European Union Network for the Implementation and Enforcement of Environmental Law

Sustainable Landspreading Report

Phase III

Date of report: December 2024

Report number: 2022(VI)WG5

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Introduction to IMPEL

The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an international non-profit association of the environmental authorities of the European Union (EU) Member States, and of other European authorities, namely from acceding and candidate countries of the EU and European Economic Area (EEA). The association is registered in Belgium and its legal seat is in Brussels, Belgium.

IMPEL was set up in 1992 as an informal Network of European regulators and authorities concerned with the implementation and enforcement of environmental law. The Network's objective is to create the necessary impetus in the European Community to make progress on ensuring a more effective application of environmental legislation. The core of the IMPEL activities concerns awareness raising, capacity building and exchange of information and experiences on implementation, enforcement and international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation.

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 8th Environment Action Programme that guide European environmental policy until 2030, the EU Action Plan: "Towards a Zero Pollution for Air, Water and Soil" on Flagship 5 and the Recommendation on Minimum Criteria for Environmental Inspections.

The expertise and experience of the participants within IMPEL make the network uniquely qualified to work on both technical and regulatory aspects of EU environmental legislation.

Information on the IMPEL Network is also available through its website at: www.impel.eu

Title of the report:	Number report:
Sustainable Landspreading Report	2022(VI)WG5
Project Manager/Authors: Barry Sheppard, Mat Davis, Lottie Hutchinson, Environment Agency England	**Report adopted at IMPEL General Assembly Meeting**: Adopted by written procedure on 20/03/2025 **Total number of pages: 32** Report: 14 Annexes: 18

Executive Summary

This is the report for the IMPEL 'Sustainable Landspreading' project based on the results of an initial survey conducted in 2021 that was also updated via a further questionnaire provided to IMPEL members between October 2024 and November 2024. This work is part of the overarching 'Safeguarding the Water Environment Throughout Europe (SWETE) project which is overseen by IMPEL's Land and Water Expert Team.

Phase III of the project builds on the previous two phases of SWETE: discussions at the Land and Water Expert Team Meeting in Rome in October 2019, a workshop at Cranfield University in 2020 the results of which were presented in the 'Landspreading Materials Conference Report' in 2020 and the results of a survey conducted between 2020 and 2021, which are presented in the 'Sustainable Landspreading Report' 2020/21.

To conclude the Sustainable Landspreading project, in phase III the project team resent an update of the 2021 questionnaire as, in recognition that sludge management is quickly evolving, we wanted to take the opportunity to gain updated responses from countries that had previously responded as well as to gather additional responses as the response rate in 2021 was greatly impacted by the Covid-19 pandemic. The updated survey had 26 questions, including 2 new questions, which we designed to gather information on different sludge management practices and were broken down into questions on background and context to sludge management, problems and issues, knowledge and good practice and solutions.

The questionnaire was circulated to IMPEL's Water and Land Expert Team, put on Basecamp, and provided directly to contacts that the project team were aware of from previous work and responses were provided over a month's period in November 2024.

In total 11 different countries responded, 9 of which were new respondents to 2024, giving a total of 17 different country responses when combined with the 2021 questionnaire responses.

The aims were to compare and contrast the different approaches to sludge management in different member countries and organisations to highlight common problems, solutions and areas of best practice as examples for others to learn from.

With these combined responses it was possible to obtain interesting and useful information from the questionnaires. The commonalities and differences across the respondents were presented and discussed during an online meeting held on 9th December 2024 which was attended by 8 different IMPEL member and a guest speaker.

Summary of Conclusions

1. (Q1) Seventeen countries responded with figures on how much sludge is produced in their country but two countries (Romania and Albania) don't have the data on how much sludge they produce. However, it is not clear whether the tonnages were being reported as tonnes dry solids or wet tonnes.
2. (Q2) With the exception of Belgium, The Netherlands and Malta all corresponding countries allow spreading of sludge to land. Malta prohibits sludge spreading as the whole of the island was designated as an NVZ in 2004. Germany allows spreading on agricultural land only under strict controls. Lithuania restricts spreading of sludge between 15th November and 1st April and prohibits spreading on damaged areas if the average daily air temperature is higher than 20°C. Belgium only allows the spreading of non-sewage sludge to land.
3. (Q3) What is surprising is the low uptake of land restoration with only England, Scotland and Iceland using brownfield and landfill restoration as an outlet for sludge. For the remaining countries that responded, there is a varied picture of landfill use ranging from not used to commonly used. The same is the case for incineration. Malta mostly uses landfill and Cyprus and Romania mostly use incineration. Slovenia and Malta don't use agricultural land as an outlet and Portugal doesn't use agricultural often. Azores, some regions in Italy, England, Wales and Scotland predominantly rely on agricultural land as an outlet.
4. (Q4) The majority of the responding countries differentiate between sludge produced by water companies and other sources such as septic tank sludge. They appear to differentiate between these 2 waste streams which is evident through their waste classification.
5. (Q5) Only England and Wales identified the regulatory option of the use of untreated septic tank sludge to land.
6. (Q6) Sludge is reported to be mostly regulated nationally across the responding countries.
7. (Q7) There is a mixture of public and private ownership across the responding countries with only England and Romania identifying that all companies are privately owned.
8. (Q8) The regulation controlling the use of sludge was shown to be associated with a European Directive with individual country implementation of this domestic legislation.
9. (Q9) Not all countries are able to report on how their sludge is treated. Those that did respond showed that there is a variation in treatment technologies. Predominant treatment technologies appear to be digestion followed by composting and the addition of lime. Albania, Lithuania and Belgium mostly use long term storage.
10. (Q10) Slovenia does not collect information on what contaminants are tested for in the sludge. The majority of the respondents test for selected metals. Lithuania is the only country to report the testing of plastics. Germany, Lithuania and Italy (Lombardia) test for pharmaceuticals. Malta carries out landfill waste acceptance testing requirements. Albania tests for salt. A few respondents report testing of pathogens.
11. (Q10) The way that sludge is characterised is different across the responders. In England it is traditionally associated with heavy industry i.e. heavy metals but in Italy (Lombardia region) it is more modern and considers more modern industries and their

associated contaminants such as pharmaceuticals.

12. (Q11) There is export of sludge from 10 out of 17 of the responding countries. This is reported to be mainly to neighbouring countries for final use or disposal.
13. (Q12) Unable to comment on whether there is a pattern of integration of sludge and other materials across the countries. There is some indication of sludge being combined with other wastes, but the picture is unclear.
14. (Q13) Most countries recognise that there are problems with environmental and public awareness issues associated with sewage sludge. Sludge is recognised as having a high political status in England and there is concern about supply chain issues to agriculture.
15. (Q14) In Malta there is a concern about economies of scale when investigating various treatment processes due to the limited volume of sludge produced. In Germany there is increased regulatory requirement to recover phosphorus from sludge. In Lithuania poor quality composts with pharmaceuticals and microplastics are a concern.
16. (Q15) There is not a good awareness of where the main sources of contaminants such as metals and plastic in sludge come from with suspected sources ranging from agriculture, household products, industry, surface water run-off, pharmaceuticals.
17. (Q16) Italy, England, Portugal, Belgium Iceland, Germany, Scotland and Romania have referenced research in their country relating to sludge. German research focus is on phosphorus recovery, Scotland has a human health impact study from sludge spreading and Belgium is conducting research into raw material recovery and England has the Chemical Investigation Programme.
18. (Q17) Responders appear to understand the generic risks associated with sludge, but not specific complexities associated with their own sludge. Nutrient and metal impact is mostly understood but there are many gaps in knowledge relating to impact from chemicals and microplastics.
19. (Q18) There is variable public interest across the countries, which seems to be increasing in recent years.
20. (Q19) Recognition by several countries of the age of the regulations used to control sludge and gaps in the regulations.
21. (Q20) Most respondents referred to a need for an updated regulatory framework that takes into account wider contaminants present in sludge and the impact on the environment.
22. (Q21) Many countries referred to a need for more focus on the source of chemicals in sludge, treatment standards and more focus on the impact on the receiving environment (soils) under existing regulation.
23. (Q22 and 23) The above changes to the management of sludge are considered to mostly resolve current issues but most countries face challenges to deliver due to funding constraints and ongoing gaps in the research.
24. (Q24) Germany reported many recommendations for good practice. England consider soil testing requirements down to 5ha as good practice. Cyprus refers to the Code of Good Agricultural Practice as good practice.
25. (Q25) Priorities

    All respondents except Romania, Malta and Cyprus rank PFAS as a high priority for sludge.

    Other chemicals are a top priority for Scotland and England and low priority for the Netherlands, Malta and Cyprus.

    Microplastics are a high priority for Italy, Malta, Scotland, Slovakia, Germany, Lithuania and England.

    AMR is a top priority for Italy, Scotland and England.

    Nutrients (N and P) are viewed as high priority across most respondents except The Netherlands.

Landbank availability is a lesser priority for most respondents except Cyprus and England (may be due to landfills getting full in Cyprus and in England we have lots of organic fertilisers competing for landbank and catchments saturated in nutrients making it harder to find land that requires sewage sludge to be spread).
The Netherlands and Cyprus rank most topics of interest as low priority.
Italy, Scotland and England rank most topics of interest as high priority.

26. (Q26) Landspreading of final effluent
Malta, Scotland and Slovakia don't routinely allow the spreading of final effluent for any purposes.
Countries that do allow the landspreading of final effluent do so through permits.
German response – application is carefully controlled and limited to non-food crops and land reclamation due to potential health risks. Strict quality standards need to be met and there is ongoing research in this area.

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Introduction and Background

Many different waste materials may be spread on land across Europe. This includes industrial and domestic material such as food and paper waste, anaerobic digestate, compost and different types of ash. Perhaps the most significant waste that may be spread to land from a volume and environmental perspective is sewage sludge; the residual solid waste left over from the treatment of urban waste waters.

Sludge is made up of domestic and industrial effluents and surface water run-off. It mostly comes from wastewater recycling centres (sewage plants). Some of it comes from private treatment such as package treatment plants or septic tanks.

Sludge contains useful levels of organic matter and plant nutrients. It can also contain chemicals, microplastics and pathogens that could risk human health and the environment.

Although regulators and others use the term sewage sludge some producers and end users use the term biosolids for treated sludge. This reflects the different perspectives of those involved in the sludge production and supply chain.

Some European countries, notably the UK, consider that the most sustainable option (in most circumstances) is to recycle it to agricultural land as organic manure.

An organic manure is fertiliser which comes from animal, plant or human sources. Organic manures commonly used in agriculture include:

- animal manure or slurry
- compost
- anaerobic digestate
- biosolids and septic tank sludge

Sludge can provide beneficial amounts of organic matter and nutrients to the soil. It is important to manage sludge properly to make sure:

- sludge treatment, storage and uses are sustainable
- risks to the environment, water, soil, plants, animal and human health are understood and addressed
- farmers and land managers can safely spread it to benefit land

The beneficial use of sludge is an application of the circular economy principles to support reuse of materials on land as fertilisers and soil conditioners.

If sludge is not correctly managed and used to benefit soil, it needs to be disposed of in other ways. This will ensure reuse is undertaken in a manner that does not allow unacceptable and avoidable impacts on soil health and the wider environment.

In England sludge management is being considered as part of a new sludge strategy driven by drivers which include:

- there have been changes to treatment processes (with a greater focus on digestion and the energy value of sludge) and the supply chain of sludge into and then out of treatment centres
- new hazards are emerging compared to the previously considered metals from heavy industry
- there have been over application concerns, complaints, pollution and poor management practices involving sludge and more so septic tank sludge

Delegates from across Europe attending the Landspreading Conference at Cranfield University in 2021 confirmed that these issues were of concern in their countries. Indeed, some European countries do not allow the spreading of sewage sludge to land because of these current and emerging concerns. For these countries other possible disposal routes for sludge include incineration or landfill.

Phase III of the project builds on the previous two phases of SWETE: discussions at the Land and Water Expert Team Meeting in Rome in October 2019, a workshop at Cranfield University in 2020 the results of which were presented in the 'Landspreading Materials Conference Report' in 2020 and the results of a survey conducted between 2020 and 2021, which are presented in the 'Sustainable Landspreading Report' 2020/21.

In November 2024 the different phases of this project were presented on a poster at the European Biosolids and Bioresources conference in Manchester, UK to raise awareness of this project and the work of IMPEL. The poster is included in annex 1 of this report. A presentation was also given at the conference to detail the work that the Environment Agency in England are doing on sludge regulation.

During an online meeting on the 9th December 2024 the commonalities and differences across the respondents were presented and discussed. English representatives explained that sludge management has a high profile with many priorities and concerns that are threatening the safe and sustainable use of sludge as a fertiliser on agricultural land. English and Welsh Water Companies sign up to a voluntary scheme called the Biosolids Assurance Scheme.

