Ref. Ares(2025)2975968 - 11/04/2025

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

D6.1 Report on the policy framework

Funded by
the European Union

Document information

Grant Agreement Number	n° 101112889
Project Title	Information-based Strategies for LAND Remediation
Project Acronym	ISLANDR
Project Coordinator	GTK / Juha Kaija
Project Duration	1 May 2023 – 30 April 2026 (36 months)
Related Work Package	WP 6
Related task	T6.1 Horizontal policy integration
Deliverable name	DEL6.1- Report on the policy framework
Lead Organisation	Finnish Environment Institute, Syke
Contributing Partner(s)	r3 (Paul Bardos), GTK (Timo Tarvainen), Deltares (Marissa van de Wijngaard-Frambach), BRGM (Dominique Guyonnet)
Authors	Teija Haavisto, Jaana Sorvari, Outi Pyy
Submission Date	5.3.2025
Dissemination Level	Final

The ISLANDR project has received funding from the European Union's Horizon Europe research and innovations actions programme under Grant Agreement No. 101112889". Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

History

Date	Submitted by	Reviewed by	Version (Notes)
15 Nov 2024	Teija Haavisto	ISLANDR WP6 partners	Draft
21 Feb 2025	Jaana Sorvari	MC and ISLANDR WP6 partners	Final draft
3 March 2025	Teija Haavisto, Jaana Sorvari	MC	Final draft
6 March 2025	Teija Haavisto, Jaana Sorvari	MC	Final

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

ISLANDR project in brief

The Information-based Strategies for Land Remediation, in short ISLANDR, is a multidisciplinary project, which is foremost aimed at supporting the execution of the EU mission: A Soil Deal for Europe.

More specifically, the ISLANDR research activities are designed to provide tools and methods so as to support: (1) the delineation of polluted soils across Europe, (2) an evidence-based assessment of the risks posed by polluted soils, (3) the promotion of sustainable and risk-based land management practices, (4) the inclusion of a wider valuation approach in financial and investment cases, and (5) a closer integration of land contamination and spatial planning decision-making. Lessons learnt and experience gained throughout the project duration will be used to (6) deliver key policy-relevant findings related to the Soil Strategy, the proposed Soil Health Law, and other areas of policy where soils are crucial.

In order to road-test the project's findings, seven test areas across Europe have been identified. To begin with, the ISLANDR Test Areas (ITAs) will provide a real-world context for the planned research activities. More concretely, the ITAs have been selected to cover different land use types, such as urban, peri-urban, rural, agro-forestry, mining, wetlands and coastal areas. Furthermore, the ITAs are characterized by both point source and diffuse pollution, as well as by different soil pollution types, such as organic, inorganic, as well as contaminants of emerging concern.

Furthermore, ISLANDR brings a dedicated focus to low input remediation, by including test areas impacted by the consequences of the green transition, such as former mining areas. This will ensure that soil remediation will be facilitated even when the cost of remediation is economically marginal or may even be negative. On the one hand, this necessitates a more thorough understanding of low input remediation approaches from a technological perspective, yet it also requires a wider value proposition for investment cases and financial planning.

Key actors, stakeholders and end-beneficiaries are at the epicentre of ISLANDR. Through roundtables in the respective ITAs, the foremost assignment of local actors will be to provide feedback and offer insights as to the robustness and effectiveness of the strategies, frameworks and decision-support tools, as well as on the wider valuation approaches and financing mechanisms to be developed over the course of the project's lifetime. Thus, the Roundtables are foreseen to bring an iterative feedback loop to the research process, with a view to ensure the wider uptake of the project's outcomes and achievements.

Last but not least, local communities in the respective ITAs will be invited to participate in a survey organized both during the early stages and towards the end of the project, as a means to document soil literacy among society thereby bringing insight as to whether the exposure of society to the project's activities on the ground can bring about a strongly desired 'awareness pull' to the benefits to be reaped from healthy soils, thereby leveraging society at large to subscribe to the projects' motto: ISLANDR for Soil Health!

Summary

This report is an outcome of a study that is part of the EU project known as ISLANDR (Information-based Strategies for Land Remediation), which aims to support the execution of the EU mission: A Soil Deal for Europe and as part of it, sustainable and risk-based land management (SRBLM). This literature study compiles the policy instruments, e.g., international agreements, EU strategies and EU legislation that are relevant in managing the risks of contaminated land. The policy instruments extend to different levels of decision-making. The international conventions and EU strategies provide the framework for the regulatory policy instruments, which can be indicative or binding. Both the EU directives and regulations are binding, but in the case of directives, the Member States have leeway in national implementation. Although there is currently no specific regulation addressing the contaminated land management (CLM), several strategies and statutes acknowledge it and include requirements that contribute to the management of contaminated sites.

Water legislation, waste legislation, environmental liability legislation, and legislation concerning significant polluting activities (Revised IED (EU) 2024/1785) were identified as the most significant regulatory tools. In some cases, legislation concerning, for example, mining activities, persistent organic pollutants, or invasive species also emerge as significant. The forthcoming soil directive will be the key statute governing the risk management of contaminated land. The Directive will improve the level of soil protection and monitoring and assessment of soil status as well as harmonise the practices of CLM.

