological contamination.

Nevertheless, in case of proper sewage sludge treatment and application unwanted factors can be eliminated or minimized up to acceptable level.

The 2013 HELCOM Ministerial Meeting called for sustainable use of nutrients, enhancement of phosphorus recycling (especially in agriculture and waste water treatment) and promoting development of appropriate methodologies.

This document contains draft of HELCOM Recommendation on Sewage Sludge Handling taking into account the received comments (Attachment 1), as well as updated background information and explanations of the different articles in the draft (Attachment 2), compiled by Lead Countries Sweden and Germany.

Action required

The Meeting is invited to take note drafting of HELCOM Recommendation on Sewage Sludge Handling and make use of it planning work on phosphorus recycling.

Attachment 1

Draft HELCOM Recommendation on Sewage Sludge Handling

[HELCOM RECOMMENDATION XX/X]

[Adopted XXXXX],

having regard to Article 20, Paragraph 1 b) of the Helsinki Convention

SEWAGE SLUDGE HANDLING**THE COMMISSION,**

RECALLING Paragraph 1 of Article 6 of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992 (Helsinki Convention), in which the Contracting Parties undertake to prevent and eliminate pollution of the Baltic Sea Area from land-based sources,

HAVING REGARD also to Article 3 of the Helsinki Convention, in which the Contracting Parties shall individually or jointly take all appropriate legislative, administrative or other relevant measures to prevent and abate pollution in order to promote the ecological restoration of the Baltic Sea Area,

RECALLING Article 5 of the Helsinki Convention, in which the Contracting Parties undertake to prevent and eliminate pollution of the marine environment of the Baltic Sea caused by harmful substances,

RECALLING ALSO the Baltic Sea Action Plan (BSAP) adopted at the HELCOM Ministerial Meeting 2007 (Krakow) that calls for urgent actions to reduce the discharges of nutrients and hazardous substances to the Baltic Sea Area,

RECALLING FURTHER that the HELCOM Ministerial Meeting in 2010 (Moscow) and the high-level segment of the Helsinki Commission meeting in 2011 highlighted the need to improve resource efficiency and recycling of nutrients through utilisation of sewage sludge,

RECALLING AS WELL that the 2013 HELCOM Ministerial Meeting called for sustainable use of nutrients, enhancement of phosphorus recycling (especially in agriculture and waste water treatment) and promoting development of appropriate methodologies.

RECOGNISING that phosphorus is a limited resource and thus recycling of nutrients and energy from the sewage sludge is important,

TAKING INTO ACCOUNT that leakage of nutrients from agriculture is the primary contributor to the eutrophication of the Baltic Sea and that **THEREAFTER** sewage sludge need to be used in a manner to minimize the risk for leakage of pollutants to water bodies,

RECOGNISING ALSO that some substances in the sewage sludge can be harmful for plants, animals and humans, and that reuse and disposal of sewage sludge shall not cause any harmful effects, including accumulation and interactions of harmful substances and its degradation products, on humans, animals, vegetation, soil and waters,

RECOGNISING FURTHER that addition of sewage sludge to agriculture often has a positive effect on microorganisms in the soil, and that treatment of sewage sludge has found to be necessary before it is used in agriculture,

RECOGNISING ALSO that improved quality of incoming wastewater to wastewater treatment plants is necessary to obtain the best possible quality of the sewage sludge,

NOTING that for the purpose of this Recommendation the definition of sewage sludge should be the same as the definition of sewage sludge according to the Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture,

DESIRING not to lose the nutrients in the sludge, especially phosphorus, to make use of its material and energy and to dispose it safe, efficiently and sustainable,

NOTING the waste management hierarchy set in the in the EU Waste Framework Directive 2008/98/EC contains following steps: prevention; preparing for re-use; recycling; recovery (including energy recovery); and disposal.

RECOMMENDS to the Governments of the Contracting States to the Helsinki Convention that the following procedure is ensured with regards to sewage sludge handling:

A. Overall sewage sludge handling

1. The waste water quality has to be continuously improved at the origin to obtain a better sludge quality.
If unwanted substances are identified plans should be established for the WWTP on how to prevent the unwanted substances to enter the plant.
2. The waste water and the sewage sludge should be treated with the best available techniques intended to get the best possible sludge quality regarding to the usage of the sludge.
3. Design of new WWTPs or reconstruction work should take into account that waste water treatment technology should be chosen to facilitate reuse or recycling of nutrients from the sewage sludge.
4. Gas should be extracted and collected from the sewage sludge if possible. If gas is produced via anaerobe sludge handling the gas should be energetically used.