The Scottish Environmental Protection Agency (SEPA), Scotland shared their recent consultation on moving the regulation of sludge into their Environmental Authorisation (Scotland) Regulations 2018. An extract from this consultation details their proposals as follows:

2.1 Sewage sludge

We proposed to bring the regulation of sludge into the 2018 Regulations and to incorporate a number of new technical requirements which will:

- make appropriate parts of the Safe Sludge Matrix mandatory
- ensure the transport, storage and use of sewage sludge is subject to environmental authorisations and that all Authorised *Persons can demonstrate they are a 'Fit and Proper' person*
- *tighten soil protection values in line with best evidence and improve monitoring and sampling provisions*
- *make it possible for the Scottish Environment Protection Agency (SEPA) to charge for authorisations to fund regulatory activity in this area.*

….in line with the Scottish Government's commitment to remain aligned, where possible, with EU law, we intend to await the results of a recent evaluation of the Sewage Sludge Directive by the European Commission and will then consider further potential amendments to the 2018 Regulations as appropriate. It is Scottish Ministers' position that properly treated sludge, when managed safely and effectively on the course of its journey from the treatment facility to being spread to land, is an effective fertiliser. As part of the review of sewage sludge conducted by the Scottish Government in 2016, an independent research report was commissioned from the James Hutton Institute. The aim of the research was to provide up-to-date and robust evidence that the practice had no harmful effect on the environment or human health. The findings of the report, whilst highlighting areas which should be closely monitored over the next few years, did not identify any new or increased risks.

It was also discussed that in Scotland and England sludge is not allowed to be used on land where barley is cropped and used in the whiskey malting process. This is due to market forces and public perception of the use of sludge. This presents constraints in Scotland on sludge spreading as half the agricultural land in Scotland is used for barley production. For the first time in 2022 drought effects were experienced in Scotland that affected the irrigation of crops.

National Resources Wales allow a controlled use of final effluent for firefighting purposes.

During the online meeting we were joined by a guest speaker Rick Lancaster from AtkinsRèalis, a consultancy that are working on behalf of the UK water companies on the long-term strategy for bioresources. This provided a useful insight into the challenges that the water industry is facing in relation to sludge management.

Survey Development and Format

The project team updated the 2021 questionnaire (26 questions) informed by their knowledge of landspreading practices and by the outcomes of the 2020 Cranfield Conference. The questions were designed to gather information to help achieve the project aims which were:

- to compare and contrast the different approaches to sludge management in different member countries and organisations
- to highlight common problems, solutions and areas of best practice as examples for others to learn from.

The questions were divided into the following sections:

- Sludge Management in your country
- Problems and Issues
- Knowledge
- Good practice and solutions

Two new questions were included in the 2024 survey, the first one being:

Current priorities/ concerns for sludge quality and recovery/ disposal outlets: How do you rate the following topics of interest relating to sludge quality and recovery/ disposal outlets in terms of priorities for your country? Score from 1 (being lower priority) to 6 (being highest priority) for each category

The second new question was on **Landspreading of final effluent:** Does your country allow the spreading of final effluent for the following activities: agricultural use, non-agricultural use or other?

This report presents the findings of a survey which had the aims of comparing and contrasting the different approaches to sludge management in different member countries and organisations to highlight common problems, solutions and areas of best practice as examples for others to learn from.

The final list of questions are included in annex 2.

Responses

The questionnaire was circulated to IMPEL's Water and Land Expert Team, put on Basecamp, sent to IMEPL national coordinators and provided directly to contacts that the project team were aware of from previous work.

In total 11 different countries responded, 9 of which were new respondents to 2024 giving a total of 17 different country responses when combined with the 2021 questionnaire responses.

The contributing countries for 2024 were:

- Italy
- The Netherlands
- Romania
- Albania
- Malta
- Scotland
- Cyprus
- Slovakia
- Germany – Saarland and Baden-Württemberg)
- Lithuania
- England

The contributing countries/regions for 2021 were:

- Azores
- Wales
- Portugal
- Slovenia
- Belgium
- Iceland
- England

and the Italian Regions of:

- FVG
- Compania

- Lombardia
- Marche
- Puglia
- Veneto

With these combined responses it was possible to obtain interesting and useful information from the questionnaires. The commonalities and differences across the respondents were presented and discussed during an online meeting that was held on Monday 9th December. The meeting was well attended with 8 different countries represented as follows:

- England
- Italy
- The Netherlands
- Germany
- Romania
- Wales
- Scotland
- Malta

The consolidated responses are provided in annex 3. The consolidated responses for 2021 are included in annex 4.

Conclusions

The main conclusions identified by the project team are shown below. These reference the question from which the conclusion was obtained.

1. (Q1) Seventeen countries responded with figures on how much sludge is produced in their country but two countries (Romania and Albania) don't have the data on how much sludge they produce. However, it is not clear whether the tonnages were being reported as tonnes dry solids or wet tonnes.
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4. (Q4) The majority of the responding countries differentiate between sludge produced by water companies and other sources such as septic tank sludge. They appear to differentiate between these 2 waste streams which is evident through their waste classification.
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9. (Q9) Not all countries are able to report on how their sludge is treated. Those that did respond showed that there is a variation in treatment technologies. Predominant treatment technologies appear to be digestion followed by composting and the addition of lime. Albania, Lithuania and Belgium mostly use long term storage.
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20. (Q19) Recognition by several countries of the age of the regulations used to control sludge and gaps in the regulations.
21. (Q20) Most respondents referred to a need for an updated regulatory framework that takes into account wider contaminants present in sludge and the impact on the environment.
22. (Q21) Many countries referred to a need for more focus on the source of chemicals in sludge, treatment standards and more focus on the impact on the receiving environment (soils) under existing regulation.
23. (Q22 and 23) The above changes to the management of sludge are considered to mostly resolve current issues but most countries face challenges to deliver due to funding constraints and ongoing gaps in the research.
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    AMR is a top priority for Italy, Scotland and England.

    Nutrients (N and P) are viewed as high priority across most respondents except The Netherlands.

    Landbank availability is a lesser priority for most respondents except Cyprus and England (may be due to landfills getting full in Cyprus and in England we have lots of organic fertilisers competing for landbank and catchments saturated in nutrients making it harder to find land that requires sewage sludge to be spread).

    The Netherlands and Cyprus rank most topics of interest as low priority.

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26. (Q26) Landspreading of final effluent

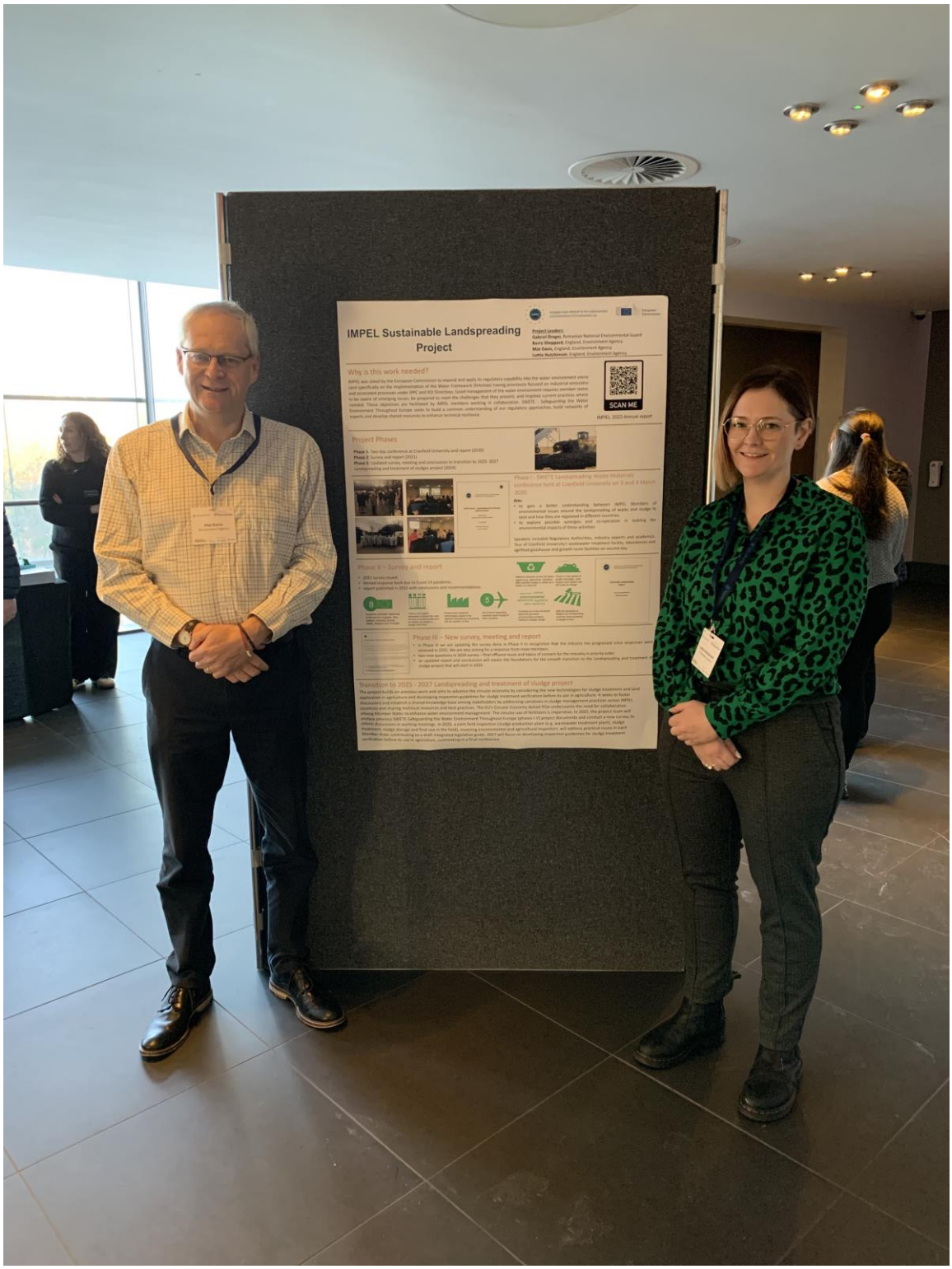
    Malta, Scotland and Slovakia don't routinely allow the spreading of final effluent for any purposes.

    Countries that do allow the landspreading of final effluent do so through permits.

    German response – application is carefully controlled and limited to non-food crops and land reclamation due to potential health risks. Strict quality standards need to be met and there is ongoing research in this area.

Annexes

Annex I. IMPEL Sustainable Landspreading poster at the European Biosolids & Bioresources conference, Manchester, UK



SUSTAINABLE LANDSPREADING SURVEY

Dear colleagues,

We are resending the questionnaire that was sent to IMPEL members in 2021 as part of the Phase II 2022-24(VI) WG5 Sustainable Landspreading Project to get an update on responses from those IMPEL members that responded to the original questionnaire* and to provide opportunity for additional members to provide their response. We have also included two new questions for 2024 *(E. Current priorities/ concerns for sludge quality and recovery/ disposal outlets & F. Landspreading of final effluent)* to conclude Phase III of the Sustainable Landspreading Project and to facilitate the smooth transition into the Sustainable Landspreading project that will run between 2025 - 2027.

**Responses were received from the following 8 members: Italy, Slovenia, England, Wales, Belgium, Iceland, Portugal and Azores.*

We are planning a team meeting in November 2024, during which we will base our discussions on the responses to this questionnaire. **Therefore, we kindly ask that you 👉 please complete the questionnaire by Sunday, 10 November 2024.** A fully completed questionnaire would be much appreciated! Please feel free to forward the survey to other colleagues and the competent authorities in your country.

Thank you so much for your support!

🚩If you have any questions, please do not hesitate to contact the PM/steering group: Barry Sheppard (barry.sheppard@environment-agency.gov.uk), Gabriel Dragoi (gabriel.dragoi@daav.rowater.ro), Lottie Hutchinson (lottie.hutchinson@environment-agency.gov.uk)

The QUESTIONNAIRE in pdf version; might be useful for you, prior to its completion: https://public.3.basecamp.com/p/FEBdxfqR2gbjVo9KaGkyMv1h

* Required

BACKGROUND INFORMATION

1. Name *

2. Email Address *

3. Country *

4. Organization *

5. Current job position & Expertise *

A. Sludge Management in your country

6. Approximately how much sludge is produced by your country annually? (Estimate if necessary)

7. Is landspreading of sludge allowed in your country? (If so under what circumstances?)

8. Where does the sludge go to? **Score from 1 (<u>not used</u>) to 5 (<u>most used</u>) for each category.**

	1	1	2	2	3	3	4	5
Agricultural landspreading	○	○	○	○	○	○	○	○
Other landspreading	○	○	○	○	○	○	○	○
Land restoration	○	○	○	○	○	○	○	○
Incineration	○	○	○	○	○	○	○	○
Other	○	○	○	○	○	○	○	○

9. Specify for "other", if applicable.

10. Do you distinguish between sludge produced by water companies (or your sewerage and sewage treatment provider) at sewage works and other sources such as septic tank sludge?

- ○ Yes
- ○ No
- ○ Other

11. Does your country allow spreading of untreated septic tank sludge direct to land?

- ○ Yes
- ○ No
- ○ Other

12. Is sludge in your country regulated nationally or regionally?

- ◯ Nationally
- ◯ Regionally
- ◯ Other

13. Are the Water Companies or your sewerage and sewage treatment provider (as sludge producers) in your country in public or private ownership?