The fact that the legislation cannot be applied retroactively, complicates the determination of liability, especially in cases of contamination that occurred before the Liability Directive came into force. In these cases, liability must be determined on a case-by-case basis based on other statutes in force at that time.

Although sustainability is currently a central principle guiding human activities, it is not explicitly stated as an objective in the legislation for the risk management of contaminated land. The division of environmental law into sectors and potential contradictions between different policy instruments can emerge as a barrier to a holistic approach to decision-making. The EU legislation is also undergoing constant changes due to emerging new issues. This, alongside the fragmentation of EU law, challenges the different CLM actors who need to be aware of the current requirements and restrictions that guide their actions.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Keywords

Soil, land, contamination, remediation, environment, soil protection, soil conservation, EU legal act, environmental convention, regulation, legislation, risk management, risk reduction, policy instrument

Abbreviations and acronyms

Acronym	Description
AA	Annual average concentration relating to environmental quality standards
AMR	Antimicrobial Resistance
As	Arsenic
BAT	Best Available Techniques
BEP	Best Environmental Practice
CBD	The Convention on Biological Diversity
Cd	Cadmium
CLM	contaminated land management
CLP	Classification, Labelling and Packaging of Chemicals
CMR	carcinogenic, mutagenic, reproductive toxicity
Co	Cobalt
COP	Conference of the Parties is the ultimate authority and the supreme decision-making body of international agreements
CPV	Common Procurement Vocabulary
Cr(total),	Chromium total concentration
CRM	critical raw material
Cu	Copper
DDT	Dichlorodiphenyltrichloroethane
DEHP	Di(2- ethylhexyl)- phthalate
DWD	Drinking water Directive, Directive on the quality of water intended for human consumption
EAP	Environmental Action Programme
ECHA	EU Chemicals Agency
EEA	European Environment Agency
ELD	Environmental Liability Directive
EoW	End of Waste
EQS	Environmental Quality Standard
EQSD	Environmental Quality Standards Directive
EUSO	European Soil Observatory
GHG	greenhouse gases
GEM	genetically engineered organism
GMO	genetically modified organism
GPP	green public procurement
GWD	Groundwater Directive
HBB	Hexabromobiphenyl
HBCD / HBCDD	Hexabromocyclododecane
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Acronym	Description
HCH	Hexachlorocyclohexanes
Hg	Mercury
IED 2.0	revised Industrial and Livestock Rearing Emissions Directive
IMPEL	European Union Network for the Implementation and Enforcement of Environmental Law
LDN	Land degradation neutrality
ITA	ISLANDR test area
LULUCF	Land Use, Land Use Change and Forestry
MS	Member State
NATURA 2000	European network of protected nature areas where certain species of animal and their natural habitats are protected in order to preserve biodiversity
Ni	Nickel
NRL	Nature Restoration Law, Regulation (EU) 2024/1991 on nature restoration and amending Regulation (EU) 2022/869
PAH	Polyaromatic hydrocarbons
Pb	Lead
PBT	persistent, bioaccumulative and toxic
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-p-dioxin
PCDF	Polychlorinated dibenzofuran
PCN	Polychlorinated naphthalene
PCP	Pentachlorinated phenol
PeCB	Pentachlorobenzene
PFAS	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexane sulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PM_{10}	particulate matter, which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM10, EN 12341, with a 50 % efficiency cut-off at 10 µm aerodynamic diameter
$PM_{2,5}$	particulate matter, which passes through a size-selective inlet as defined in the reference method for the sampling and measurement of PM2,5, EN 12341, with a 50 % efficiency cut-off at 2,5 µm aerodynamic diameter
POP	Persistent Organic Pollutant
PP	public procurement
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RED	Renewable Energy Directive

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Acronym	Description
REPowerEU	Plan of the European Commission to phase out Russian fossil fuel imports
Sb	Antimony
SCCPs	short-chain chlorinated paraffins
SDGs	Sustainable Development Goals
SLUS	sustainable land use systems
SRBLM	sustainable and risk-based land management
SVHC	Substances of Very High Concern
Tl	Thallium
UNCCD	The United Nations Convention to Combat Desertification
UNECE	The United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UV-328	2-(2H-benzotriazol-2-yl)-4,6-di-tert-pentylphenol
V	Vanadium
vPvB	very Persistent and very Bioaccumulative
WFD	Water framework Directive
Zn	Zinc

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Table of Contents

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

List of Figures

List of Tables

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

1. Introduction

1.1. Background and objectives of the study

This report is an outcome of a study that is part of the EU project known as ISLANDR, where sustainable and risk-based land management (SRBLM)[1] is a key element. This study provides insights and feedback for the development of contaminated land management (CLM) practices that are addressed in other work packages of ISLANDR and identifies policy instruments, besides the upcoming "Soil Directive", which should be considered in shaping project outcomes (such as the ISLANDR roadmap). At a broad scale, this report is aimed to serve the need of different CLM actors, i.e. authorities at different levels of the environment administration, municipal decision makers, subscribers of land remediation, service providers and land use planners.

This report describes the most relevant obligations of international agreements, EU strategies and EU legislation, including their complementing important guidelines and recommendations, which should be considered in managing the risks of contaminated land throughout the life cycle, from the contamination identification to clean-up. It also aims to support the operationalization of the "healthy soil" objective by presenting the legislation that has to be acknowledged in various types of contaminated sites and when different remediation or other risk management actions are planned and carried out. The environmental legislation in EU has changed considerably in recent years. Therefore, this report also studies the most significant implications of these regulatory changes and new statutes to the remediation of contaminated sites and discusses briefly the relevant international environment agreements where the EU is a contracting party. In addition, it presents a summary of the objectives of the identified EU strategies.