B. Restrictions

1. Landfilling of sewage sludge should be avoided.
2. Sewage sludge from other WWTPs than for treatment of domestic waste water or waste water with a similarly low content of pollutants should not be applied on or used in soils.
3. Sewage sludge must not be applied on land during the cultivation of fruits and vegetables. Sewage sludge must not be applied on land intended for coming cultivation of fruits and vegetables within one year before harvest.
4. On arable land used for growing feed or sugar beet, insofar as the sugar beet foliage is used as feed, it shall only be allowed to apply sewage sludge before sowing and with subsequent deep-turn tillage. On arable land used for growing silo and green maize, the sewage sludge must be worked into the soil before sowing.
5. Sewage sludge must not be applied on permanent grassland.
6. Sewage sludge must not be applied on soils used for forestry, except there is a special permission from the competent authorities.
7. Sewage sludge must not be applied on agriculturally or horticulturally used soils in nature reserves, nature benchmarks, national parks, protected parts of the landscape and other areas of special interest, except there is a special permission from the competent authorities.
8. Sewage sludge must not be applied in wetlands, potential flooded areas, water protected zones or closer than 10 meters from water bodies.

C. Recommendations regarding agricultural and horticulture use

1. Before sewage sludge is applied for the first time the soil has to be analyzed on at least the following parameters:
 - Heavy metals: Cd, Cu, Ni, Pb, Zn, Hg, Cr, Ag, As, Tl, U
 - Nutrients: P, N
 - Others: pH, type of the soil
2. Analysis of the soil should be repeated whenever necessary.
3. The application of sewage sludge on/in soil has to be critically considered if the soil analyses show that the content of the following parameters exceed at least one of the values in Table 1.

Table 1. Concentration of unwanted substances in soil

Parameters	Concentration (mg/kg DS)
Cd	0.4
Cu	40
Ni	30
Pb	40
Zn	100
Hg	0.3
Cr	60

4. Sewage sludge must not be applied on soils if the phosphorus content in the soil is sufficient for the crop.
5. If the sewage sludge is to be used in agriculture or horticulture it has to be:
 - hygienized or
 - assured that no problematically pathogens exist in the sludge or
 - worked into the soil
6. Representative samples should be taken from each batch of sewage sludge that will be used on the arable land and analysis of the sewage sludge should be made.
7. The application of sewage sludge on/in soil has to be critically considered if the sludge analysis show that the content of the following parameters exceed at least one of the values in Table 2:

Table 2. Concentration of unwanted substances in sludge for use in agriculture
(one of the two limits should be used mg/kg DS or mg/kg P)

Parameter	Concentration (mg/ kg DS)	Concentration (mg/kg P)
Cd	1	40
Cu	900	21 400
Ni	50	1 400
Pb	100	1 600
Zn	2 500	800
Hg	1	40
Cr	300	2 100
Ag	5	180
As	18	-
Tl	1.5	-
U	50 mg Uran/ kg P2O5	-
B(a)P (Benzo(a)pyren)	1	-
PCB (Polychlorinated Biphenyls)	0.1	2

PCDD/F (Polychlorinated Dibenzenodioxins and Polychlorinated Dibenzofurans)	30*	700*
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*ng TEQ/kg TS alt ng TEQ/kg P

8. The quantity of sewage sludge should be regulated in such a way that the accumulation of unwanted substances are limited by either
- a limit of the average amount of five tons sewage sludge added per hectar in three years
 - or in accordance with Table 3. Exemptions should be possible if a lack of special nutrients e.g. copper is proven in the soil.

Table 3. Concentrations of unwanted substances which may be added to agricultural land on a yearly average.

Parameter	Concentration (g/ha and year)
Cd	0.55
Cu	300
Ni	25
Pb	25
Zn	600
Hg	0.8
Cr	40

D. Recommendations regarding use on other land than agricultural land

If mixing sewage sludge with other organic compounds to create soil the following should be taken into account that the amount of unwanted substances in the mixed product should not exceed the limits in Table 2.

E. Recommendations regarding incineration and construction

1. If the sewage sludge is incinerated,
 - the produced energy has to be collected and used,
 - valuable substances, especially phosphorus, should be removed from the sewage sludge previously or from the ashes as soon as appropriate techniques are available if the content of phosphorus is considerable. If it is not possible to remove the phosphorus from sludge or ashes directly and the content of phosphorus is considerable high, the ash should be stored temporally in mono-landfills to remove the phosphorus later when appropriate techniques are available. The use of best available techniques for mono-landfills is required.
2. If the sewage sludge is used substantial as construction material of for industry, valuable substances, especially nutrients like phosphorus, should be removed from the sewage sludge previously if appropriate techniques are available, in case the nutrients are not needed in the material and lost for further use.