- ◯ Public
- ◯ Private ownership
- ◯ Other

14. Approximately how many are there *(Water Companies or sewerage and sewage treatment provider)*?

15. What is the main national regulation governing sludge and how does it operate?

16. What treatment methods are used for sludge in your country? **Score from 1 (<u>not used</u>) to 5 (<u>most used</u>) for each category.**

	1	2	3	4	5
Digestion	○	○	○	○	○
Composting	○	○	○	○	○
Heat treatment	○	○	○	○	○
Addition of lime	○	○	○	○	○
Long term storage	○	○	○	○	○
Addition of other wastes	○	○	○	○	○

17. What contaminants are tested for in your sludge? Consider:

	Yes	No
Chemicals	○	○
Plastics	○	○
Pharmaceuticals	○	○
Metals	○	○
Any other contaminants?	○	○

18. Please specify any other contaminants that are tested for in your sludge, if applicable.

19. Does your country export sludge to another country? (if so which one(s)?)

20. Is your sludge combined with other wastes in your country? **Score from 1 (not relevant) to 5 (most relevant) for each category**

	1	2	3	4	5
Green wastes	○	○	○	○	○
Industrial effluents	○	○	○	○	○
Industrial soild wastes	○	○	○	○	○
Other	○	○	○	○	○

21. If your sludge is combined with other wastes in your country, explain what.

B. Problems and Issues

2

2. What problems and issues does sewage sludge management present in your country or region? Consider the following: **Score from 1 (not relevant) to 5 (most relevant) for each category**

	1	2	3	4	5
Environmental	○	○	○	○	○
Political	○	○	○	○	○
Public awareness or Pressure Grps	○	○	○	○	○
Regulatory	○	○	○	○	○
Operational	○	○	○	○	○
Market effects (e.g. is sludge traded between different water companies)	○	○	○	○	○

23. Please elaborate and/or or add adittional problems/issues if applicable.

D. Knowledge, practice and solutions

2

4. Do you know where the main source of contamination (Chemicals, plastics etc) in your countries sludge comes from?

25. Is there any research currently being done into sludge in your country? (Please make reference to any documents also in your home language)

26. Have you a good knowledge of the environmental impacts of sludge in your country?

27. Does the management of sludge have a high profile in your country? Do Environmental Pressure Grps show an interest in how sludge is managed?

28. Do the regulations in your country reflect the current knowledge concerning sludge treatment and usage? Or is there a gap between the two?

2 9. What changes to the regulation of sludge could help a framework of sustainable landspreading?

30. What changes to the management of sludge (under existing regulation) could help a framework of sustainable landspreading?

31. Would this resolve most of the existing problems?

32. What is preventing these changes being implemented?

33. Are there aspects of sludge management or regulation in your country that you consider as good practice and would like to share with others?

34. Have you any other comments concerning the management of sludge in your country that you would like to make?

35. What are the actions in case of complaints?

E Current priorities/ concerns for sludge quality and recovery/ disposal outlets

36. How do you rate the following topics of interest relating to sludge quality and recovery/ disposal outlets in terms of priorities for your country? **Score from 1 (being lower priority) to 6 (being highest priority) for each category.** *

	1	2	3	4	5	6
PFAS	○	○	○	○	○	○
Other chemicals	○	○	○	○	○	○
Microplastics	○	○	○	○	○	○
Anti-microbial resistance	○	○	○	○	○	○
Nutrients - N and P	○	○	○	○	○	○
Landbank availability	○	○	○	○	○	○

37. Are there any missing priorities/ concerns relating to sludge quality and recovery/ disposal outlets that you think should be included? *

F. Landspreading of final effluent

38. Does your country allow the spreading of final effluent for the following activities? *

	Yes	No
In agriculture	◯	◯
In non-agriculture amenity	◯	◯
Other	◯	◯

39. If yes how are these activities regulated? *

40. You can tell us here if you want to bring up something else that we haven't been able to consider in the survey.

TERMS AND CONDITIONS

41. Do you accept IMPEL's Terms and Conditions? *

- ◯ Yes, I have accepted the terms and conditions in IMPEL privacy policy (https://www.impel.eu/en/privacy-policy)
- ◯ No, I don't accept the terms and conditions in IMPEL privacy policy. I will inform the IMPEL Secreteriat via Email (info@impel.eu) of my objections

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Country	Italy	The Netherlands	Romania	Albania	Malta	Scotland	Cyprus	Slovakia	Germany – Saarland and Baden-Württemberg)	Lithuania	England
1) Approximately how much sludge is produced by your country annually? (Estimate if necessary)											
	Not answered.	Approx. 4346435,31 tons of Euralcode 190805 Approx. 13365,94 tons of Euralcode 1908011* Approx. 106094,41 tons of Euralcode 190812 Approx. 8324,078 tons of Euralcode 190813 Approx. 106094,42 tons of	The operators report to the central level, but I do not have the exact data.	We don't have data. Don't know the exact amount, we have notes only from a regional office that is about 500 ton. About 1000 ton.	Around 32,000 tonnes.	Approx 245,000t fresh weight was produced in 2021/22.	8000 tonne/year.	56 000 t of dry sludge matter.	18 000 t In Germany, with a population of around 83 million people, around 2 million tons of sewage sludge is produced annually from municipal wastewater treatment. Sewage sludge from industrial wastewater treatment plants amounts to around 1 million tons per year. The total sewage sludge	On average, 42,487.5 tons of sludge is produced in Lithuania per year.	2020 data – 807,882tds 2021 data – 826,572tds 2022 data – 811,693tds 2023 data – 818,477tds

		Euralcode 190814							production in Germany per year is therefore around 3 million tons.		
2)	**Is land spreading of sludge allowed in your country? (If so under what circumstances?)**										
	Not answered	Landspreading (different than application of Hydrostab) is not seen as the minimal processing standard though some euralcodes are landfilled	Yes, based on precise studies regarding the agrochemical and pedological component	Yes. We have e DCM No. 127/2015 that transpose the 86/278/EC Directive, changed from 91/692/EC Directive, regulation (EC) 807/2003 and regulation (EC) 219/2009. If it's within the	No in view that all of Malta was designated as a nitrate vulnerable zone in 2004. The only land spreading in agriculture fields in Malta is of solid manure of specific animals and in specific months of the year	Yes under the Sludge Use In Agriculture Regulations 1989 and sludge can be used for land restoration, reclamation or improvement under Waste Legislation	Yes	Yes - the requirements of the legislation must be met (for example, the content of heavy metals in the sludge and also the content of heavy metals in the soil and the content of pathogens in the sludge)	It´s allowed if the analytical results of the sludge and the soil are in the limits determined by special regulation (§4 ff. AbfKlärV). The spreading of sewage sludge on agricultural land is generally permitted in Germany, but only under strict conditions designed to protect the environment and health. Both the sewage sludge itself and the soil on which it is spread are	It is possible to fertilize with sludge from November 15. until April 1. It is prohibited to use treated sludge of all types and categories for fertilization or recultivation of damaged areas if the average daily air temperature is higher than 20 C. Only treated sludge can be used. The requirements for using sludge for soil fertilization	Yes, under SUiAR to agricultural land and under EPR land spreading permits to non-agricultural land, including restoration sites, some dedicated sites

				norms permitted from Albanian laws					subject to intensive monitoring. The practice is being increasingly scrutinized, particularly with regard to micropollutants and the long-term effects on soil and water.	can be found here: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.143603/asr	
3) Where does the sludge go to? Score from 1 (not used) to 5 (most used) for each category.											
Agricultural land spreading	Not answered.		2	1 or 2		5	3	1	1 or 2	3	5
Other land spreading	Not answered.		1	1		1	1	1	2	3	2
Land restoration	Not answered.			1		4	1	1	1	3	4
Landfill	Not answered.	3	2	1		3	1	2	4 or 5	3	3
Incineration	Not answered.	3	4	1 or 5		2	5	4	2		4
Other	Not answer	landfilling / separation /	Non-hazardous	Industrial landfill	5 Non hazardous	Landfilling primarily in the	Composting	The spreading	phosphorus recovery /		3 – industrial

	ed.	immobilized / composting / fermenting	waste deposits		landfill	Shetland Islands	and Biogas	of untreated sludge is not used in Slovakia. Sludge is most often processed in a composting plant and biogas plant (anaerobic digestion). Less it is incineration.	biogas production, co-digestion / landfilling		use: cement
4)	**Do you distinguish between sludge produced by water companies (or your sewerage and sewage treatment provider) at sewage works and other sources such as septic tank sludge**										
	Not answered.	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes. Septic tank waste-20 03 04; cess pool waste- 20 03 09, raw sewage sludge19 08 05 Regulatory position statement 231 provides further details on how sewage is

											coded
5)	**Does your country allow spreading of untreated septic tank sludge direct to land?**										
	Not answered.	No	No	No	No	No	No	No	No	No	Yes
6)	**Is sludge in your country regulated nationally or regionally?**										
	Not answered.	Nationally	Nationally	Nationally	Nationally	Nationally	Nationally	Nationally	Nationally	Nationally	Nationally
7)	**Are the Water Companies or your sewerage and sewage treatment provider (as sludge producers) in your country in public or private ownership? Approximately how many are there?**										
	Not answered.	Public 300+	Private ownership - there are at least 42 regional operators, one for each county.	Public - joint stock company where 51% of the capital is owned by the state Currently there are 37 planned WWTPs of different scale from which 11 are in	Public - one corporation which takes place of all 3 sewage treatment plants on the islands.	Public - 'Scottish Water and their PFI contracts (approx 6).	Public - 6	Public- approximately 16.	Public - In Germany, the ownership of water companies and sewage treatment providers (which are the primary producers of sewage sludge) is generally a mix of public and private ownership, with the majority. Only one sewerage and sewage treatment provider association -->	Municipal company There are about 65 agglomerations in Lithuania where water supply and sewage networks are managed centrally. Each municipality (60 in total) has its own sewage treatment company in its territory.	9 English water companies, all privately owned.

				operation. 12.					EVS (Entsorgungsverband Saar) In Germany, there are around 500-600 municipal or regional water utilities, with each municipality or district typically managing its own water and sewage systems. Some larger cities (like Berlin, Munich, or Hamburg) may have one major utility serving the entire city, while smaller towns often have their own utilities. Germany operates around 9,000 to 10,000 sewage treatment plants (Kläranlagen) across the country, serving both urban and rural populations.		

									These plants treat wastewater from households, businesses, and industrial sources.		
8) What is the main national regulation governing sludge and how does it operate?											
	Not answered.	Minimal treatment standards are described in a document called LAP (National waste plan). This LAP is used when issuing permits (permits are made by the local EPA).	ORDER no. 344/708/2004 for the approval of the Technical Norms on the protection of the environment and especially of soils, when sewage sludge is used in agriculture. * Limit values for annual quantities of heavy metals that can be introduced into	The sewage sludge requirements are fully transposed into Albanian legislation by DCM of 2015 On requirements on use of sewage sludge in agriculture. The following institutions are part of	As per relevant environmental permits of the sewage treatment plans, sludge shall be transferred to permitted facility for disposal, in the case of Malta in the non hazardous landfill. However, there are future plans dependent on other future big projects (such as	The Sludge Use In Agriculture Regulations 1989	The Water Pollution Control (Use of Sludge in Agriculture) Regulations of 2002 (517/2002) and Code of Good Agricultural Practice (283/2023)	Act 188/2003 on the application of sewage sludge and bottom sediments to the soil. It sets the requirements for the sludge (metal content, pathogens) and for the soil on which the sludge is to be spread. It also establishes	Abfallklärschlammverordnung (AbfKlärV) The main national regulation governing sewage sludge in Germany is the AbfKlärV (Abfallklärverordnung), also known as the Sewage Sludge Ordinance. This regulation specifically addresses the management, treatment, and disposal of sewage sludge produced by municipal and industrial wastewater treatment	https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.5884/asr - The wastewater management function is assigned to municipalities https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.276576/asr - wastewater management regulation	The Environment Agency Regulate the use of sewage sludge under the Sludge Use in Agriculture Regulations (1989), treatment of sludge is regulated under the Environmental Permitting (England and Wales) Regulations 2010

			agricultural land based on a 10-year average (kg/ha/year). * Sludge producers must regularly provide the sludge user with information on sludge availability and sludge characteristics. * The establishment of sludge characterization indicators and the number of analyzes depend on the amount of sludge from the treatment plant, used in agriculture, * Representative soil samples for analysis	the Competent authorities related to the sewage sludge: -Ministry of Agriculture and Rural Development (MARD) -Ministry of Tourism and Environment (MTE) -National Environment Agency (NEA) -State Inspectorate of Environment, Forests and	the construction of a waste to energy) to maybe use this sludge as fuel in such facilities			obligations for sludge producers and land owners to record and report data on produced and spread sludge on land. Supervision of compliance with these laws is carried out by the Architectural Institute of Inspection and Testing. Other relevant laws are 136/2000 on fertilizers, Act 79/2015 on waste and Act 364/2004	plants. Enforcement: The regulation is enforced by state environmental authorities in the 16 federal states (Länder) of Germany, which ensure that local and regional wastewater treatment plants comply with national standards. The authorities perform inspections and audits of sludge management practices to ensure compliance. Sewage Sludge Treatment Operators: Operators of wastewater treatment plants must ensure that their sludge is treated according to		

