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WORKING DOCUMENT
SLUDGE AND BIOWASTE
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**This Working Document is intended as a basis for discussions with stakeholders.
It does not necessarily represent the position of the Commission.**

Working document: sludge and biowaste

1. Introduction. :

The document is aimed for structure further discussion with Member States and key stakeholders as well as to enable the Commission for a better preparation of Impact Assessment and proposal of revision of Directive on use on sewage sludge in agriculture (278/86/EEC). The document builds onto changes to bio-waste and sludge policy outlined in the Communication from the Commission on future steps in bio-waste management in the European Union adopted on 18 May 2010.¹

The key question is:

Whether extension of sewage sludge directive (minimum standards) onto bio-waste is justified or not (if not: use of stabilized bio-waste in agriculture should remain subject to national rules).

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by 21 October 2010.

2. Background information and sources used

This working document builds on result of reports and stakeholders discussions based on Green Paper on bio-waste as well as on reports and stakeholders discussions concerning use of sewage sludge in agriculture. See relevant CIRCA sites:

a) Green Paper on biowaste:

http://circa.europa.eu/Public/irc/env/biowaste_prop/library?l=/stakeholders_comments&vm=detailed&sb=Title

b) Sewage sludge:

http://circa.europa.eu/Public/irc/env/rev_sewage/library

It is also based on studies and stakeholders consultations conducted by the DG Environment during the period 2000-2003. Finally it is based on studies made for European Commission especially on:

c) Heavy metals and organic compounds from wastes used as organic fertilisers (Amlinger, Pollak, Favoino, 2004)

http://ec.europa.eu/environment/waste/compost/pdf/hm_finalreport.pdf

d) Study on the environmental, economic and social impacts of the use of sewage sludge on land (Millieu/WRc/RPA, 2010)

http://ec.europa.eu/environment/waste/sludge/pdf/part_i_report.pdf

http://ec.europa.eu/environment/waste/sludge/pdf/part_ii_report.pdf

http://ec.europa.eu/environment/waste/sludge/pdf/part_iii_report.pdf

e) Organic contaminants in sewage sludge for agriculture use (JRC, 2001)

http://ec.europa.eu/environment/waste/sludge/pdf/organics_in_sludge.pdf

f) Disposal and recycling routes for sewage sludge (Andersen, 2002)

¹ COM(2010)235 final

http://ec.europa.eu/environment/waste/sludge/sludge_disposal.htm

g) End of waste criteria (JRC IPTS, 2008)

<http://susproc.jrc.ec.europa.eu/documents/Endofwastecriteriafinal.pdf>

h) Compost production and use in the EU (Orbit/ECN for JRC IPTS, 2008)

http://susproc.jrc.ec.europa.eu/activities/waste/documents/080229_EoW_final-report_v1.0.pdf

http://susproc.jrc.ec.europa.eu/activities/waste/documents/080229_EoW_final-report_annex1-7_v1.0.pdf

3. Setting the scene

Directive 86/278/EEC on use of sewage sludge in agriculture was adopted with a view to encourage the application of sewage sludge in agriculture and to regulate its use in such a way as to prevent harmful effects on soil, vegetation, animals and man. The use of sewage sludge must not impair the quality of the soil and of agricultural products. Sewage sludge contains nutrients and organic matter but it contains also contaminants such as heavy metals, persistent organic pollutants and pathogens.

The present Directive sets limit values only for 7 heavy metals such as Cadmium, Copper, Nickel, Lead, Zinc, Mercury and Chromium in soil as well as in sludge itself.

After 20 years since its adoption the Directive is entirely outdated. Member States have on the bases of new scientific insight in the effects of sludge use on land enacted and implemented much stricter limit values for heavy metals as well as for contaminants which are not addressed in the Directive.

The aim of the Commission to set minimum standards for use of bio-waste and sewage sludge on agricultural soil follows the aim set in the Thematic Strategy on Soil²: *i.e. to ensure that maximum benefit is reaped from the reintroduction of nutrients while further limiting the release of dangerous substances into the soil.*

On 18 May 2010 the Commission published a Communication from the Commission on future steps in bio-waste management in the European Union in which it rejected the idea of stand alone legislation on bio-waste. Instead the solutions supporting better management of bio-waste may be addressed by revision of existing legislation.