This report intends to cover all policy instruments which may be relevant in CLM. Water legislation is dealt with only to the extent necessary for addressing surface and groundwater risks from contaminated land. The focus is solely on retrospective risk management, i.e. management of existing land contamination. Therefore, the legislation regarding prospective risk management, such as regulations for limiting emissions from industrial facilities and marketing of chemicals, among others, are handled only superficially.

The items of the studied policy instruments that were identified as the most important in the context of contaminated land management, are highlighted in bold.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

1 SRBLM means land management, e.g., remediation, that is both risk-based and sustainable. Sustainable remediation is generally understood as "the practice of demonstrating, in terms of environmental, economic and social indicators, that the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of a balanced decision-making process" (SuRF-UK. Available at: https://claire.co.uk/sustainable-remediation/about-sustainable-remediation)

1.2. Policy framework

The remediation of contaminated environment should ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally non-degrading, economically viable, institutionally robust, and socially acceptable ways[2,] Holistic approach is needed to integrate the principles of circular economy, recycle and reuse, into soil remediation practices[3].

Primary prerequisite in any approach of soil remediation is that it fulfils the legislative requirements. Legislation is the key policy tool to protect the environment, minimize health and climate risks and maintain biodiversity and convert these objectives into practical actions. It requires to control the environmental hazards to health and the environment by prohibiting, restricting, and regulating environmentally harmful practices.

According to Kokko (2017)[4] environmental law can be divided into five regulatory levels:

- Legislation based on international law
- Legislation based on EU law
- National legislation and other statutes
- Orders issued by municipalities and provinces/regional administrations
- Self-regulation issued by various actors affecting the environment, e.g. companies, industry, or nature conservation organisation alone or together with others.

Each regulatory level has its own hierarchy of norms. A higher-level regulation authorizes to give lower-level legislation and guides their interpretation. In international law, framework agreements, such as Convention on Biological Diversity and the 2030 Agenda for Sustainable Development, usually form the upper regulatory level and they are implemented by protocols. EU Treaties comprise also international agreements, and they form the level of primary law. They provide the EU with jurisdiction to give regulations, directives, and decisions (secondary law). The competence of the EU is thus derived from the Treaties. [5]

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

2 Rizzo, E., Bardos, P., Pizzol, L. et al. (2016). Comparison of international approaches to sustainable remediation. J. Environ. Manage. 18, 4-17. http://dx.doi.org/10.1016/j.jenvman.2016.07.062

3 Lee, H., Sam, K., Coulon, F. et al. (2024) Recent development and prhospects of sustainable remediation treatments for major contaminants in soil: A review. Sci. Tot. Environ. 912, 168769. https://doi.org/10.1016/j.scitotenv.2023.168769

4 Kokko, K. (2017). Fundamentals of Environmental Law General Doctrines, Regulation, and Theory of Solution (in Finnish). Edita Publishing Oy. Otavan kirjapaino Oy, Keuruu. ISBN 978-951-37-6889-8

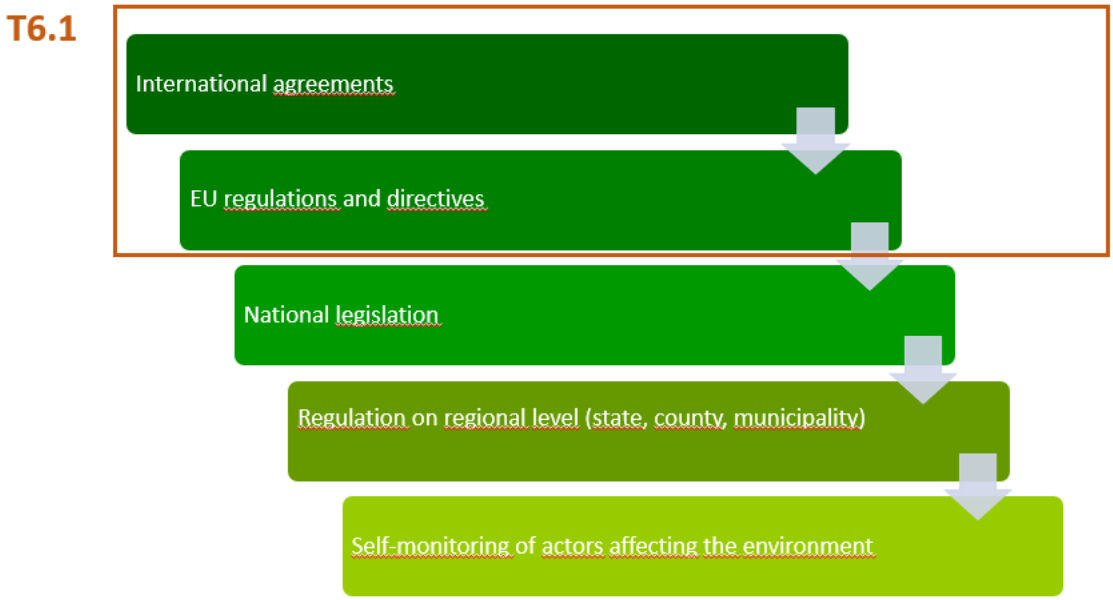


Figure 1. Regulatory levels of environmental law according to Kokko (2017) and the focus in this study (ISLANDR Task 6.1) framed by a red line.