			* It is prohibited to use sludge or deliver it for use on: ● the lands used for grazing; ● lands intended for the cultivation of fruit trees; ● the land intended for the cultivation of vegetables ; ● lands intended for fruit tree crops 10 months before harvest and during harvest. The sludge producer has the	Water -State Inspectorate of Land Protection - Agricultural Technology Transfer Center (QTTB) - National Agency of Water and Sewerage and Waste (AKUM) -Local government units (LGU). Agricultural Technologies Transfer Center Fushë-				on water protection .	the requirements of the AbfKlärV, and they must report the results of quality monitoring to the relevant authorities. Sludge Producers: Producers of sludge (e.g., municipal utilities, industrial plants, and wastewater treatment facilities) must maintain proper records of sludge quality, treatment methods, and disposal practices. They must demonstrate that their sludge meets the relevant criteria for reuse or disposal.		

			following obligations: 1. to notify the environmental territorial authority and the sludge users about any pollutants present in the sludge; 2. to identify the sludge user and the agricultural surfaces (including the sensitive ones) that meet the conditions necessary for the use of sludge, based on the pedological studies prepared, at the request of the	Krujë (ATTC) will be the implementing agency of future sludge management in Albania. ATTC is responsible for the transfer of scientific knowledge into practical action for the farming community and hosts the accredited reference laboratory and performs soil and water analysis							

			producer, by the territorial offices of pedological and agrochemical studies; 3. to contact the sludge user and evaluate the possibilities of using the sludge. In order to obtain the application permit based on the operation authorization of the treatment plant, the sludge producer must send to the competent territorial authority, at least one month before the spreading	. National Agency of Water Supply, Sewerage and Infrastructure of Waste has completed the draft National Strategy for Sludge Management Sludge. Implementation is at initial stage and very limited in the territory of the country. An attempt to use sewage sludge in agricultu							

			period, data on: a) the quantities of sludge generated and the quantities of sludge supplied for use in agriculture; b) the composition and characteristics of sludge, according to the sludge characterization indicators of this order; c) the type of treatment carried out on the sludge; d) identification data of sludge	re was made in Kavaja. Pogradec and Korça have experimented the use of sewage sludge with some fruit, trees and vineyards, which seemed to more effective. So far, sludge use in agriculture is widely unknown in Albania. Some sludge quantities produced by Korça, Pogradec and							

			users; e) data on the location of the agricultural area on which the sludge is to be applied; f) the probable period of distribution ; g) type of culture;	Kavaja WWTPs are provided to local farmers. Geostatistical analysis was performed by the Centre for Transfer of Agricultural Technologies Fushë Kruja to produce spatial distributions of heavy metal concentrations in soil and the thematic maps for Ni, Cr and Pb. Currentl							

				y there are 37 planned WWTPs of different scale from which 11 are in operation. No monitoring of such use is available in practice, therefore detailed information on implementation is missing regarding the use of this novel product in Albania. No records							

				or registers have yet been kept by the producers or users of sewage sludge, neither the Competent Authorities. No control or inspection was done so far. The labs for soil and sewage sludge analyses are yet to be accredited. No report has been published on the implementation of this Directiv							

				e.							
9) What treatment methods are used for sludge in your country? Score from 1 (not used) to 5 (most used) for each category.											
Digestion	Not answered.	1	4	1 or 5		5	4	3	5 or 3	4	5
Composting	Not answered.	3	3	1		1	5	4	2	5	3
Heat treatment	Not answered.	4	2	1 or 2		3	1	2	5	4	2
Addition of lime	Not answered.	1		1		4	2	2	2	5	4
Long term storage	Not answered.	1	2	5		1	1	2	2	5	2
Addition of other wastes	Not answered.	1	3	1		1	2	4	3		2
10) What contaminants are tested for in your sludge?											
Chemicals	Not answered.	Yes	Yes	Yes and No		No	No	No	Yes	Yes	No
Plastics	Not answered.	No	No	No		No	No	No	No	Yes	No

Pharma ceuticals	Not answer ed.	No	No	No		No	No	No	Yes or no	Yes	No
Metals	Not answer ed.	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Any other contami nants?	Not answer ed.	No	Yes	Yes and No Salt	Yes In view that sludge ends up in the landfill, testing shall follow the waste acceptanc e criteria defined in the landfill directive	No	No	Yes - pathogens Thermotol erant coliform bacteria and Fecal streptococ ci	Yes - In Germany, sewage sludge undergoes stringent testing for a wide range of contaminants as part of its regulation under the AbfKlärV (Sewage Sludge Ordinance). These contaminants include heavy metals, organic pollutants (e.g., PCBs, dioxins, PAHs), pathogens, pharmaceutica ls, and nutrients like nitrogen and phosphorus. The goal of this testing is	Constant monitoring is carried out in accordance with the requirements and according to the company's pollution permit.	Pathogens (voluntarily) nutrients (regulatory requirement)

									to ensure that sewage sludge, when treated and disposed of or reused, does not pose a threat to human health, the environment, or the sustainability of soil and water resources.		
11) Does your country export sludge to another country? (If so which one(s)?)											
	Not answered.	Unknown	They are made depending on the type of waste water that enters the station and from which type of water use it is discharged	No	No	Very rarely to England	No	No	Germany does export sewage sludge to other countries, mainly to neighbouring EU nations (Netherlands, Belgium, and Poland), for purposes such as incineration, energy recovery, or agricultural use (though this is less common due to stringent regulations).	The export of sludge is not prohibited	Yes, within UK

									The practice is heavily regulated under both national and EU laws		
12) Is your sludge combined with other wastes in your country? Score from 1 (not relevant) to 5 (most relevant) for each category											
Green wastes	Not answered.	1	3	1		1	2	3	3	1	4
Industrial effluents	Not answered.	1		1		1	1	1	2	1	4
Industrial solid wastes	Not answered.	1		1		1	1	2	5	1	2
Other (explain what)	Not answered.	1	No	1 - In illegal ways we have had occasional combination with oil	Sludge originating from sewage treatment plants are not mixed with other waste	1 - some contamination may occur at the WWTW prior to sludge production	2 Manure	Combination with green wastes and wood waste during composting and anaerobic digestion	3 - Co-Digestion with Organic Waste (Anaerobic Digestion) and Co-Incineration with Other Wastes (Waste-to-Energy)	Not combined with other wastes.	5 - Final effluent, Food waste (co-digestion) potential
13) What problems and issues does sewage sludge management present in your country or region? Consider the following: Score from 1 (not relevant) to 5 (most relevant) for each category											
Environmental	Not answered.	1	1 or 3	5	3	5	3	2	4	5	5

Political	Not answered.	1	2 or 1	1 or 2	3	3	2	1	3	1	4
Public awareness	Not answered.	1	2	5		5	3	1	3	4	4
Regulatory	Not answered.	2	2 or 4	3 or 5		2	2	1	3	3	4
Operational	Not answered.	2	2 or 4	3 or 5		3	2	2	3	3	2
Market effects	Not answered.	2		1 or 2		1	1	1	2	1	3
14) Please elaborate and/or or add additional problems/issues if applicable.											
	Not answered.	Not answered	N/ A	Not answered	In view of the limited amounts of sludge generated in Malta, various sludge treatment processes might not be feasible due to economies of scale. As explained previously other big projects are	Additional market effects - some maltsters do not accept barley grown on land where sludge has been used	Not applicable	The produced composts are mostly of poor quality and there is not much interest in them. Microplastics, pharmaceuticals or other chemicals are not analyzed in sludge. Pharmaceuticals are	In 2017 a new regulation was passed with the purpose of a national programm to regain phosphorus from the sluge. It´s binding for most of the sluge producing facilities. It has turned out that the	Not answered	Supply chain issues - the majority of sludge is sent to agricultural land. There is growing concern about about farmer acceptance

					in the pipeline for Malta such as the first waste to energy plant and thus tests are being carried out to determine whether such sludge could be used as a biofuel in the WtE plant, thus reducing the load from non-hazardous landfill.			usually reduced by composting or anaerobic digestion, but microplastics are not.	realization is very complex and difficult. It has to be ready till the year 2029. Contamination: the most significant challenges in managing sewage sludge is the contamination by heavy metals (e.g., cadmium, lead, mercury, arsenic) and organic pollutants (e.g., PCBs, dioxins, phthalates). Public Opposition to Land Application and Use in Agriculture: there is ongoing public opposition to the use of sewage		

									sludge as fertilizer or soil conditioner in agriculture due to concerns about its potential contaminati on with heavy metals, chemicals, and pathogens. Disposal Capacity and Lack of Landfill Space: While incineration is the most common method of sewage sludge disposal in Germany, landfill disposal is still occasionally used, particularly for sludge ash. However,		

									there is limited landfill space for disposal		
15) Do you know where the main source of contamination (Chemicals, plastics etc.) in your countries sludge comes from?											
	Not answered.	No	No. Private households, industry (chemical, food, manufacturers, etc.)	Illegal deposits of urban waste Chemicals, detergents	In my opinion, probably from Agriculture, however there are no tests attesting to this	Variable depending on WWTW. Assessments have not been carried out to determine the main sources	No	I don't know	It differs by regional conditions Main Sources of Contamination in Germany's Sewage Sludge: -Household Products: Pharmaceuticals, personal care products, cleaning agents, plastics, and pesticides. -Agriculture: Pesticides, herbicides, veterinary antibiotics, and hormones. -Industry: Heavy metals, organic	Mostly yes, always in the case of pollution, the source of the pollution is determined.	Domestic and industrial sources and surface run off (highways), further details required

									chemicals, and solvents from various industrial processes. -Healthcare: Pharmaceutic als and toxic chemicals from hospitals and clinics. -Microplastics: From textiles, synthetic fibers, and other household products. -Stormwater and Wastewater: Runoff containing petroleum products, chemicals, and heavy metals from urban environments.		
16) Is there any research currently being done into sludge in your country? (Please make reference to any documents also in your home language)											
	Not answer ed.	Unknown	Yes. "Utilizarea in agricultura soluriulor acide a	No	Not that I know of	Assessment of Organic Contaminants in Materials Spread on Land, 2019 -	No	I don't know about any ongoing research.	CoMinGreat (competence platform for micro-pollutants in the greater	Sludge is studied in the laboratories. Companies that produce sludge are	Chemical Investigation Programme

			namolului din apele uzate urbane" + lots of private studies of treatment plant operators			https://www.sepa.org.uk/media/413269/organic_contaminants_materials_to_land.pdf Scottish Government - human health impact study on sludge to land.https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2021/10/impacts-human-health-environment-arising-spreading-sewage-sludge-land-cr-2016-23-project-summary/documents/impacts-human-health-environment-arising-spreading-sewage-sludge-land-cr-2016-23/impacts-human-health-			region) Key Areas of Research in Germany Related to Sewage Sludge Phosphorus Recovery and Recycling ♣ The "Phosphorus Recovery and Recycling from Sewage Sludge" project, funded by the German Federal Ministry of Education and Research (BMBF), explores innovative technologies for phosphorus recovery and their integration into the existing wastewater treatment infrastructure. ♣ The	obliged to carry out monitoring. https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.276576/asr - wastewater standards are specified in the appendices https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.295779 - surface wastewater regulation	

						environment-arising-spreading-sewage-sludge-land-cr-2016-23/govscot%3Adocument/impacts-human-health-environment-arising-spreading-sewage-sludge-land-cr-2016-23.pdf			"Sustainable Phosphorus Management" research initiative at Leibniz-Institut für Agrartechnik und Bioökonomie (ATB) focuses on innovative methods to recover phosphorus from sewage sludge and other organic waste streams, as well as potential uses in agricultural practices. Microplastic Removal and Detection • The "Microplastics in Sewage Sludge" research project at the Karlsruhe Institute of Technology (KIT) examines the sources and		

									amounts of microplastics in sewage sludge, as well as their environmental impact. The project aims to develop methods to better filter microplastics out of wastewater before they reach sewage treatment plants and sludge. • The "PlastX" project by the Fraunhofer UMSICHT and other partners aims to develop new technologies for microplastic detection in wastewater and to find ways to prevent them from contaminating sludge and entering the food chain.		