RECOMMENDS FURTHER that the Contracting States report to the Helsinki Commission every three years starting at the end of [2016] with data from [2015],

RECOMMENDS ALSO that the Contracting Parties re-evaluate the present Recommendation and reconsider it in 2021 taking into account new developments on national or international and EU level for Member States,

RECOMMENDS ALSO that the Contracting Parties establish a programme for the implementation of this Recommendation and that the Contracting Parties provide the Helsinki Commission with information on the programme at the latest by 30 June 2017.

REPORTING FORMAT FOR [HELCOM RECOMMENDATION CONCERNING SEWAGE SLUDGE HANDLING			
Lead Country: Germany/ Sweden			
Country:		Year:	
A. Waste water from origins			
1. Have actions been taken to improve the waste water quality from origins before it reach WWTP (source reduction)?	Yes	No	Unknown/ comments
2. Is improved waste water quality from origins a matter for the central, regional or local governments?	Yes	No	Unknown/ comments
B. Sewage sludge handling			
1. Generated sewage sludge, dry mass, t/a			
2. Usage of sewage sludge	Amount, dry mass, t/a	Number of installations	
a) incineration, co-combustion			
b) incineration, mono			
c) landfilling			
d) landfilling, mono			
e) landscaping			
f) agriculture			
g) forestry			
h) other usages			
5. Have actions been taken to reduce the leakage of nutrients from sludge handling?	Yes	No	Unknown/ comments
6. Describe how the Recommendation concerning sewage sludge handling has been implemented; new legislation, amendment to existing legislation or other means.			
7. Do your country technically recycle phosphorus from	Yes	No	Percentage of total amount
a) waste water,			
b) sewage sludge or			
c) sewage sludge ashes?			

Attachment 2

Explanation of the different articles in the Recommendation

The reasons for having a recommendation regarding sewage sludge handling are the following: When the waste water treatment plant works properly the sewage sludge from the treatment contains nutrients, micronutrients and particles that increases the content of humus in the soil. These substances are needed in production of food from arable land. If we do not reuse the nutrient phosphorus from the sludge we need to produce and buy mineral fertilizers. The phosphorus in these fertilizers is at some level contaminated by unwanted substances such as cadmium. And the access of virgin phosphorus with low contamination is not endless. To be able to produce food in the future without polluting the arable land we need to act now and start reuse the phosphorus that is already in use. If we do not use the sewage sludge in a proper way it might lead to leakage of nutrients from the sludge to the water causing eutrophication. Improper usage of sewage sludge may counter the work at the urban waste water treatment plant.

In the version of "October 2014" the comments of the last meeting as well as the comments of arrived via email from Lithuania, Estonia and Finland are considered.

A. Overall sewage sludge handling

1. The quality of the sewage sludge and the water in the outlet depend on what comes to the treatment plant in the sewage system. To get a better quality of the sludge and the water regarding to the amount and levels of unwanted substances work has to take place to identify what comes to the treatment plant that is not possible to treat and that we do not want in the sewage sludge or in the water. If unwanted substances are identified a plan should be established on how to increase or eliminate the presence of the substance.
2. The use of best available techniques as well as a forward-looking design of a new or reconstructed plant shall always be an option. Most important is to get the best possible sludge quality regarding to the usage of the sludge. This includes treatments like stabilizing and treatments to hygiene the sludge.
3. This point meets the importance of the reuse of nutrients and the closure of nutrient cycles. And takes into account that different techniques of nutrient removal from the waste water, dewatering technology and other choices do have an impact on the possibility of reuse the phosphorus in an effective way. Waste water treatment has a great influence on the quality of the sewage sludge notably on the plant availability of phosphorus (e.g. Fe precipitation vs biological elimination of phosphorus). Consequently this paragraph is highly important for nutrient reuse.
It is just a suggestion, but such an article is needed and highly important because it will sensitize the operators of waste water treatment plants for the topic of phosphorus recycling. Of course if somebody is interested in the topic, the possibilities for phosphorus recycling will taken into account, but in reality often decisions are not very holistic. To look at the waste water treatment in its entirety relating to the conservation of resources as well as to economical considerations should be fostered here.
4. The awareness of energy conservation and the use of alternative energy is rising in the EU and other countries of the world. The energetically utilization of sewage sludge is a good way to produce energy, already implemented in many countries. Thus, if ever possible the fermentation gas should be received via anaerobic sludge handling. If such a gas is produced it is highly desirable that the received gas will be used for energy and not just burned.