The part referring to the separate collection or recycling targets will be analysed during review of recycling targets (as required by art 11.4 of Waste Framework Directive). The other part referring to establishment of a quality-based classification of the different types of compost from bio-waste will be analysed below.

In the Communication, Commission has proposed to address the issue of standards of biodegradable waste used on soil by preparation of *de facto* three-tier system. On one hand it would distinguish product quality compost/digestate – which could be used on soil without further control, on the other hand it would set minimum standards for bio-waste used on agricultural soil in an analogue way to the current standards of the use of sewage sludge in

² COM(2006)231 final

agriculture. Use on bio-waste and sludges of lower quality would be restricted to non-agricultural lands and would be subject to national legislation.

The main aim of the document is to set scene for discussion of the specific elements of the system, especially to validate added value of setting minimum standards for bio-waste used on soil and assess cost and benefits of such proposal. This document also outlines functioning of the other elements of the system.

4. Three tier system:

Following the ideas outlined in the Communication, the Commission would like to propose the separation of sludges and composts/digestates which are to be used in agriculture onto three "classes".

In practice it would mean that use of high quality (e.g. source-separated) material would be subject to rigorous production control but its use would not be monitored, while use of sludge and bio-waste in agriculture would be subject to waste permits (if relevant), soil tests and monitoring, limits of contaminants in the material as well as maximum limits on the pollutants introduced into soil over a 3-year average. See table below for details:

Table 1 Legislative regime for different qualities of sludge and bio-waste

	"PRODUCT" QUALITY COMPOST/DIGESTATE (END OF WASTE)	MINIMUM QUALITY FOR SLUDGE AND BIO-WASTE	BELOW MINIMUM QUALITY LIMITS
Input material	Source segregated waste	All biodegradable waste (including mixed municipal waste and sewage sludge)*	All biodegradable waste*
Use	Not restricted	Allowed to be used in agriculture, however not on soils subject to high risk of contamination	Not to be use in agriculture, possible use on non-agri soils, for land reclamation or for construction purposes
Monitoring	Only in production phase	During production and use on soils, also periodic monitoring of soils	Not regulated on EU level (left for national regulation)
Regulated by:	regulation on end of waste criteria for bio-waste	Revised sewage sludge directive	Left for national regulation

* It should be ensured, though, that sludge and bio-waste from mixed municipal waste are exempt as much as possible of non-organic material (e.g. metal, plastic, glass).

In any case the new system shall not affect other relevant legislation – especially Animal By-Product Regulation (ABPR)³ or Nitrates Directive⁴ – all such legislation shall apply accordingly.

³ Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation)

5. End-of-waste criteria

The technical work concerning preparation of end of waste criteria will be conducted by JRC (IPTS Sevilla), based on their experiences with preparations end-of-waste standards for other waste streams and pilot projects (see link g) in chapter 2). The work on end of waste criteria for biodegradable waste is planned for 2011.

End-of-waste criteria may act as reference point for any future recycling targets on biodegradable waste (e.g. targets set in accordance to art 11.4 of Waste Framework Directive).

It should be mentioned that in parallel the Commission is conducting studies on possible extension of regulation on mineral fertilizers⁵ onto organic fertilizers. Once adopted, regulation on end-of-waste criteria may constitute reference point for organic fertilizers/soil improvers/growing media produced from biodegradable waste.

6. Maximum permissible levels of contaminants in the sludge and bio-waste used on agricultural soils

The study conducted for the European Commission by Millieu/WRC/RPA⁶ "*Study on the environmental, economic and social impacts of the use of sewage sludge on land*" stated that *significant environment or health risks linked to the use of sewage sludge on land in the EU have not been documented in scientific literature since the Directive took effect. It is, however, difficult to establish whether this is because the provisions of the Directive are sufficient or is due to the fact that more stringent national requirements have been put in place.* The same study when summing up potential threat from heavy metals in sludge and soil suggests that *consideration needs to be given to adjusting the maximum permissible soil metal limits in Directive 86/278/EEC for cadmium and zinc in soil and for lead in sludge.*

There is no single widely accepted method of setting quality criteria for sludge and soil. During stakeholder consultations basically two approaches has been proposed: one based on risk assessment, the other one based on precautionary approach. Tables in Annexes I and II demonstrate existing differences between policies of Member States. Those differences cannot be satisfactory explained on scientific bases and they illustrate different approaches to this problem.