In the hierarchy of norms of the EU law, international agreements are placed between primary and secondary law. EU institutions have to adhere to the international agreements to which the EU is a contracting party. In the European Union both the European Union and its Member States (MS) can conclude an agreement. The international agreements concluded by the Union are the law in force in the MSs and their provisions have primacy and interpretative effect on national law.

In the Member States, regulations and directives are the most important from the point of the general implementation of the EU's environmental policy. Regulations are legally binding as such throughout every MS, are directly applicable and enter into force on a set date. The Directives set out a goal that EU countries must achieve, but the MS can decide the form and method of national implementation. EU strategies, on the other hand, are non-binding acts of particular importance to the legislator. They describe what actions should be taken to attain the objectives set. In addition, they are part of the overarching context for environmental decision-making. They complement binding legislation and act as an incentive for adoption of measures for environmental protection[6]. Furthermore, an international environmental convention is a legally binding agreement negotiated among governments to act in concert to combat or mitigate a global environmental threat.

Articles 11 and 191 to 193 of the Treaty on the Functioning of the European Union (TFEU) establish the EU as the competent body for environment policy. The EU's environmental policy is based on four principles:

AWAITING APPROVAL BY THE EUROPEA[illegible]MISSION

6 Modiga, G., Miclea, A. & Avramecu, G. (2012) Strategies of Environmental Policy in the European Union. The 7th edition of the International Conference European Integration Realities and Perspectives. Available at: https://proceedings.univ-anubius.ro/index.php/eirp/article/download/1381/1203

- **Precaution**: if an action or policy has the potential to cause harm to the environment or public health, and there is persisting scientific uncertainty about its effects, this action should not be applied until further evidence is provided.
- **Prevention**: a tool aimed at preventing environmental damage, rather than reacting to it. This requires preventive measures to be taken to anticipate and avoid environmental damage.
- **Rectifying pollution at source**: if damage to the environment has already occurred, the polluters are obliged to take the appropriate measures to remedy it at the point of origin.
- **'Polluter pays'**: if damage has occurred, the polluters are obliged to take the appropriate measures to remedy it and pay for the costs. It is implemented through the Environmental Liability Directive, which aims to prevent or otherwise remedy environmental damage to protected species or natural habitats, water and soil.[7]

Both the Charter of Fundamental Rights of the European Union (Article 37) and the Treaty on the Functioning of the European Union (Article 11) require the integration of environment protection into and promoting sustainable development in the policies of the Union. The amount of EU's environmental regulation and number of legislative projects have increased strongly in the last ten years.

2. International environmental conventions

Many environmental problems are transboundary, regional or global in scope. Due to their complexity regional or global actions and rules are needed and international regulations can offer basic guarantee of environment protection. Supervisory institutions related to international agreements and maintaining cooperation between the contracting parties are important for the continuity of operations and for the fight against free-riding.

2.1. Sustainable Development Goals

All United Nations Member States adopted the 2030 Agenda for Sustainable Development in 2015[8]. The 17 Sustainable Development Goals (SDGs) are the core elements of the Agenda. The SDGs build on decades of work by countries and the UN. Its predecessors include Agenda 21 adopted in Rio de Janeiro in 1992, Millenium Declaration and Millenium Development Goals adopted in New York 2000 and United Nations Conference on

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

7 Consolidated versions of the treaty on European Union and Treaty on the functioning of the European Union. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02016ME/TXT-20240901

8 UN General Assembly (2015). A/RES/70/1 - Transforming our world: the 2030 Agenda for Sustainable Development.

Sustainable Development (Rio+20) in 2012 where Member States decided to launch a process to develop a set of SDGs to build upon the MDGs.[9]

SDG 15 aims to protect life on land: **Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

- 15.1 By 2020, ensure the conservation, **restoration** and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular **forests, wetlands, mountains and drylands**, in line with obligations under international agreements
- 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
- 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world
- 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits that are essential for sustainable development
- 15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
- 15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed
- 15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products
- 15.8 By 2020, introduce measures to **prevent the introduction and significantly reduce the impact of invasive alien species on land** and water ecosystems and control or eradicate the priority species
- 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
- 15.a Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems
- 15.b Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation
- 15.c Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities

Objective 15.3 raises key issues regarding soil status.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

9 https://www.undp.org/sdg-accelerator/background-goals

In addition, soil and soil health were identified to contribute particularly to the attainment of the following SDGs:

- SDG 2 Zero hunger: 2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively **improve land and soil quality**
- SDG 3 Good health and wellbeing: 3.9 By 2030, substantially **reduce the number of deaths and illnesses** from hazardous chemicals and air, water and soil pollution and contamination.
- SDG 6 Clean water and sanitation: 6.6 By 2020, **protect and restore water-related ecosystem**s, including mountains, forests, wetlands, rivers, aquifers and lakes.
- SDG 11 Sustainable cities and communities:
    - 11.7 By 2030, provide universal access to **safe**, inclusive and accessible, **green and public spaces**, in particular for women and children, older persons and persons with disabilities,
    - 11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
    - 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, **holistic disaster risk management at all levels**.
- SDG 12 Responsible consumption and production: 12.4 By 2020, achieve the **environmentally sound management** of chemicals and **all wastes throughout their life cycle**, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.
- SDG 13 Climate action:
    - 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
    - 13.2 **Integrate climate change measures** into national policies, strategies and planning.