									Sludge Treatment and Resource Recovery (Biogas and Energy) • The "Energieeffiziente Abwasserbehandlung" (Energy-efficient Wastewater Treatment) project at Fraunhofer UMSICHT aims to improve the energy balance of wastewater treatment plants by optimizing biogas production and identifying ways to recover more resources from sewage sludge. • The "RENUWAT" project (funded by BMBF), which		

									focuses on wastewater treatment and sludge management, specifically looks at new methods to enhance resource recovery (such as phosphorus and nitrogen) and improve the efficiency of energy production from sewage sludge. Contaminant Reduction and Environmental Impact • The "Biomonitoring and Contaminant Control in Sewage Sludge" research at Leibniz Institute for Environmental Research looks at bio-based treatment systems that		

									could help break down contaminants in sewage sludge, reducing the environmental risks of its use. • A research project at Technische Universität Berlin (TU Berlin) is focused on understanding the behavior of heavy metals in sewage sludge and how to mitigate their impact through treatment or selective use in non-agricultural applications. Waste-to-Energy Technologies • The "RETHINK" project (a joint initiative of		

									Fraunhofer UMSICHT, KIT, and other partners) investigates the use of gasification for sewage sludge as an energy recovery method. The project focuses on enhancing the process to reduce emissions and increase energy output. Key Documents and Resources in German ♣ “Phosphorrecycling aus Klärschlamm" – A comprehensive report on phosphorus recovery from sewage sludge, published by the Umweltbunde		

									samt (UBA), the German Environment Agency. It covers the state of research and practical applications in phosphorus recovery from sewage sludge. ♣ "Klärschlamm-Management in Deutschland" – An ongoing study from Fraunhofer UMSICHT that addresses the technical, environmental, and regulatory aspects of sewage sludge management in Germany, with a focus on innovative treatment processes and resource recovery. ♣ "Mikroplastik		

									in Klärschlamm" – A research paper from Karlsruhe Institute of Technology (KIT) on the occurrence and treatment of microplastics in sewage sludge. This document discusses detection methods and strategies to reduce microplastic contamination.		
17) Have you a good knowledge of the environmental impacts of sludge in your country?											
	Not answered.	Reasonable	Yes. There are documents and reports to the European Commission from the majority of environmental institutions in Romania that reflect the current state of	Yes	In view that sludge is being transferred in an engineered lined landfill, there shouldn't be a lot of environmental impacts on paper	Yes in terms of impacts on the nutrient status of soil and the impacts from metals. Limited knowledge in regards impacts from microplastics, organic contaminants and AMR	No	Unfortunately, I don't have. The Department of Integrated Permitting and Control does not supervise the application of sludge or compost	The environmental impacts of sewage sludge in Germany are multifaceted and depend largely on the treatment methods used, the level of contaminants in the sludge, and how the sludge is	There are no limits to improvement	In development

			environmental and water factors					or digestate to land.	disposed of or used. Key environmental risks include: ♣ Soil and water contamination from heavy metals, pharmaceuticals, and pathogens, particularly when sludge is used in agriculture. ♣ The accumulation of microplastics in soils and waterways, which could affect ecosystems and enter the food chain. ♣ Air pollution from the incineration of sewage sludge, including harmful emissions like CO2, NOx, and dioxins.		

									♣ Water pollution from leachate in landfills, though landfilling is becoming less common. ♣ The carbon footprint of sludge treatment processes, especially those that rely on energy-intensive methods. The shift towards circular economy practices, where waste is minimized and resources are recovered, is central to addressing the environmental impacts of sewage sludge in Germany.		
18) Does the management of sludge have a high profile in your country? Do Environmental Pressure Groups show an interest in how sludge is managed?											
	Not answer	No	Yes, in general,	No, it's in his beginnin	Not really	Yes	No. They show interest	Only low	Yes due to the recent issues	Not	Yes, in recent

	ed.		water operators are extremely responsible in managing sludge.	gs	till today		in odour during Landspreading	profile	with the regain of phosphorus from sludge. In Germany, sludge management is a prominent environmental issue, and several environmental pressure groups actively monitor and influence how sewage sludge is treated, disposed of, and used. These groups are particularly concerned with the risks posed by heavy metals, pharmaceuticals, microplastics, and pathogens. They advocate for more stringent regulations, better treatment technologies, and greater	answered.	years

									transparency in sludge management practices. As Germany works towards sustainable and circular economy principles, these environmental organizations continue to push for improvements to reduce the ecological and human health risks associated with sewage sludge. Several prominent environmental organizations in Germany monitor and advocate for better sludge management practices. Some of the most influential groups include: ♣ BUND		

									(Bund für Umwelt und Naturschutz Deutschland): BUND is one of the most active and influential environmental organizations in Germany. Example of Advocacy: BUND has called for more stringent rules on pharmaceutical residues in sewage sludge and has pushed for clearer standards regarding the use of treated sludge in agriculture. ♣ WWF Germany: The World Wide Fund for Nature (WWF) Germany is involved in advocating for sustainable		

									waste management practices. WWF is concerned with the environmental impact of landfilling, incineration, and the application of sewage sludge to agricultural land. Research and Reports: WWF has produced reports that address the dangers of microplastics in sludge and the need for more sustainable treatment processes ♣ Greenpeace Germany: Greenpeace has also raised concerns about the toxic chemicals in		

									sewage sludge and its potential to pollute the environment, particularly regarding the use of sludge in agriculture Public Campaigns: Greenpeace has been actively involved in advocating for more transparency in sewage sludge management, demanding better tracking of where sludge is applied and how it is treated. ♣ Deutsche Umwelthilfe (DUH): The DUH is another major environmental organization in Germany that focuses on		

									issues related to sustainability and pollution prevention. The DUH has been vocal about the need to improve sewage sludge treatment processes and reduce the environmental impact of sludge Public Awareness: DUH has been active in lobbying for stricter regulations and in raising awareness of the hazards of contaminated sludge for both the environment and human health.		
19) Do the regulations in your country reflect the current knowledge concerning sludge treatment and usage? Or is there a gap between the two?											
	Not answer	No gap so far as my knowledge goes.	Yes it reflects, but there	Not answere	Since sludge is disposed	We would consider there is gap around	There is no provision for possible	I think there is reflection	In Germany, the regulations governing	Yes	The SUiAR are over 30 years and focus on

	ed.		are also gaps regarding temporary storage, regarding dehydration, then there is reluctance among the population, on the one hand people do not want products grown on soils with sludge, on the other hand users do not know exactly how to proceed, larger quantities or with contaminated sludge can cause major damage.	d.	of presently, I think there is a lack of knowledge on the subject.	the regulations not considering microplastics, organic contaminants and AMR due to current knowledge gaps.	pathogens.	of current knowledge but gaps of course exists.	sewage sludge management are fairly robust, but there are still some gaps between current knowledge about sludge treatment and its environmental impacts and the actual regulatory framework. This gap is primarily due to evolving scientific understanding of contaminants (such as microplastics, pharmaceuticals, and endocrine disruptors), the complex dynamics of sludge bioaccumulation, and the long-term environmental effects of sludge use in agriculture.		metals as the main contaminants as that was the concern at the time from industry however there are now potentially other chemicals of concerns in sludge that we don't yet properly understand the risk

									Below is an analysis of how well current regulations reflect current knowledge and where gaps may exist.		
20) What changes to the regulation of sludge could help a framework of sustainable land spreading?											
	Not answered.	Not answered.	Strict and clear regulation for the use of sludge. Or the imposition of new rules such as (for example) requiring the filling of ballast excavations with such sludge from the stations.	Not answered.	N/A - in view that up to my knowledge no such regulation exists in Malta	Consider a wider range of contamination Regulating sludge in a similar way to other wastes to land - currently in development	Control of pathogens	I don't know. I think primary the problem with landspreading are contaminants (heavy metals, microplastic and so on) in sludge, composts, digestates which are ability of accumulate.	To create a more sustainable framework for the landspreading of sewage sludge in Germany, and to address some of the environmental and health concerns associated with its use, several regulatory changes and enhancements could be implemented. ♣ Stronger Focus on Emerging Contaminants:	Centralize sludge management as much as possible.	Movement of sludge use out of SUiAR and into the more modern EPR framework, enforcement of FRfW (rule 1)

									Microplastics and Pharmaceuticals Set specific limits for microplastics and pharmaceuticals in sewage sludge. This would include testing for a wider range of chemicals such as antibiotics, hormones, and pesticides ♣ Enhanced Monitoring and Long-Term Impact Assessment Cumulative Contaminant Build-Up Introduce long-term monitoring programs that track the accumulation of contaminants		

									in soil and water over multiple years. This would involve testing sludge and soil samples periodically to identify any gradual build-up of toxic substances. ♣ Stricter Pathogen and Antibiotic Resistance Controls Set higher standards for pathogen reduction in sewage sludge before land application. Consider adopting more advanced treatment technologies that target a wider range of pathogens, including antibiotic-resistant		

									strains. ♣ Incorporation of Circular Economy Principles: Phosphorus and Nutrient Recovery Encourage phosphorus recovery from sewage sludge before land application, through processes like struvite precipitation or ash recycling. Phosphorus is a finite resource, and recycling it from sludge helps reduce the need for mined phosphorus and supports a circular economy.		
21) What changes to the management of sludge (*under existing regulation*) could help a framework of sustainable land spreading?											

	Not answered.	Not answered.	Trebuie tratata mai mult cauza , nu numai efectul. Sa existe mai multe posibilitati de valorificare . Statiile ar putea fi proiectate cu incineratoare sau cu instalatii performante de deshidratare . Se poate imbunatatii monitorizarea apelor care intra in statie. Se poate mari gradul de constientizare prin mediatizarea efectelor benefice pe care o poate avea	Not answered.	N/A - in view that up to my knowledge no such regulation exist in Malta.	Improved treatments to reduce contaminants such as AMR, odour etc. Better targeted application to avoid sensitive areas.	Elimination of odours.	I don't know. I think primary the problem with landspreading are contaminants (heavy metals, microplastic and so on) in sludge, composts, digestates which are ability of accumulate.	To create a sustainable framework for landspreading sewage sludge within the context of existing regulations, changes to sludge management practices could significantly enhance the environmental and public health outcomes. While Germany's regulations around sludge management are relatively robust, there are practical adjustments to management practices under the existing regulatory framework that could improve the sustainability of land application. Here are	An information system accessible to all.	Additional sludge treatment, storage provision and hazard identification.

			gestionare a corecta a namolurilor de epurare						some potential changes to the management of sewage sludge that could help achieve this goal: ♣ Implement a tiered classification system for sludge quality that takes into account the presence of contaminants (including emerging chemicals) and sets higher quality standards for sludge intended for land application, particularly in sensitive areas (e.g., near water sources or protected ecosystems). ♣ Introduce site-specific risk assessments for		

									landspreading practices that consider factors such as soil type, land use, topography, and water management. These assessments would help determine the appropriate amount of sludge to apply, how frequently it should be spread, and how to minimize runoff risks. ♣ Implement zoning restrictions that prevent or limit sludge application in high-risk areas, such as near water supply catchments, protected habitats, or land with high biodiversity value.		

21) Would this resolve most of the existing problems?											
	Not answered.	Not answered.	Yes, mostly	Not answered.	N/A	We think so	Yes	Not answered.	Implementing the suggested changes to sludge management under existing regulations would certainly address many of the current challenges and help move towards a more sustainable and environmentally responsible framework for landspreading sewage sludge. However, while these changes would mitigate a number of risks and improve overall practices, they may not resolve all existing problems entirely. Some	No, but it would help to centralize (or foresee) the installation of sewage networks.	Yes

									ongoing challenges are structural or due to the complexity of the issue, and others require longer-term systemic shifts.		
22) What is preventing these changes being implemented?											
	Not answered.	Not answered.	The degree of awareness of the stakeholders, the lack of sufficient research, the lack of collaboration between institutions and the lack of homogeneous legislation in several fields	Not answered.	N/A	Resource and knowledge gaps	Legal Framework	Not answered.	The implementation barriers to improving sludge management are substantial but not insurmountable. Overcoming these challenges requires a multi-pronged approach that combines technological innovation, regulatory updates, financial support, and public engagement. Key steps include improving funding	Lack of funding.	The cost of change and acceptance of the need for change

									mechanisms for treatment upgrades, expanding knowledge about emerging contaminants, providing financial incentives for best practices, and fostering greater public acceptance through education and transparency. Political will and stakeholder collaboration will be crucial to addressing these obstacles and advancing toward more sustainable landspreading of sewage sludge in the future.		
23) Are there aspects of sludge management or regulation in your country that you consider as good practice and would like to share with others?											
	Not answered.	Not answered.	Yes, we also have good practices that we will	Not answered.	N/A	Regulating in a similar way, under the same regulations as	The Code of Good Agricultural Practice	Unfortunately no.	Yes, Germany has several aspects of sludge management	Not answered.	Our soil testing requirements, down to 5ha scale, and with the data

			present later in the project.			other wastes which are applied to land for benefit			and regulation that could be considered as good practice and potentially beneficial for other countries or regions looking to improve their own sewage sludge handling practices. ♣ Comprehensive Regulatory Framework (AbfKlärV) Germany's Klärschlammverordnung (AbfKlärV), or Sewage Sludge Ordinance, is a comprehensive piece of legislation that sets clear guidelines for the management and use of sewage sludge. It mandates		available on a register for inspection by the regulator

									strict limits on the levels of heavy metals, pathogens, and other contaminants in sludge, which helps ensure that land application does not pose a risk to human health or the environment. ♣ Phosphorus Recovery from Sewage Sludge: Germany has been a leader in phosphorus recovery from sewage sludge. Phosphorus is a critical nutrient for agriculture, but it is also a limited resource that is becoming increasingly scarce.		
24) Have you any other comments concerning the management of sludge in your country that you would like to make?											