While sharing the opinion of importance of risk assessments the Commission finds that the risk assessment approach tends to concentrate on human health only, while it is not possible to assess the risk to soil ecosystems. On the other hand strict precautionary approach, especially in the situation where there are significant data deficiencies, which cannot be addressed in reasonable time, could lead to high costs which would surely be transfer on citizens. The study executed by Millieu/WRC/RPA, while suggesting certain minimum protection level (similar to the one proposed by the Commission for consultation in 2001-

⁴ Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources

⁵ Regulation (EC) No 2003/2003 of the European Parliament and of the Council of 13 October 2003 relating to fertilisers

⁶ "*Study on the environmental, economic and social impacts of the use of sewage sludge on land*" link in chapter 2

2003), has illustrated the cost of enhance precautionary approach either by setting more stringent standards or even introduce of total ban on use of sewage sludge in agriculture.

Therefore the limits on contaminants proposed in this document and monitoring requirements mentioned in this paper been set having in mind precautionary principle but also taking into account results of external risks assessment as well as practical experiences of Member States concerning quality of sewage sludge and results of use of sludge in agriculture. As a result it is expected that proposed levels will guarantee safety for human health, protection of soil ecosystems and guarantee long term agricultural soil use, without forcing the consumers to bear unnecessary costs.

The proposed minimum requirements for treated bio-waste have been developed from the values set for sewage sludge taking into account different role of waste derived compost and different applications patterns, as well as analysis of standards in Member States and current contamination level of bio-waste (sources: chapter 2 - links c) and h)) with assumed rates of application of sludge at 3 tons d.m./ha year and of bio-waste 9,2 tons of d.m./ha year.

The table 2 summarizes the three tier system – current eco-label and sewage sludge directive added for illustration purposes

CONTAMINANT S	ORGANIC FARMING ⁷ (from household waste)*	ECO-LABELS ^{8*}	DRAFT EOW***	PROPOSAL SLUDGE	PROPOSAL STABILISED BIOWASTE	DIRECTIVE 86/278/EEC (CURRENT)*
Cd (mg/kg dm)	0.7	1	1.5	10	3	20 to 40
Cr (total) (mg/kg dm)	70 (total) 0 (Cr VI)	100	100	1,000	300	-
Cu (mg/kg dm)	70	500	100	1,000	500	1000 to 1750
Hg (mg/kg dm)	0.4	1	1	10	3	16 to 25
Ni (mg/kg dm)	25	50	50	300	100	300 to 400
Pb (mg/kg dm)	45	100	120	500	200	750 to 1200
Zn (mg/kg dm)	200	300	400	2,500	800	2500 to 4000
PAH (or benzo-a-pyrene)**		-	-	0.4-0.8**	0.4-0.8**	
Impurities ≥2mm		0,5%	0,5		2%	
* - parameters given for illustrative purposes						
** –exact value as well as other organic contaminants (e.g. PCBs) subject to verification by JRC study(FATE)						
*** - values resulting from JRC IPTS study – as the issue of End-of-Waste of bio-waste will be subject of separate debate the values are given for illustrative purpose only.						

Organic farming – except of the quality requirements has also requirements concerning sources of compost, i.e.: *product obtained from source separated household waste, which has been submitted to composting or to anaerobic fermentation for biogas production, Need recognised by the inspection body or inspection authority* . It also should be noted that for composts made out of vegetal matter there are no contamination limits – just requirement that compost is recognised by the inspection body or inspection authority.

Positive list of input materials is also set for eco-labelled composts (soil improvers/growing media).

⁷ 2092/91/EC

⁸ 2007/64/EC and 2006/799/EC

Table 3 Quality of sewage sludge (on dry solids) recycled to agriculture (2006)