2.2. Stockholm Convention

2.2.1. Scope and objectives

The Stockholm Convention either bans or severely restricts the production, trade, use and emissions of Persistent Organic Pollutants (POPs)[10]. POP compounds are extremely

10 Stockholm Convention on persistent organic pollutants (POPs) -Text and Annexes (revised in 2023) Available at: https://www.pops.int/Portals/0/download.aspx?d=UNEP-POPS-COP-CONVTEXT-2023.English.pdf

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

resistant to degradation, and capable of long-range transport from the emission source and bioaccumulation in living organisms. In addition, they are severely detrimental to human health or the environment even in small concentrations. As these substances travel far from the emission sources, international measures are required to limit contamination due to them. POPs can occur as impurities in chemicals or be created unintentionally, for example, in combustion processes.

The Convention was adopted in 2001 and entered into force in May 2004. Currently, it bans or restricts the use or requires reduction of unintentional releases of 40 listed substances and substance groups. The production and use of substances specified in Annex A must be eliminated while measures need to be taken to restrict the production and the use of substances in Annex B Substances listed in Annex C cover chemicals whose unintentional releases from anthropogenic sources the parties of the Convention must reduce with the goal of continuing minimization and, where feasible, ultimate elimination. (see Appendix 1) The parties must also take measures to reduce or eliminate releases from stockpiles and wastes. They must develop appropriate strategies for the identifying:

- stockpiles consisting of or containing chemicals listed either in Annex A or Annex B,
- products and articles in use and wastes consisting of, containing or contaminated with a substance listed in Annex A, B or C.

Member States should identify stockpiles consisting of or containing chemicals listed either in Annex A or Annex B and manage them safe, efficient and environmentally sound manner. Wastes consisting of, containing or contaminated with POPs should be disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants. If destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low, can waste be disposed in other environmentally sound manner.

Even though the restrictions of these substances, listed in the separate Annexes, refer to their production, use and unintentional releases, the fact that they have been identified as particularly persistent and harmful substances indicates their potential occurrence in soil with consequent risks that may require management actions.

The parties to the convention may propose, by means of an agreement, to restrict chemicals which can travel far from their emission sources and cause such significant environmental or health hazards that international restrictions are justified. The POP Review Committee (POPRC) evaluates any proposals for new chemicals and, if necessary, suggests a restriction to the parties of the Convention. Restrictions and permitted exceptional uses are agreed upon in negotiations between the parties (the Conference of the Parties / COP). The new restrictions enter into force when the parties ratify the amendments within their national legislation. Currently chlorinated paraffins, long-chain perfluorocarboxylic acids (PFCAs), their salts and related compounds and chlorpyrifos are under evaluation.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

To enable the parties to the Convention to take measures to reduce or eliminate releases of POPs from intentional production and use, for which alternatives do not exist yet or are not readily available, the Convention allows Parties to register specific exemptions for a specific period of time. Annexes A and B of the Convention describe specific exemptions, as well as acceptable purposes, that are available with respect to the relevant POPs. Parties may register for specific exemptions listed in Annex A or B pursuant to paragraph 3 of Article 4. These specific exemptions have a limited timeframe and shall expire five years after the date of entry into force of the Convention with respect to that particular chemical (paragraph 4 of Article 4), unless an earlier date is indicated in the Register by the Party, or an extension is granted by the Conference of the Parties under paragraph 7 of Article 4.

In the European Union, the obligations of the Stockholm Convention were originally instituted with a POPs Regulation in 2004. The regulation has been amended multiple times. The effectual re-casted POP regulation (EU) 2019/1021 was adopted in July 2019 and Annexes IV and V were amended in November 2022 ((EU) 2022/2400).

2.2.2. Management of POP wastes

According to Article 6 the Stockholm Convention, once POPs become wastes, Parties to the Convention are required to:

- Develop and implement appropriate strategies for identifying stockpiles, products and articles in use that contain or are contaminated with POPs,
- **Manage stockpiles and wastes in an environmentally sound manner**,
- **Dispose of waste so that the POPs content is destroyed or irreversibly transformed** so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of in an environmentally sound manner when destruction or irreversible transformation does not represent the environmentally preferable option or the persistent organic pollutant content is low,
- Not permit the recycling, recovery, reclamation, direct reuse or alternative use of the POPs,
- Endeavour to **develop strategies for identifying contaminated sites** and perform eventual remediation in an environmentally sound manner.

Improper treatment or disposal of a waste consisting of, containing or contaminated with POPs can lead to releases of POPs into the environment. Some disposal technologies can also lead to the unintentional formation and release of POPs.

The Stockholm Convention and the Basel Convention[11] have a joint mandate on POPs wastes and have agreed to cooperate closely on establishing levels of destruction and irreversible transformation necessary to ensure that POP characteristics no longer exist.