	Not answered	Not answered	No, in this moment	Not answered	N/A	The WWTW are required to deal with levels of contamination in their treatment works which are arising from other industries or sectors. Pollution from sludge can arise from the production, storage and application of sludge to land.	No	Not answered	No	Not answered	Resilience and how companies adapt to climate change given their reliance on land spreading.
25) What are the actions in case of complaints?											
	Not answered.	Not answered.	Inspections.	Not answered.	There were never any complaints on sludge management up to my knowledge	Odour - local authority pollution and production of sludge - SEPA	Inspections, Compliance notices, Fines etc	In the case of illegal landspreading, one can lodge a complaint to Agricultural Institute of control and testing	In case of complaints related to sewage sludge management in Germany, there is a structured process of investigation, enforcement, and corrective	Not answered.	Odour - local authority Sludge register audits. Environmental Performance Assessment satisfactory sludge use/ disposal metric compliance rating for sludge use/disposal

									action. Complaints typically lead to site inspections, testing of the sludge and environment, and regulatory enforcement if violations are found. Regulations like the Abwasser- und Klärschlammverordnung (AbfKlärV) provide the framework for ensuring that sludge is handled safely. Local authorities, environmental agencies, and wastewater treatment operators play key roles in addressing		compliance Treatment and storage of sludge - Inspections, Compliance notices, Fines etc

									complaints, taking corrective actions, and ensuring compliance with environmental standards.		
26) Current priorities/ concerns for sludge quality and recovery/ disposal outlets How do you rate the following topics of interest relating to sludge quality and recovery/ disposal outlets in terms of priorities for your country? Score from 1 (being lower priority) to 6 (being highest priority) for each category											
PFAS	5	2	1 or 2	3 or 5	1	6	1	4	3 or 5	4	6
Other chemicals	5	1	2	4 or 5	1	6	1	4	4 or 3	3	6
Microplastics	5	2	1 or 2	3, 5,1	4	6	1	4	3 or 5	5	5
Anti-microbial resistance	5	1	1 or 2	3,1,2	1	6	1	4	2 or 4	3	5
Nutrients – N and P	5	1	5	3,2,2	6	4	2	4	6	3	6
Landbank availability	4	1	5 or 2	3,2,2	4	4	5	1	1 or 3	3	5

27) Are there any missing priorities / concerns relating to sludge quality and recovery/ disposal outlets that you think should be included?											
	No	Not answered.	Yes, we will analyze it later in more detail	Where to dispose the sludge and how to treat it	No	Market acceptability (public perception v circular economy)	No	Priority is to minimize sludge contaminants to negatively impact environment.	No	Due to the increase in the use of production from the pharmaceutical industry, sewage sludge is not suitable for all soils.	PTEs (organic and in-organic chemicals), circular economy vs public perception
28) Landspreading of final effluent Does your country allow the spreading of final effluent for the following activities:											
In agriculture	Yes	No	Yes or no	Yes	No	No	Yes	No	No	Yes	Yes
In non-agriculture amenity	No	Yes	Yes or no	No	No	No	Yes	No	No or Yes	No	Yes
Other	No	Yes	Yes or no	No	No	No	Yes	No	Yes	Yes	Yes
If yes, how are these activities regulated?											
	D. Lgs. n. 99/92	See other answer	DECISION no. 188 of February 28, 2002 (*updated*) for the approval of some rules regarding the	As I know by laws With council of ministers decision	N/A	Final liquid is not generally applied to land	Issuing Permits	Act 364/2004 on water protection, regulation 269/2010,	Discharging effluent into a river is regulated by the national water regulation. While	https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.143603/asr	EPR permitting regime. Low Risk Waste Positions have been used in the past.

			conditions for discharging waste water into the aquatic environment - transposes the waste water directive Water Law 107/1996 updated - transposes WFD ORDER no. 344/708/2004 for the approval of the Technical Norms regarding the protection of the environment and especially of soils, when sewage sludge is used in agriculture	s					Germany does allow the spreading of treated effluent under regulated conditions (German Wastewater Ordinance (Abwasserverordnung)), its use is carefully controlled and limited to specific applications such as irrigation of non-food crops or land reclamation. The effluent must meet strict quality standards, and its use in agriculture, particularly for food crops, is generally not permitted due to		

									potential health risks. The practice is still relatively limited compared to other countries with water scarcity issues, but it is an area of ongoing research and experiment ation, particularly in regions where water recycling could support sustainable agriculture or urban water manageme nt strategies		
29) You can tell us here if you want to bring up something else that we haven't been able to consider in the survey.											
	Not answer ed	Not answered	The role of raising awareness regarding	Yes	Not answered	Nutrient harvesting, Not much	No	Not answered	'Information : SLUDGE DISPOSAL in the	Not answered	Consideration of other "Bioresources" – gas,

			the necessity of wastewater treatment and the appropriate use of sludge in new and non-dangerous industries, as well as the reuse of effluent in activities that do not require potable water. (irrigation, construction, etc)			focus on the benefits of putting sludge to land - nutrients, organic matter, reduced carbon emissions			Federal Republic of Germany https://www.umweltbundesamt.de/publikationen/klaerschlammentsorgung-in-der-bundesrepublik		cellulose, grit and screenings, algae, bio crude oil for circular economy benefit Soil health considerations Future use of destructive technologies and managing outputs such as biochar

Country	Azores	Wales	Portugal	Slovenia	Belgium	Iceland	England	Italy (consolidated)
1) Approximately how much sludge is produced by your country annually? (Estimate if necessary)								
	7183 ton (data from 2019), only in the Azores islands.	38,648 Tds	All types of sludge: 2016- 611,989 tons 2017- 750,293 tons 2018- 839,129 tons UWWT sludge: 2016- 428,967 tons 2017- 517,222 tons 2018- 551,130 tons	Approximately 35.000 ton (in dry substance)	UWWT sludge: 1.472 kT in 2018 (food)industry sludge: 629,6 kT	Approximately 458 tons.	2020 data – 807,882tds	Approximately 441,722 tons
2) Is land spreading of sludge allowed in your country? (If so under what circumstances?)								

	Yes. Only treated sludge that meet contaminant limits provided by regulation.	Yes	Yes, the referred spreading operation, agronomically identified as agricultural sludge recovery (valorização agrícola de lamas – "VAL"), is allowed when the requirements defined in Portuguese law are accomplished (DL nº. 276/2009, of 2nd of October)	If sludge from a municipal sewage treatment plant is intended to be used in agriculture or placed on the market for agricultural use, sludge must be processed. Regular measurement of treated sludge parameters must be always provided. The Ministry shall report to the Commission every three years.	UWWT sludge is not allowed, but sludge originating from the (food)industry is allowed If treated: see VLAREMA annex 2.3.1.D 1° Under certain circumstances: VLAREMA article 5.3.2.4	Iceland has implemented the Sewage sludge directive 86/278 and follows those requirements. It´s use is allowed in agriculture (treated before) and has to be worked into the soil.	Yes, under SUiAR to agricultural land and under EPR land spreading permits to nonagricultural land, including restoration sites, some dedicated sites	Yes, though each region faces different constraints
3) Where does the sludge go to? Score from 1 (not used) to 5 (most used) for each category.								
Agricultural land spreading	5	5	2	1	3	1	5	2-5
Other land spreading	1	1	1	1	1	1	2	1-2
Land	1	1	1	1	1	3	4	1

restoration								
Landfill	4	1	1	3	1	5	3	1-5
Incineration	4	1	1	4	1	1	4	2
Other	4	1	1	5	3 digestion> agricultural land spreading	1	3 industrial use: cement	1-5 composting
4) Do yo ı distinguish between sludge produced by water companies (or your sewerage and sewage treatment provider) at sewage works and other sources such as septic tank sludge								
	No. (Septic tank sludge sent to wastewater treatment plants for treatment)	Yes, in terms of where the waste is sourced and sector that generates them. There is currently separate reference to them under the regulations.	Yes, article 3 of DL nr. 276/2009, identifies the different types of sludge, depending on its origin; they all have different codes according to the LIST OF WASTE (Directive 2014/955/EU).	No	We distinguish two kinds of sludge, i.e. VLAREMA article 1.2.1 § 2 90°: (a) sludge derived from domestic or municipal wastewater treatment plants; (b) sludge from treatment plants for commercial wastewater; Sceptic tank sludge must be collected and treated in a municipal waste water treatment plant.	No	Yes. Septic tank waste-20 03 04; cess pool waste-20 03 09, raw sewage sludge19 08 05 Regulatory position statement 231 provides further details on how sewage is coded	Yes
5) Does ʏour country allow spreading of untreated septic tank sludge direct to land?								

	No	Yes, under sludge regs with requirement	In accordance with article 12, nr 1, point c) of DL nr.	No	No	No	Yes	No

		to either inject or work in asap	276/2009, of 2nd of October, it can only be subject to VAL, the sludge that meets the quality criteria foreseen in this same diploma, namely with regard to the concentration of heavy metals and organic compounds and also the presence of certain microorganisms - Escherichia coli. and salmonella. The control of microbial activity is only possible with the previous treatment of the sludge, so it is considered that it is not possible to value untreated sludge agriculturally.					
6) Is sludge in your country regulated nationally or regionally?								

	Regionally (for the Azores).	Nationally	In Portugal, the diploma DL nr. 276/2009, of 2nd of October, establishes the regime for the use of sewage sludge and sludge of similar composition in agricultural soils, transposing into the internal legal order Directive nr. 86/278/EEC, of the Council, of 12th of June.	Nationally	Regionally (waste regulation) +nationally (fertiliser regulation)	Nationally, but regional health inspectorate are responsible for enforcement in their area.	Nationally	Both

7) Are the Water Companies or your sewerage and sewage treatment provider (as sludge producers) in your country in public or private ownership? Approximately how many are there?

	Public ownership. 19 public entities on the Azores.	Private – not for profit	Urban Waste Water Treatment Plants (WWTP) are generally managed by public companies. About 60 management entities, sludge-producing "organizations" are identified, which in most cases manage more than one WWTP. The remaining WWTPs that produce sludge within the scope of the Sludge Diploma are produced mainly by private operators, especially the paper and agrifood industry.	They are in public and in private ownership. There are approx. 100 companies, mostly in public ownership.	6 private drink water companies (according to Flemish federation for water and sewage companies. Aquafin (private-public) is the only company in Flanders responsible for treatment of urban waste water	Almost all are in public ownership (municipalities). I can only think of one that is privately owned. Approximately one for each municipality so around 60-70.	9 English water companies, all privately owned.	Over 40 across 6 regions either public, private or a mix of both

8) What is the main national regulation governing sludge and how does it operate?								
	In the Azores, the regulation for sludge is the Decreto Legislativo Regional n.º 18/2009/A and the governing body is the	Sludge (Use in Agriculture) Regulations 1989 Environmental Permitting Regulations	National diploma nr. 276/2009, of 2nd of October, as mentioned, establishes the regime for the use of sewage sludge and sludge of similar	Decree on the discharge and treatment of municipal wastewater (URL RS, št. 98/15, 76/17 in 81/19).- for the use of sewage sludge in	Regional regulation, cfr. 2) In addition to the regional regulation, on the federal level one needs the permission to apply (food)industry sludge on land. (https://fytoweb.be/nl/meststoffen/zuiveringsslib)	The Sewage sludge directive 86/278. https://www.reglugerd.is/reglugerdir/eftirraduneytum/umhverfisraduneyti/nr/4292	The Environment Agency Regulate the use of sewage sludge under the Sludge Use in Agriculture Regulations (1989), treatment of	National decree n. 99/1992
	environmental department of the Azores (Direção Regional do Ambiente), which collects information on sludge production and is responsible for land spreading permit emission.		composition in agricultural soils, transposing into the internal legal order Directive nr. 86/278/CEE, of the Council, of 12th June, in order to avoid harmful effects for man, animals, vegetation and the environment, especially soils and water, promoting its correct use.	agriculture: Decree on the use of sludge from municipal sewage treatment plants in agriculture (URL RS, št. 62/08)			sludge is regulated under the Environmental Permitting (England and Wales) Regulations 2010	

9) **What treatment methods are used for sludge in your country? Score from 1 (not used) to 5 (most used) for each category.**								
				We do not collect data on this	Municipal sewage sludge: 100% incineration (0% landfill) Industry sludge: *Cfr. Treatment criteria Vlarema BIJLAGE 2.3.1.D 1°, mandatory treatments before use on agricultural soils.	Not known, but most likely addition of lime.		

Digestion	5	5	1		3		5	2-5
Composting	4	1	1		2		3	3-5
Heat treatment	1	1	1		5*		2	1-2
Addition of lime	1	3	5		5*		4	2-4
Long term storage	4	1	1		5*		2	1-2
Addition of other wastes	1	1	1				2	1-3
10) What contaminants are tested for in your sludge?								
				We do not collect data on this.				

Chemicals	Yes	Yes	5 (organic compounds)		Yes	No	No	Yes
Plastics	No	No	1		No	No	No	No
Pharmaceuticals	No	No	1		No	No	No	No (except Lombardia)
Metals	Yes	Yes	5		Yes	Yes	Yes	Yes
Any other contaminants?	No	Pathogens	5 (microorganisms)		No	No	Pathogens (voluntarily) nutrients (regulatory requirement)	Salmonella, Bacteria, PAHs, PCBs, Dioxins, Hydrocarbons Other contaminants such as organic compounds, micro organic contaminants as PCDD, PCB, IPA, and

								biological.
11) Does your country export sludge to another country? (If so which one(s)?)								
	No	Small quantity to England	Currently, we have only undergoing, one process for sludge removal from Urban WWTP to Spain	Yes, In 2018 and 2019 sludge was exported to Hungary.	Yes, France (treated commercial sludge for agricultural land spreading).	No	Yes, within UK	Yes, within Italian regions, Spain and Hungary
12) Is your sludge combined with other wastes in your country? Score from 1 (not relevant) to 5 (most relevant) for each category								

			No complete answer to this question. Urban WWTP sludge is in most situations composted on its own, however, sometimes it may occur it's mixing with other types of sludge such as paper pulp or the agri-food industry (what might be referred to as industrial effluents). The	We were unable to obtain this information/data.				

			mixing of other types of Waste typology is also not very frequent and the amounts of sludge are clearly prevalent. Green waste is used as a mixture in some waste management operators.					
Green wastes	4	1			1	1	4	3-5
Industrial effluents	1	1			1	1	4	1-2
Industrial solid wastes	1	1			3	1	2	1-3
Other (explain what)	1	1			3 Commercial sludge is mixed during treatment with organic industrial waste, agricultural waste or animal manure, or after treatment with other organic soil improvers/fertilisers.	1	5 - Final effluent, Food waste (codigestion) potential	1-5

13) What problems and issues does sewage sludge management present in your country or region?