B. Restrictions

1. This is an equal definition as in the European law! To get rid of the sludge by deposit it on a landfill is a misuse of nutrients and it also causes problems at the landfill such as instability and greenhouse gas emission when deposit organic waste.
2. Industrial sludge is allowed when the content of pollutants is similarly low, e.g. from food production like dairy or potato products. "Should" is used here to meet the discussions. However to use sludge from industry is often not linked to the high amount of nutrients in the sludge and should therefore be handled very cautions.
3. It is European law to prohibit the application of sewage sludge on land used for cultivation of fruits and vegetables during vegetation and at least 10 month before harvest. This is due to the risk of contamination of pathogens such as E-coli and salmonella.
4. Same as 3 above.
5. It is European law to prohibit the application of sewage sludge on grassland if it is used for animals. This is due to the risk of pathogens such as salmonella and E-coli. A way to reduce the risk or spread of infection is to work the sludge into the spoil by deep tillage at once when it is spread. This is not possible on grassland.
6. In many countries (e.g. Germany) it is prohibited to apply sludge in forests. There is a technical problem to work in the sewage sludge into the ground. If it cannot be worked into the soil there is a risk that the sewage sludge will reach e.g. a river or lake. If the sewage sludge is treated in such a way that the risk for spreading of diseases can be avoided without being worked into the soil then the exemption can be used. To have this under control special permissions has to be given before the sludge is being used in forest. Lithuania is suggesting that the use of sludge to woods grown as energy plantations or very young woods. If problems and environmental contamination can be excluded a special permission for such cases can be issued.
7. Sensitive areas should not be compromised. This is especially important to protect regions of special interest (e.g. nature reserves) within the Baltic Sea Region. Eventually it could be possible with a special permission.
8. It is important to take special care for water bodies and wetlands, especially potential flooded areas to protect the Baltic Sea! Ten meters is a compromise since some other countries have this value (also Germany).

C. Recommendations regarding agricultural and horticulture use

1. Standard methods for all parameters are available. Data are important for background information, especially if a new area shall be used for agriculture. It is also important to see that the amount of nutrients or metals in the soil is not too high before starting to use fertilizers. Values are also important for data collection for future regulations and to have an overview over the actual situation in the Baltic Sea region.

2. It is difficult to make a general statement when analysis should be repeated or conducted more intensive. It has to be done case specific. If there is any reason to suspect that the soil has been contaminated by for example an accident the analysis should be repeated.
3. Discussion has shown that it is difficult to determine region-wide values. Thus, here we do not have "limit values". The application of sewage sludge on/in soil has to be critically considered if the soil analyses show that the content of specific parameters exceed given values. These values give a hint that the application of sewage sludge to a soil can lead to problem. CPs should submit national values and give reasons for other than the chosen values if necessary. Below the limits from the Directive are presented:

Parameter	Limit in directive (mg/kg DS)	Limit in recommendation (mg/kg DS)
Cd	1-3	0.4
Cu	50-140	40
Ni	30-75	30
Pb	50-300	40
Zn	150-300	100
Hg	1-1,5	0.3
Cr	-	60

4. To measure the phosphorus content in the soil is important since one of the reasons for application of sewage sludge is to add fertilizer to the soil. If the content of phosphorus in the soil is already high the need of more phosphorus is low. In this case application of sewage sludge might lead to eutrophication since it is not possible for the crops to use the phosphorus added.
5. The three options are given to ensure that the application of sewage sludge on agricultural used land do not lead to health risks due to pathogens which exists in untreated sewage sludge. E.g. for horticulture use it is fine to work the sludge into the soil to meet this paragraph. If hygienization only should be suggested for agriculture use this has to be discussed.
6. If the analyzed values are higher than the values in Table 2 application of sewage sludge has to be critically considered to minimize risks. To have verified results, the analysis has to be conducted from every batch of sewage sludge what is used. The chosen values in the table are a compilation of the values in the member countries. One should choose if one want to follow the parameter mg/kg DS och mg/kg P. It is either mg/kg DS **or** mg/kg P not mg/kg DS **and** mg/kg P.
7. Note that the same limit values counts for both using the sludge on the arable land and for using it in mixtures to create soil. For comparison with the Directive see table below:

Parameter	Limit in directive (mg/kg DS)	Limit in recommendation (mg/kg DS)
Cd	20-40	1
Cu	1 000 – 1 750	900
Ni	300 – 400	50
Pb	750 – 1 200	100
Zn	2 500 – 4 000	2 500
Hg	16 – 25	1
Cr	-	300

Limit values are stricter than in the EU directive, but current in some EU member countries. Economic and administrative implications cannot be taken into account for all HELCOM member countries. However, since the values are a recommendation it seems not to be necessary anyway.