11 Basel Convention defines waste as hazardous waste when it belongs to any of the categories of Annex I to the Convention and it has at least one of hazardous characteristics (e.g. explosive, flammable solids, oxidizing, poisonous (acute), ecotoxic) listed in the Annex III to the Convention. Annex I contains a list of various waste streams to be controlled and wastes having certain constituents. Wastes listed in Annex VIII to the Convention are characterized as hazardous. Also wastes that are defined as, or considered to be, hazardous wastes by the domestic legislation of the Party of the Convention are subject to the Basel Convention.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Additionally, the COPs of these two Conventions determine cooperatively which methods constitute environmentally sound disposal. Due to the cooperation of these two conventions also the guidelines of Basel Convention regarding POPs waste and sites contaminated with POPs are handled in this chapter to the extent necessary.

In May 2023 "General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants"[12] of Basel Convention were published. These technical guidelines serve as an "umbrella" document and should be used in conjunction with the Basel Convention's specific technical guidelines regarding certain substance or group of substances (Appendix 1 Table 4).

The purpose of the general technical guidelines is:

- To provide an overarching and common guidance on the environmentally sound management of POP wastes,
- To address provisions referred to in Article 6, paragraph 2 of the Stockholm Convention on:
  - The levels of destruction and irreversible transformation and
  - The methods that are considered to constitute environmentally sound disposal,
- To provide guidance on reducing or eliminating POP releases to the environment from waste disposal and treatment processes and
- To set up-to-date concentration limit values for concentrations of low POP content.

The Stockholm Convention defines actions need if the POP content is at or above " low POP content limit" imposed in the EU POPs Regulation. The low POP content definition is independent from the provisions on the determination of hazardous waste and requirements for transboundary movements under the Basel Convention.

If the POP concentration of a solid residue is at or above the low POP content, it should be treated with methods that are considered to constitute environmentally sound disposal of POP wastes. If the concentration exceeds the maximum concentration limit set in EU POPs Regulation (see 4.3.1), there are more stringent requirements to the waste management.

Disposal technologies that can fulfil the requirements of the Basel Convention Annex IV Sections A and B, when ensured that the remaining wastes and releases do not exhibit the characteristics of POPs, are:

- D9: Physico-chemical treatment,
- D10: Incineration on land,
- R1: Use as a fuel (other than in direct incineration) or other means to generate energy,

12 UNEP Basel Convention (2023). General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants. UNEP/CHW.16/6/Add.1/Rev.1. Available at: https://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW.16-6-Add.1-Rev.1.English.pdf

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- R4: Recycling/reclamation of metals and metal compounds but restricted to activities of certain primary and secondary metallurgy described in the guidance. POPs that are isolated from a waste stream during pre-treatment should subsequently be disposed of in accordance with operations D9 and D10. Best Available Techniques (BAT) Reference Document for Waste Treatment[13] 2018 includes also guidelines for treatment of waste containing POPs or mercury.

Disposal technologies must have at least 99.999 percent of Destruction Efficiency (DE)[14], with 99.9999 percent of Destruction Removal Efficiency (DRE)[15] as a supplemental requirement where applicable. Because neither DE nor DRE take into account the potential transformation of the original POP to an unintentionally produced POP, potential releases of unintentionally produced POPs should be considered when choosing a particular disposal technology. Different technologies that are capable to destruct and irreversibly transform 99,999 % of different POPs in wastes are presented in Table 5 in Appendix 1.

If the content of the listed substances in the waste is below the concentration limits specified in Annex IV, waste is not regarded as POP-waste and may be disposed of or recovered by other means in accordance with the relevant Union legislation.

2.2.3. Contaminated sites

In accordance with Article 6 of the Stockholm Convention, the Parties are required to endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C, and if remediation of those sites is undertaken, it shall be performed in an environmentally sound manner.

Draft Guidance on Best Available Techniques (BAT) and Best Environmental Practices (BEP) for Management of POPs Contaminated Sites[16] is under preparation (in February 2025). The guidance is aimed at parties to the Convention who have not yet developed a contaminated sites management (CSM) framework or who may have basic inventories and are seeking to prioritise management resources and remedial efforts. The guidance is generally not intended for parties who have well developed frameworks for CSM although they may still find some of the information useful particularly on remedial techniques. This guidance proposes a structure and framework within which parties can develop their management practices, but it is not intended to be legally binding.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

13 Pinasseau, A., Zerger, B., Roth, J. et al (2018); Best Available Techniques (BAT) Reference Document for Waste treatment Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control); EUR 29362 EN; Publications Office of the European Union, Luxembourg, 2018; ISBN 978-92-79-94038-5. JRC113018. https://doi.org/10.2760/407967

14 DE = (POP content within waste – POP content within gas, liquid and solid residual) / POP content within the waste.

15 DRE = (POP content within waste – POP content within gas residual) / POP content within the waste.

16 Stockholm Convention (2024). Draft guidance on best available techniques and best environmental practices for the management of sites contaminated with persistent organic pollutants. Available at: https://chm.pops.int/Implementation/BATandBEP/POPscontaminatedsites/Guidance/tabid/9649/Default.aspx

The aim of the BAT and BEP guidance document is **to guide Parties in their actions to minimize and prevent releases of POPs from contaminated sites and in determining means to protect human health during the CSM process.** It provides a step-by-step approach on technical matters related to management of POPs contaminated sites but also advises on a range of governance issues that are important in establishing a broader national level contaminated sites program to align with sustainability principles and the SDGs. The guidance examines the following topics:

- site investigation,
- site assessment,
- conceptual site model,
- environmental risk assessment,
- remediation technologies and techniques,
- stakeholder engagement,
- public and worker safety and health,
- management of site remediation, monitoring, and aftercare.