	Environment	Environmenta	Response in the context of	We were unable to	Environmental	Most agglomerations are discharging wastewater	Environmental, political, public	Environmental, political, public

	al Operational	l Public awareness Pressure Grps Regulatory Operational	agricultural sludge recovery (VAL): <u>Associated environmental problems:</u> a) Non-compliance with the quality criteria, as they contain substances harmful to the soil where they are applied, such as heavy metals, organic chemical contaminants and pathogenic microorganisms. The presence of these substances can devalue or even render the sludge useless, thus preventing them from being used as an agricultural fertilizer, either as fertilizer or as a corrective;	obtain this information/data.	Regulatory	into less sensitive area and regulations in Iceland only require primary treatment to be done with screening. Many smaller agglomerations under 10.000 pe. do not have any treatment so very little sludge is collected. Due to no political pressure and large cost regarding wastewater treatment for small communities, little emphasis has been on better wastewater treatment or sludge management. That is though changing and the government is giving municipalities financial support for waste water treatment and more interest is in the use of sludge.	awareness and pressure groups, regulatory, operational, market effects	awareness and pressure groups, regulatory, operational

			b) The volatilization of pollutants into					

			the air and the consequent production of bad odours when not properly treated / sanitized. <u>Operational problems:</u> When the conditions defined in DL 276/2009 are not fulfilled, which contributes to the above mentioned problems					
14) Do you know where the main source of contamination (Chemicals, plastics etc.) in your countries sludge comes from?								

	No	Likely from the sewer via domestic and trade effluents	Known and analyzed contaminants: microbiological contamination, heavy metals and organic compounds	We were unable to obtain this information/d ata.	The main sources of sludge pollution are agriculture, domestic and industrial activities. In all cases, these are both direct discharges and discharges through sewage treatment plants. Hence also sludge originating from these treatment plants contains contaminations.	No	Domestic and industrial sources and surface run off (highways), further details required	Metals. Industrial effluent

15) Is there any research currently being done into sludge in your country? (Please make reference to any documents also in your home language)

	Not that I know	Not directly	Study undergoing on National Institute for agriculture and a veterinary investigation (INIAV - Instituto Nacional de Investigação Agrária e Veterinária, I.P.) in collaboration with AEVO Innovate.	We were unable to obtain this information/data.	Currently the UGent and Vlaamse Milieumaatschappij (VMM) are conducting a study about microplastics in sludge (contact person ma.verdievel@vmm.be) Aquafin is conducting research on raw material recovery within the current treatment plant and on alternative techniques (https://www.aquafin.be/nlbe/onderzoekers/energieen-grondstoffen/verwerkingstec hnieken-voor-slib) Research on emerging contaminants is ongoing.	Agency commissioned an analysis of greenhouse gas emissions from primary treatment was made this year. https://ust.is/library/sida/haf-og-vatn/Greinarger%c3%b0%20um%20aukna%20s%c3%b6fnun%20seyru%20og%20losun%20GHL%20161220.pdf A new study is underway where available organic waste types are mapped and their nutritional content calculated. Then the aim is to look for solutions to adjust the nutritional content so that it is suitable as a fertilizer. https://matis.is/matis-ogsamstarfsadilar-hljotaum-150-milljona-kronastyrk-ur-markaaetlun/	Chemical Investigation Programme	In Lombardia and Puglia. Lombardia-regional waste program with special part for sludge, Puglia there are some experimental project as reported below: - BFBios – BioFuel and Biomethane from Sludge; - RONSAS Project– Recovery of Organics and Nutrients from Sludge on Apulian Soil.
16) Have you a good knowledge of the environmental impacts of sludge in your country?								

	Theoretically, yes.	Mainly from a nutrient's perspective	YES a) Negative environmental impacts identified in inspection operations, associated with soil contamination, water and air; b) Positive environmental impacts: as a fertilizer, when it meets the quality criteria.	We were unable to obtain this information/d ata.	Yes, we have knowledge of the composition of sludge and its applications.	Yes I would say so but we are also working on acquiring better knowledge as there is more interest in the matter today.	In development	Generally yes across the regions
17) Does the management of sludge have a high profile in your country? Do Environmental Pressure Groups show an interest in how sludge is managed?								
	No.	No	It allows the development of VAL activity, ensuring that the application of sludge does not affect the quality of the environment, especially water and soil, and does not constitute a risk to public	Yes, special last years.	No	No, not much. I would say that the public organisation *The soil conservation service of Iceland* has been the driving force as of yet.	Yes, in recent years	Yes, with particular interest in experimental technologies to reduce sludge production (in Puglia)

			health. Yes, they demonstrate, through the publication of articles, for example, denouncing some bad practices associated with unsustainable sludge management.					
18) Do the regulations in your country reflect the current knowledge concerning sludge treatment and usage? Or is there a gap between the two?								
	Yes	Current legislation is out of date with current practices and emerging risks	Yes, The regulation defines operational, control and monitoring procedures, aiming to safeguard not only the quality of the sludge itself, but also the characteristics of the soil and climate of the regions where they will be	We were unable to obtain this information/data.	Research is ongoing for the knowledge gap concerning emerging contaminants.	Similar to the rest of Europe, I think? That is we need more information on micro pollutants in sludge and possible effect on vegetation, soil, water… We are also closely following the review of the directive.	The SUiAR are over 30 years and focus on metals as the main contaminants as that was the concern at the time from industry however there are now potentially other chemicals of concerns in sludge that we don't yet properly understand the	Generally regions identify there is a gap due to the age of the national reference Law (D.Lgs. 99/1992) which, although it has undergone changes over the years, requires an overall review to make it current. Though Lombardia considers that the regulations reflect the current knowledge concerning sludge treatment and usage.

			applied, taking into account the cultural systems and requirements of a legal nature. In short, not all sewage sludge has quality for agricultural use and not all soils have the conditions to be able to receive sludge as fertilizer.				risk	
19) What changes to the regulation of sludge could help a framework of sustainable land spreading?								

	Not Answered	Change needs a regulatory framework that drives continuous improvement in quality of sludge, innovation in treatment and use and improved understanding of the receiving land bank and	National legislation that regulates the agricultural recovery of sludge is being revised, in view of the alignment with the principles of the circular economy, a greater demand for the quality of sludge, the inclusion of the	We were unable to obtain this information/data.	Regulating emerging contaminants	Not Answered	Movement of sludge use out of SUiAR and into the more modern EPR framework, enforcement of FRfW (rule 1)	Targets for improvement of sludges quality for producers, higher responsibility for producers in sustainable management of sludges.

		receptors.	inspection procedure and the dematerialization of the entire procedure of licensing of sludge production and management operation for agricultural recovery. This update also arises from the need to harmonize the diploma with other legal regimes that have been approved in the meantime, namely the Law of General Bases for Public Policy on Soils, Spatial Planning and Urban Planning, Law Nr. 31/2014, of 30th of May, amended by Law Nr. 74/2017, of 16th of August, focusing on its purposes and					

			the respective general principles, as well as that of the Basic Law for Environmental Policy, Law Nr. 19/2014, of 14th of April and the respective assumptions and also Law nr. 25/2019, of 26th of March, which updates article 18 of Law nr. 50/2006, of 29th of August, amended by Laws nr. 89/2009, of August 31st, and 114/2015, of August 28th and by DecreeLaw nr. 42A/2016, of August 12th. It should also be noted that Article 13 of Law nr. 19/2014, of April 14th, expresses the					

			transversality of					


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			environmental policy and imposes its consideration in all sectors of economic, social and cultural life, and requires its articulation and integration with the other sectorial policies, aiming at promoting relations of coherence and complementarity. Likewise, Decree-Law Nr. 73/2011, of 17th of June, defines as a priority objective of the waste management policy to avoid and reduce risks to human health and the environment, ensuring that production, collection and transportation, preliminary storage and waste treatment are carried out					

			using processes or methods that are not likely to have adverse effects on the environment, namely water, air, soil pollution, fauna or flora affectation, noise or odours or damage to any places of interest and the landscape.					
20) What changes to the management of sludge (*under existing regulation*) could help a framework of sustainable land spreading?								

	Not Answered	Greater consideration of the receiving land bank, better understanding of the emerging risks, control over inputs to the sewer (domestic and trade)	Change: - at source, that is, at the level of wastewater treatment plants (WWTP), which should apply more efficient sludge treatment and stabilization technologies and processes, in order to generate	We were unable to obtain this information/data.	No opinion.	Not Answered	Additional sludge treatment, storage provision and hazard identification.	Treatment by producers (digestion, composting) in order to get sludges ready to be used in agriculture and control of treatment system, sludges composition and soil quality by regional EPA and importance of following existing rules in sludge management.

			sludge with guaranteed quality; - at the level of sludge management operators, who must follow and respect the applicable regulations / legal framework; - in the destination: greater demand at the level of the farmer who will receive the sludge, as a fertilizer, in the soil where he will develop his activity; -strengthening the control of agricultural sludge recovery - development of a computer platform that allows the dematerialization of information					

			related to sludge management, at the level of origin, carrier and destination.					
21) Would this resolve most of the existing problems?								
	Not Answered	Review of current regulatory framework using evidencebased risk assessment. Accepting that as a regulator the "precautionary principle" may need to be applied.	We believe so. They would improve VAL	We were unable to obtain this information/data.	There is a need for better treatment technology in order to recover more nutrients, other raw materials and/or energy from urban waste water treatment sludge.	Not Answered	Yes	Yes
22) What is preventing these changes being implemented?								

	Not Answered	Will be reviewing the application of changes in England	The diploma was published in 2009, and its review was not considered opportune in the following years. Since 2020, the revision proposal is being prepared.	We were unable to obtain this information/data.	The market value of the recovered resources is mostly not covering the additional cost of necessary treatment.	Not Answered	The cost of change and acceptance of the need for change	Water companies have different priorities in their working programmes and continue to manage sludges as wastes and not as resources.
23) Are there aspects of sludge management or regulation in your country that you consider as good practice and would like to share with others?								

	Not Answered	Amendments have been made on a voluntary basis to the degree of assessment prior to application of sewage sludge to land to protect water and habitats.	Effective treatment at the origin (WWTP) and at the operator (transports / stores / treats / values), with the objective of producing and enhancing a quality sludge, which complies with the legislation; - Effective supervision/co ntrol across the entire chain: at the origin, at the operator and at the farmer, - Computer system associated with VAL operations,	We were unable to obtain this information/d ata.	No	Not Answered	Our soil testing requirements, down to 5ha scale, and with the data available on a register for inspection by the regulator	To introduce a compulsory preventive and final control of soil where sludges are going to or are landspreaded under the EPA surveillance could better monitor environmental effect of sludges use as fertilizer. IT application by web to manage all information and analytical data of sludge (lombardia). Experimental projects ongoing in Puglia.

			accessible to all actors; - recognized training in collecting sludge samples for analysis, - Brief publication of new legislation					
24) Have you any other comments concerning the management of sludge in your country that you would like to make?								
	Not Answered	Not Answered	Not Answered	Not Answered	Not Answered	Not Answered	Resilience and how companies adapt to climate change given their reliance on land spreading.	

Italian responses

Region	**FVG**	**Compania**	**Lombardia**	**Marche**	**Puglia**	**Veneto**
1) Approximately how much sludge is produced by your country annually? (Estimate if necessary)						


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	Below is a summary table[1] concerning the production of sludge from the treatment of urban and industrial waste water classified with EWC code 190805, 190812 and 190814; the table contains also the production data relating to EWC code 200304 "septic tank sludge"; the data were extracted from the MUD (Unified Declaration Form) 2018 database (data for 2017) and 2019 (data for 2018), or from the Environmental Declaration submitted annually by the subjects obliged under Law n. 70/1994 "*Rules for the simplification of environmental, health and public safety obligations and for the implementation of*	375.450 tons or Mg (in the year 2019)	The production of sludge in Lombardia is about 500.000 ton (EER 190805) and other 350.000 ton (industrial biological sludge) a year	About 70000 tons handled as waste, CER 190805	The total amount of sludge produced in the Puglia Region during 2014 was approximately 360˙000 tT.Q.. The estimation of sludge production for 2021 is 379˙000 tT.Q. (Data source: https://pugliacon.regione.puglia.it/web/sitpuglia-dipartimento/rifiuti-e-fanghi)	350.000 tons

	the ecomanagement and environmental audit system". It should be noted that these data may be underestimated, as there is no obligation of MUD for companies that carry out waste water treatment that have fewer than 10 employees, and also for some producers of nonhazardous special waste including those that produce the EWC 200304. This could be one of the reasons why in 2018 the total produced (see the following table) is less than the total managed (see question 9). Sludges classified with other EWC codes were not analysed (hazardous sludges of Chapter 19 and waste from other chapters of the EWC list).					