Parameter	BE a,b)	DE	ES	FI b)	IT	PT a)	SE	UK	BG	CY	CZ	EE b)	HU	LT	LV	PT	SI	SK b)
Zinc	337	713	744	332	879	341	481	574	465	1188	809	783	824	534	1232	996	410	1235
Copper	72	300	252	244	283	12	349	295	136	180	173	127	185	204	356	153	190	221
Lead	93	37	68	8.9	101	27	24	112	55	23	40	41	36	21	114	51	29	57
Nickel	11	25	30	30	66	15	15	30	13	21	29	19	26	25	47	32	29	26
Chromium	20	37	72	18	86	20	26	61	20	37	53	14	57	34	105	127	37	73
Mercury	0.2	0.4	0.8	0.4	1.4	<1	0.6	1.2	1.2	3.1	1.7	0.6	1.7	0.5	4.2	4.6	0.8	2.7
Cadmium	1	1	2.1	0.6	1.3	<0.4	0.9	1.3	1.6	6.9	1.5	2.8	1.4	1.3	3.6	4	0.7	2.5
Total Nitrogen	3.9	4.3	4.5	3.4	4.1	1.7	4.5	2.8	7.2	4.1	3.6	4.9	3	2.3	3.9	0.9	3.2	3.8
Total Phosphorus	6.7	3.7	3.6	2.4	2.1	2	2.7	2.2	4.3	4.9	1.9	3.4	1.4	0.9	1.3	0.6	3.9	1.8

- a) Data from the Flemish Region
b) data for 2005 as no values available for 2006

Comparison of Member States requirements relating to the use of sewage sludge in agriculture (heavy metals, organics, pathogens) is provided in Annex I, while heavy metal limits in European compost standards are given in Annex II.

Table 4

Limit values for amounts of heavy metals which may be added annually to soil, based on a three-year average

Elements	Limit values (g/ha/y)	Current limit values from Directive 86/278
Cd	15	150
Cr (total)	3 000	-
Cr(VI)	15	-
Cu	3 000	12 000
Hg	10	100
Ni	750	3 000
Pb	1 000	15 000
Zn	7 500	30 000

The proposal to set limits of heavy metals depending on P content has been preliminary rejected. The reason for that was that setting minimum protection standards for soil should have general character and should not depend on one specific agronomic parameter. Of course Member States would retain the possibility to set up schemes in which allowed contamination level is set in relation to fertilisation properties. In any case such scheme can not lead to contamination above minimum set in the proposal. Of course this approach and possibility to introduce of limits linked to P content may be subject to further debate (see questions at the end of the text).

As for organic contaminants report of Millieu/WRC/RPA states that "in terms of other impacts on human health, recent risk assessments indicate that the exposure resulting from organic

compounds in sewage sludge applied to land have not found an adverse effect on human health".

Taking into account that most of discussed organic contaminants are subject to phase out from production and use or at least subject to increased control from other legislation (e.g. REACH, RoHS, Water Framework Directive) etc. the Commission preliminary proposal would be to limit the number of organic contaminants in comparison to proposal consulted in 2003 to only PAHs (or benzo-a-pyrene)⁹. However decision will be taken subject to results of FATE/SEIS project to be realised by JRC (Ispra)¹⁰.

Member States would have freedom in setting more stringent criteria both for list of contaminants as well as their permissible amounts or conditions of use up to total ban on landspreading of waste (sewage sludge/biowaste).

Member States should also be given possibility to set nationally more relaxed rules on monitoring of use of the material of guaranteed quality (e.g. by setting national standards or quality assurance schemes).

The spreading on land of sewage sludge and stabilized bio-waste should be subject to monitoring concerning limits of contaminants in soil and sludge/bio-waste as well as record keeping.

The application rates should follow good agricultural practises and be adapted to the need of crops and soil (taking into account other input of nutrients).

7. Minimum standards for soil quality

The limit values proposed for agricultural land are intrinsically precautionary values for the protection of long-term soil quality having a regard to background concentrations in European agricultural soils. Where for geogenic reasons the concentration value of an element in the soil is higher than the concentration limit as set in the table, the competent authority could set local/regional rules for the use of sludge/bio-waste on that soil (case-by-case basis) provided that the concentration value in the soil does not exceed the concentration limit set in the table by more than 50%. As in case of quality of sludge/bio-waste Member States would retain the ability to set more stringent requirements. For illustration Annex III contains current limits set in Member States.

Proposed limits have been derived from limits proposed and consulted by DG ENV in 2003. In 2009 validity of those limits has been verified by study of Millieu (chapter 2 - link d)

Table 5. Proposed maximum permissible concentrations of potentially toxic elements in sludge-treated soils

⁹ These substances has also mentioned by EFAR as most contributing to risk from sewage sludge

¹⁰ SEIS - Shared Environmental Information System. FATE - Fate and impacts of pollutants in terrestrial and aquatic ecosystems – is JRC project aimed at verification of presence of less known pollutants in environment. One of FATE subprograms is to focus on bio-waste and sewage sludge.