Regarding remediation technologies and techniques, the guidelines refer to the General technical guidelines of the Basel Convention on the environmentally sound management of wastes consisting of, containing, or contaminated with POPs. This guidance **recommends using non-combustion technologies, which can destroy or irreversibly transform POPs in the treatment of POPs waste from POPs contaminated sites**, because these technologies do not generate unintentional POP emissions or waste residues containing POPs.

2.3. Minamata Convention on Mercury

Minamata Convention is a global treaty to protect the human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention was signed in 2013 and ratified by the EU in 2017 (Council decision (EU) 2017/939).

The Minamata Convention sets out a range of measures to meet the above objective including measures to control the supply and trade of mercury, including limitations on specific sources of mercury such as primary mining, and control of mercury-added products and manufacturing processes in which mercury or mercury compounds are used, as well as artisanal and small-scale gold mining. The text of the Convention includes separate articles on emissions and releases of mercury, with controls directed at reducing levels of mercury while allowing flexibility to accommodate national development plans. In addition, it contains measures on the environmentally sound interim storage and management of mercury and mercury wastes, as well as management of contaminated land.

Article 9 concerns the management and reduction of mercury and mercury compound releases from relevant point sources to land and water not covered by other provisions of the Convention. Each Party to the Convention shall **identify relevant point sources and**

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

take measures to control releases, such as setting of release limit values, the use of best available techniques and best environmental practices, or a multi-pollutant control strategy. Each Party shall **establish an inventory of releases from relevant sources**.

In article 11, mercury waste means substances or objects:

- Consisting of mercury or mercury compounds,
- Containing mercury or mercury compounds or
- Contaminated with mercury or mercury compounds.

Each Party must take appropriate measures so that mercury waste is managed in an environmentally sound manner following guidelines developed under Basel and Minamata Conventions. The mercury waste is to be recovered, recycled, reclaimed or directly re-used only for a use allowed to a Party under Minamata Convention or for environmentally sound disposal. The transportation of mercury waste across international boundaries is allowed only for the purpose of environmentally sound disposal.

The article 11 of the Convention refers to certain quantity thresholds. The COPs to the Convention have adopted decisions (MC-3/5, MC-4/6 and MC5/10[17]) that no threshold needs to be established for:
mercury wastes consisting of mercury or mercury compounds and wastes containing mercury or mercury compounds, meaning that these are regarded mercury waste as such. Also waste containing mercury or mercury compounds in non-exhaustive list in Table 2 of Decision MC-3/5[18], would be regarded as mercury waste. **For waste contaminated with mercury or mercury compounds a threshold of 15 mg/kg total concentration of mercury was decided (MC5/10).** The COP decided also the following two-tier thresholds above which tailings from mining, other than primary mercury mining, are mercury waste if:

- Tier-1 threshold 25 mg/kg total mercury is exceeded and
- Tier-2 threshold (applied in the case of exceedance of Tier-1 threshold)0.15 mg/L in the leachate is exceeded. Leaching needs to be determined using an appropriate test method which simulates the leaching of mercury at the site where the tailings are deposited (method described in guidance document UNEP/MC/COP.5/INF/13).

The technical guidelines on the environmentally sound management of wastes consisting of, containing, or contaminated with mercury or mercury compounds were accepted by Basel Convention in 2022.[19]

According to the article 12 of the Convention, each Party is obliged to endeavour to develop appropriate **strategies for identifying and assessing sites contaminated by**

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

17 Fact sheet: Mercury waste thresholds. Available at: https://minamataconvention.org/sites/default/files/documents/forms_and_guidance_document/Mercury_Waste_Thresholds.pdf

18 E.g Non-electronic measuring devices like thermometers, electrical and electronic switches, contacts, releys, fluorescent bulbs, batteries, accumulators, biocides, pesticides, paints, pharmaceuticals, cosmetics, dental amalgam

19 Technical guidelines UNEP/CHW.15/6/Add.6/Rev.1. Available at: https://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW.15-6-Add.6-Rev.1.English.pdf

mercury or mercury compound(s). Where appropriate, an assessment of the risks to human health and the environment from the mercury or mercury compounds they contain should be conducted to ensure their environmentally sound management.
Guidance on the management of contaminated sites was adopted by the COP to the Minamata Convention on Mercury in 2019.[20]

2.4. Convention on Biological Diversity

The Convention on Biological Diversity (CBD)[21] was opened for signature at the Earth Summit in Rio de Janeiro on 5 June 1992 and entered into force on 29 December 1993.
To date, 193 Parties have signed the Convention. CBD is an international legally binding treaty with three main goals:

- conservation of biodiversity,
- sustainable use of components of biodiversity and
- fair and equitable sharing of the benefits arising from the use of genetic resources.

CBD's overall objective is to encourage actions which will lead to a sustainable future, and it covers all components of biodiversity including ecosystems, animals, plants, fungi and microorganisms.

COP is the governing body of the CBD. This ultimate authority of all governments (or Parties) that have ratified the treaty meets every two years to review progress, set priorities and commit to work plans. Contracting Parties are required to create and enforce national strategies and action plans to conserve, protect and enhance biological diversity.