	ARPA Friuli Venezia Giulia is available for further information. 2017 – 133.405t/y 2018- 147.212					
2) Is land spreading of sludge allowed in your country? (If so under what circumstances?)						
	The spreading of sludge in agriculture is regulated by D.Lgs. 99/1992 "Implementation of Directive n. 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture".	Yes, according to national and regional law	Yes, according to National and Regional Law	Handled as waste	Actually, land spreading of sludge is a potentially usable practice in Puglia but difficult to apply due to legal limitations	Yes
3) Where does the sludge go to? Score from 1 (not used) to 5 (most used) for each category.						
Agricultural land spreading	5		4		2	2
Other land spreading	1		2			1

Land restoration	1		1		1	1

Landfill	2		1	5	3	2
Incineration	2		2		2	2
Other	2		1		3	5 - composting
	The scores have been assigned according to the analysis carried out for the question n. 9) and considering the second fate of the treated sludge in the plants authorized for their management. It should be noted that 95% of the sludge (after treatment or not) is destined for agriculture (considering therefore also its transformation into compost / soil improver at authorized plants).	No data available		Disposed of in landfill		

4) Do you distinguish between sludge produced by water companies (or your sewerage and sewage treatment provider) at sewag works and other sources such as septic tank sludge

	In terms of production, the distinction is made through the analysis of the MUD database	Yes. we distinguish about 60 kind of sludge, defined by different codes of eer	Yes we do. We have data of all kind of sludges and we have a list of sludges that are allowed to use in	Not answered	Yes. The septic tank sludge is carried by Water Company to some wastewater treatment plants, adopting pre-treatment of sludge.	Yes

	(see for the reading of Question No. 1)		agriculture.			
5) Does your country allow spreading of untreated septic tank sludge direct to land?						
	Septic tank sludge spreading on land without prior treatment shall not be allowed.	No	No, in Lombardia region is necessary to treat the sludge before spreading	Not answered	No	No
6) Is sludge in your country regulated nationally or regionally?						
	In our country sludge is regulated both nationally and regionally.	Both	In our country sludge is regulated both nationally and regionally.	Handled as waste	Yes, it is regulated nationally and regionally.	Both
7) Are the Water Companies or your sewerage and sewage treatment provider (as sludge producers) in your country in public or private ownership? Approximately how many are there?						

	In Friuli Venezia Giulia Region the main producers of waste arising from urban waste water treatment (identified with EWC code 190805) are 6; they are all jointstock companies with total public capital with the exception of one that is a publicprivate mixedparticipation company.	Public. In Campania region (5.800.000 inhabitants), in 5 districts there are 5 principal water companies and a lot of little municipal water companies. Also, there are about 10 regional sewage treatment providers and a lot of municipal sewage treatment providers.	In Lombardia we have about 20 private plants authorized to collect, treat and landfill spreading. They treat a total of 800.000 t of sludge per year.	Companies with public participation	In Puglia, currently there is only one Water Company as sewerage and sewage treatment provider, named AQP SpA. This Company is a public-private one, and the Puglia Region Government represents 100% (SpA a single shareholder). (*Society web links - https://www.aqp.it/ - http://www.asecospa.com*).	Public, about 10 in veneto region (5.000.000 inhabitants)

	The producers of sludge from industrial wastewater treatment (identified with EWC code 190812 and 190814) are mainly private companies; significant is also the contribution made by a jointstock company with public participation.					

8) What is the main national regulation governing sludge and how does it operate?

	The Legislative Decree n.99/1992 regulates the activity of spreading sludge through limits defined for chemical parameters to be detected in sludge and soil; it also defines quantitative limits of sludge that can be disposed in the soil (as a function of pH and CSC exchange of the	National decree n. 99/1992 and regional decree n. 239 del 24.05.2016. Region authorizes who ask for land spreading sludges on agricultural land. Sludges have to respect limits set for chemical and microbiological parameters such as soil on which they have to be spread.	Main national regulation governing sludge is d.lgs 27/01/1992 n. 99. In Lombardia the first rule was issued in 1980 and the new regional regulation is DGR_2031 del 1_07_2014 and D.G.R. 11 settembre 2017 n. 7076. The Provinces of	Regional regulations	- Legislative Decree 152/2006 – art. 127 – part III and subsequent amendments and additions; - Legislative Decree 99/1992; - Legislative Decree 75/2010 and subsequent amendments and additions for sludge land spreading; - DM 5/2/98 for co-incineration and to produce energy; - D. Lgs 121/2020 - landfill regulations" - L. 16/11/2018, n.130 (art. 41 ex D.L. 109/2018 Decree "Genova") In Puglia: - R.R. n. 2/1989 Discipline for the spreading of sludge on the soil and subsoil; - L.R. 29/1995 "…functions of the	Decree n. 99/1992 region authorizes who ask for land spreading sludges on agricultural land. sludges has to respect limits set for chemical and microbiological parameters such as soil on which they have to be spread
	soil).		Lombardia authorizes who ask for land spreading sludges on Agricultural land. Sludge has to respect limits set for chemical and microbiological parameters such as soil on which they have to be spread.		provincial administration and the use of sewage sludge in agriculture". - the Special Waste Management Plan - DGR 819_23/4/2015; - DGR 1482/2018 – Adoption of the proposal Regional Urban Waste Management Plan (sewage sludge).	

9) What treatment methods are used for sludge in your country? Score from 1 (not used) to 5 (most used) for each category.						
Digestion	2		4	5	3	3
Composting	3		3	4	3	5
Heat treatment	2		1		2	2
Addition of lime	4		4		2	2
Long term storage	1		2		1	2
Addition of other wastes	1		2		3	1
	Other – material recovery – R3) 4 Other	We actually have no data to answer this question				
	Environmental recovery – R10) 4					
10) What contaminants are tested for in your sludge?						
Chemicals	Yes	Yes	Yes		Yes	Yes
Plastics	No	No	No		No	No
Pharmaceuticals	No	No	Yes		No	No
Metals	Yes	Yes	Yes		Yes	Yes

Any other contaminants?	Bacteria, PAHs, PCBs, Dioxins, Hydrocarbons	Salmonella	Other contaminants such as organic compounds, micro organic contaminants as PCDD, PCB, IPA, …. And biological		Biological: Salmonella.	Salmonella
	D. Lgs. N. 99/1992 has been amended by D.L.n. 109/2018 converted into Law n. 130/ 2018. This modification implemented the standardized analytes in sludge for use in agriculture, introducing organic compounds (PAHs, PCBs, Dioxins,			Categorized as waste		

	Hydrocarbons) and adding other metals.					
11) Does your country export sludge to another country? (If so which one(s)?)						

There is	no Yes, 50% of evidence that is sludges with the EWC Piemonte, in the Romagna,).	sludge No, it does exported in other classified Italian Puglia (30,8%), analysis (3,7%), destined for Spain	not. We Partly receive sludge regions, (50%) region as and in other (1,3%) and	sent out of the region from other (Veneto, codes above, are foreign	Sludge is exported in extra-regional plants (in Italy), for material recovery or other. considered Toscana (5%), Lazio European countries, Emilia countries Hungary (1,2%).	Yes, in other Italian regions (Lombardia)
12) Is your sludge combined with other wastes in your country? Score from 1 (not relevant) to 5 (most relevant) for each category						
Green wastes			3		4	5
Industrial effluents			2		1	2
Industrial solid wastes			1		3	2
Other (explain what)			1		The sludge is combined with the organic waste (c.d. FORSU) and green waste in the composting and anaerobic digestion process, to produce soil conditioner.	5- organic urban waste
	Sludge waste from urban or industrial waste water treatment are managed together with other waste in	We actually have not data to answer this question		The sludge produced by water purification is disposed of as waste in landfills		

	dedicated plants, which in addition to sludge may also receive other waste (some plant processes are carried out precisely through a mixing, e.g. anaerobic digestion composting, mechanicalbiological treatment and chemical treatment,...); obviously these processes are authorized.					
13) What problems and issues does sewage sludge management present in your country or region?						
	Not answered	Public awareness or pressure groups, regulatory, operational	In our region the main problems and issues are environmental, Regulatory and Public awareness or Pressure Grps.	Political and environmental problems	Environmental, political, public awareness and pressure groups, regulatory, operational	Public awareness and pressure groups, regulatory. operational
14) Do you know where the main source of contamination (Chemicals, plastics etc.) in your countries sludge comes from?						
	ARPA FriuliVenezia Giulia does not regularly carry out analyses of sludge; there is no systematic	Metals	The main sources of contamination are metals and organic compounds and they comes from	Not answered	Metals- Chemicals	Metals

	collection of data and information available in the Region to allow a reliable assessment of the sources of contamination		Industrial waste water.			
15) Is there any research currently being done into sludge in your country? (Please make reference to any documents also in your home language)						
	ARPA FriuliVenezia Giulia is not aware of any particular studies in progress.	No	Lombardia Region is preparing the regional waste program with a special part for sludge.	Not answered	In Puglia, there are some experimental project as reported below: - BFBios – BioFuel and Biomethane from Sludge; - RONSAS Project– Recovery of Organics and Nutrients from Sludge on Apulian Soil; - Phytoremedition; - Life Perbiof Project- SBBGR (Sequencing Batch Biofilter Granular Reactor) Technology (CNR-IRSA).	No
16) Have you a good knowledge of the environmental impacts of sludge in your country?						

	ARPA FriuliVenezia Giulia does not systematically sample soils to assess the impacts of sludge	Yes	Yes, the main impact is due to olfactory harassment in my Region.	Handled as waste	Yes	Yes

	use.					
17) Does the management of sludge have a high profile in your country? Do Environmental Pressure Groups show an interest in how sludge is managed?						
ARPA	Friuli-It is not Venezia Giulia, within its grps competence, production.	adequately Yes, it as faced. env have few does attention on particular reports	does. Yes, Not pressure they particular it technologies in in this regard.	answered In do. have a high attention to order to reduce	Puglia, the management of sludge It is profile; at present, there is faced. env experimental grps have few attention the on it not detect any sludge	not adequately pressure far as it's
18) Do the regulations in your country reflect the current knowledge concerning sludge treatment and usage? Or is there a gap between the two?						

	We think that there is a gap due to the age of the national reference Law (D.Lgs. 99/1992) which, although it has undergone changes over the years, requires an overall review to make it current.	It is not adequately faced. env pressure grps have few attention on it	Yes the regulations in our country and especially in Lombardia Region reflect the current knowledge concerning sludge treatment and usage.	Not answered	Some aspects are not well regulated, nationally and regionally, for both treatment and usage of sludge.	It is not adequately faced. Environmental pressure groups have few attention on it.
19) What changes to the regulation of sludge could help a framework of sustainable land spreading?						
	Not answered	Targets for improvement of sludges quality for producers, higher responsibility for producers in sustainable management of sludges	It could be useful to introduce treatment processing for improving the quality of sludge material and the stabilization of organic matter.	Not answered	Best identification of limit concentration values for the parameters to be investigated.	Targets for improvement of sludges quality for producers, higher responsibility for producers in sustainable management of sludges
20) What changes to the management of sludge (*under existing regulation*) could help a framework of sustainable land spreading?						

	Not answered	Treatment by producers (composting) in order to get sludges ready to be used in agriculture and control of treatment system, sludges composition and soil quality by regional epa	It's important to stick to the rules in management of sludge for ensuring a sustainable land spreading	Not answered	In Puglia, the management of sludge in terms of prevention, reuse and recycling have to be implemented (A.4 – to see proposal Regional Planning G.R.U. – DGR 1482/2018) changing the rules.	Treatment by producers (digestion, composting) in order to get sludges ready to be used in agriculture and control of treatment system, sludges composition and soil quality by regional epa
21) Would this resolve most of the existing problems?						
	Not answered	Yes	Yes, it would.	Not answered	This can help the resolution of some existing problems but it isn't enough. It is necessary to verify over time the feasibility of sustainable land spreading.	Yes
22) What is preventing these changes being implemented?						
Not		answered Water companies have and not as farmers. In Puglia,	companies manage sludges regulation, programmes and	Policy choices. as sludge land together with	Not answered A strategic planning for spreading with appropriate different the information their working resource agriculture is a significant productive manage activity. sludges as wastes and	sustainable Water priorities in wastes to the citizens and continue to not as resources
23) Are there aspects of sludge management or regulation in your country that you consider as good practice and would like to share with others?						

	Not answered	To introduce a compulsory preventive and final control of soil where sludges are going to or are landspreaded under the epa surveillance could monitor environmental effect of sludges use as fertilizer	In Lombardia Region we are implementing an IT application by web to manage all information and analytical data of sludge.	The sludge produced by water purification is disposed of as waste in landfills	In Puglia, there are some experimental projects, as above reported.	To introduce a compulsory preventive and final control of soil where sludges are going to or are landspreaded under the epa surveillance could better monitor environmental effect of sludges use as fertilizer
24) Have you any other comments concerning the management of sludge in your country that you would like to make?						
	Not answered	Not answered	Not answered	Not answered	Not answered	Not answered

1 Summary table provided for FVG in response to Question 1

EWC code	description	2017 (t/y)	2018 (t/y)
190805	sludges from treatment of urban waste water	81.734	79.810
190812	sludges from biological treatment of industrial waste water other than those mentioned in 19 08 11	10.107	14.174
190814	sludges from other treatment of industrial waste water other than those mentioned in 19 08 13	1.376	1.552
200304	septic tank sludge	40.188	51.676
Total amount (t/y)	**133.405**	**147.212**	


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