Elements	Limit values (mg/kg dm) for agricultural land		
	$5 \leq \text{pH}(\text{CaCl}_2) < 6$	$6 \leq \text{pH}(\text{CaCl}_2) < 7$	$\text{pH}(\text{CaCl}_2) \geq 7$
Cd	0.5	1	1.5
Cr (total)	50	75	100
Cu	40	50	100
Hg	0.2	0.5	1
Ni	30	50	70
Pb	50	70	100
Zn	100	150	200

8. Further restriction of use of sludge and bio-waste

Further restrictions are generally list of actions to limit the risk of transmission of pathogens and diseases by sludge. It should have also effect on soil safety leading to quicker decomposition of some contaminants of organic character:

- ban the use of untreated sludge
- the sludge should be sufficiently stabilised so as not to cause unreasonable odour nuisance to the nearest dwellings, - possible indicators: lack of oxygen demand; volatile solid (VS) reduction of 38% or specific oxygen uptake rate of less than 1.5mg/h/g total solids
- sludge should be sanitised – possible indicators could be: absence of salmonella in 25-50g or reduction of E.Coli to less than 5×10^5 colony forming units per gram (wet weight) of treated sludge
- ban the use of sludge on water-saturated, flooded, frozen or snow-covered ground,
- time period between use of sludge on grasslands and allowing to use it by grazing animals
- time period between use of sludge and cultivation of fruit and vegetable crops which are normally in direct contact with the ground and normally eaten raw.

The sanitary restrictions for bio-waste would relate to composting process:

- Windrow composting ensuring that all material maintains a temperature of at least 55°C for at least four hours between each turning. The heaps shall be turned at least three times and in any case it shall be reached a complete stabilisation of the material,
- In-vessel composting ensuring that all material maintains a temperature of at least 55°C for at least four hours and reaches complete stabilisation.

9. Other issues

Sampling

The current document does not discuss sampling – as this issue would is planned to be set to be decided in Comitology.

Monitoring

In order to relieve the burden for smaller plants the frequency of the monitoring would depend of the size of the plant.

The requirements on the monitoring should also be eased in case the sludge/bio-waste is consequently of high enough quality.

The frequency of analysis of any of the parameters (heavy metals, organic compounds, micro-organisms) may be reduced if it has been shown that in a two-year period each measured value of the parameter is consistently below certain % of the limit. Detailed system should be agreed in Comitology process (together with sampling).

Use of sludge/bio-waste on non-agri soils

Preliminary analysis stated that setting limits for non-agricultural lands would be very complicated task due to variety of potential uses (parks, playgrounds, construction, restoration of contaminated sites etc.) which would be very problematic to address on EU level. Moreover such regulation would be problematic to justify on subsidiarity grounds.

Nevertheless the values proposed could be used as recommendation to use on non-agri soils. It is also possible to extend the scope of such limits to precisely defined types of non-agricultural soil or purposes.

10. Questions to the Member States and key stakeholders

1. Do you see an added value to introduce minimum quality requirements for bio-waste used in agriculture?

2. What are in your opinion costs and benefits of introduction minimum standards for bio-waste used on soils?

Explanation: The costs for introduction of more stringent criteria for sewage sludge has already been assessed in Millieu/WRC/RPA study, however in case of including biodegradable waste in the revision of sewage sludge directive the Commission would have to assess how introduction of minimum standards for bio-waste would impact the practises of use treated bio-waste (composts/digestates) in different Member States.

The key information sought would be:

- the assessment of the percentage of bio-waste which is currently used in agriculture and which would not meet the new standards, and
- (if possible) assessment of costs of management of abovementioned bio-waste which would be excluded from use in agriculture (it should include alternatively cost of landfilling of such bio-waste or additional costs to improve the collection of bio-waste and their further treatment or costs of other use of bio-waste). e.g. costs of improved waste collection (separate collection of contaminating streams), cost of improvement of treatment (e.g. sorting) of compost/digestate).

3. Do you see an added value of extension of coverage of revision of sewage sludge directive onto non-agricultural soils (if yes, which types).

If you do not see a need for extension of a directive onto other lands – would you include the proposed values as recommended.

4. Would you have any proposals of substances to be tested for presence in sludge/bio-waste by JRC (Ispra) during FATE/SEIS exercise (separately for sludge and treated biowaste).

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