Also organic parameters are highly important since organics are a well known problem in sewage sludge. This is documented in a high number of studies (e.g. Bergamann et al. 2010, Oliva et al. 2009, Fraggmann & Barkowski 2006). If the JRC study is mentioned to show that contents of organic substances are low in sewage sludge it has to be taken into account that in this study a very low number of sludge were analyzed and that it is also not very sure where the samples came from. Because of the dangerous substances in sewage sludge meanwhile in a number of countries it is permitted to use sewage sludge as a fertilizer. In the EU it is scheduled that the fertilizer directive will be also appropriate for sewage sludge. But it is unknown when this directive will be adopted and presumably there will be no limit values specified. Probably this will be regulated in every EU country – states which are not EU members are exempted of course. However, the problem of organic substances should be considered in this recommendation.

8. The quantity of sewage sludge added to the arable land should be regulated in such a way that the accumulation of unwanted substances is limited. For protecting humans and the environment it is very important to have critical considered parameters or/and restrictions of the maximum amount of sewage sludge which can be added to the agriculture land in a limited time. The motivation for the much more stringent values compared to the directive is that the directive is old and that we now know that the supply has to be much lower not to create contaminated sites due to accumulation of unwanted substances in the soil. Also the quality of the sludge has improved since 1986 when the directive was launched. Analyses are also important for data collection. Since it is known that some soils in some countries have a lack of special nutrients like copper, reasonable exceptions should be possible.

If further discussion is necessary, the CPs should provide national data including background information. It is very difficult and not constructive just to question the suggested values. Furthermore, the suggested values are just a recommendation and because of that they can be stricter than the limit values in the EU directive or in some of the national directives.

This table has to be revised due to the comments of Lithuania.

Parameter	Limit in directive (g/ha and year)	Limit in recommendation (g/ha and year)
Cd	150	0.55
Cu	12 000	300
Ni	3 000	25
Pb	15 000	25
Zn	30 000	600
Hg	100	0.8
Cr	-	40

D. Recommendations regarding use on other land than agricultural land

If sewage sludge is mixed with other organic compounds it should also be critically considered how to minimize the risk from using products made with sewage sludge.

E. Recommendations regarding incineration and construction

1./2. Possibilities to remove especially phosphorus from sewage sludge or sewage sludge ashes should be used whenever possible and if appropriate techniques are available – this should be seen optionally and not as an obligation. It is clear that at the moment only a few techniques are usable. However, everybody should be aware that this could be changed in near future since there is a rising awareness in the EU and other countries regarding the need of recovery of phosphorus from sewage sludge (phosphorus resources in the world are limited, qualities of sewage sludge are decreasing etc.). The rates of incinerated sewage sludge are increasing, too. Nevertheless, there are already a few techniques which are used practically and which are working effectively and efficiently.

The possibility of mono land filling is very important since in many countries technologies for the recycling of the highly valuable phosphorus from sewage sludge or ashes is not state of the technology right now. The mono land filling should be practiced in such a technical way that leaching and thus the loss of phosphorus can be excluded (use of best available techniques is necessary). However, phosphorus recycling is already a serious topic in many countries as well as in the EU, some technologies are already existing and a few are working well (e.g. MAP precipitation from sludge or sewage). Nevertheless, currently most technologies are not very common and need some time to be implemented nationwide. Thus, if the amount of phosphorus in sludge is considerably high and it is not used for agriculture because of high amounts of organic or anorganic compounds, the sewage sludge should be mono incinerated and the phosphorus from the ashes should be recovered as soon as appropriate technologies are available and running commercially. The use of harmless (no high amounts of heavy metals) ashes with plant available phosphorus is included at this point. If ashes with a high amount of phosphorus are mixed and stored with other ashes or substances or used in industry, the valuable phosphorus is lost or cost for recovery is unreasonably high. Of course, the use of ashes with a very low phosphorus content for industrial processes, especially for cement plants (here high amount of P is deleterious), should also be encouraged.