The CBD addresses soil biodiversity and established an International Initiative for the Conservation and Sustainable Use of Soil Biodiversity as a cross-cutting initiative within the programme of work on agricultural biodiversity. It also invited the Food and Agriculture Organization (FAO) of the United Nations, and other relevant organizations, to facilitate and coordinate this initiative. This cross-cutting initiative aims to increase the recognition of the essential services provided by soil biodiversity across all production systems and its relation to land management, to share information, and to increase public awareness, education and capacity-building.

In December 2022, the Fifteenth meeting of the COP of the CBD (CBD COP 15), adopted the Kunming-Montreal Global Biodiversity Framework[22]. This framework sets out an ambitious pathway to reach the global vision of a world living in harmony with nature by 2050. Its key elements include four goals for 2050 and 23 targets for 2030, the four goals being:

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

20 https://minamataconvention.org/en/documents/guidance-management-contaminated-sites-3

21 https://www.cbd.int/doc/legal/cbd-en.pdf

22 https://www.cbd.int/gbf

- **All ecosystems are** maintained, enhanced, or **restored**, human induced extinction of known threatened species is halted and the genetic diversity within populations is maintained.
- Biodiversity is sustainably used and managed and **ecosystem functions and services** are **valued, maintained, and enhanced**, with **those currently in decline being restored**.
- The monetary and non-monetary benefits from the utilization of genetic resources and digital sequence information on genetic resources, and of traditional knowledge associated with genetic resources are shared fairly and equitably and substantially increased by 2050.
- Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the Kunming-Montreal Global Biodiversity Frameworkare secured and equitably accessible to all Parties.

Relevant targets for 2030 relating to soil pollution and spatial planning are:

- Restore 30% of all degraded ecosystems globally
- Reduce risk from pesticides by at least 50%
- Reduce nutrients lost to the environment by at least 50%
- Reduce pollution risks and negative impacts of pollution from all sources to levels that are not harmful to biodiversity and ecosystems.
- Enhance green spaces and urban planning for human well-being and biodiversity
- Integrate biodiversity in decision-making at every level.
- Strengthen capacity-building, technology transfer, and scientific and technical cooperation for biodiversity.
- Ensure that knowledge is available and accessible to guide biodiversity action.
- Ensure participation in decision-making and access to justice and information related to biodiversity for all.

2.5. UN Convention to Combat Desertification

At its 16th conference (December 2024) the United Nations Convention to Combat Desertification (UNCCD)[23] launched a report "The Global Threat of Drying Lands: Regional and global aridity trends and future projections". According to this report some 77.6% of Earth's land experienced drier conditions during the years 1991-2020 compared to the previous 30-year period (1961-1991). Over the same period, drylands expanded by about 4.3 million km^2 to cover 40.6% of all land on Earth (excluding Antarctica). The research warns that this trend will continue in the future with direct implications for agriculture, ecosystems, and the people living in drought-stricken areas Areas particularly hard-hit by the drying trend include almost the whole Europe (95.9% of its land), parts of the western United States, Brazil, parts of Asia (notably eastern Asia), and central Africa.[24] The

23 https://catalogue.unccd.int/936_UNCCD_Convention_ENG.pdf

24 Vicente-Serrano, S. M., N. G. Pricope, A. Toreti, E. et al. (2024). The Global Threat of Drying Lands: Regional and global aridity trends and future projections. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD). Bonn, Germany. Available at: https://www.unccd.int/sites/default/files/2024-12/aridity_report.pdf

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

European Union and the following thirteen EU Member States have declared themselves as affected by desertification, based on their own self-assessments: Bulgaria, Greece, Spain, Croatia, Italy, Cyprus, Latvia, Hungary, Malta, Portugal, Romania, Slovenia and Slovakia.

The objective of UNCDD is to take action to reduce and prevent desertification and mitigate the effects of drought in countries experiencing these problems supported by international cooperation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, non-binding action plan of the United Nations with regard to sustainable development accepted in the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992.

The Convention defines the term "combating desertification" as activities that are part of the integrated development of land in arid, semi-arid and dry sub-humid areas for sustainable development which are aimed at:

- prevention and/or reduction of land degradation,
- rehabilitation of partly degraded land and
- reclamation of desertified land.

In this definition "land degradation" means in arid, semi-arid and dry sub-humid areas, reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, irrigated range, pasture, forest and woodlands. The reasons for degradation include changes in land use, human activities and habitation patterns, such as:

- soil erosion caused by wind and/or water,
- deterioration of the physical, chemical and biological or economic properties of soil and
- long-term loss of natural vegetation.

Achieving the objective of the UNCCD involves long-term integrated strategies, national action programmes, resource allocation from different financial mechanisms, cooperation between the Parties, scientific and technical cooperation, awareness raising and facilitation of the participation of local populations. The Parties of the Convention have to report to the COP on measures they have taken and affected Parties must also describe strategies and action programmes they have established and implemented.

At its thirteenth session in 2017, the COP adopted the UNCCD 2018−2030 Strategic Framework[25], which has three main components: a vision, strategic objectives and an implementation framework.
The Framework's five strategic objectives are meant to guide the actions of all UNCCD stakeholders and partners:

- To **improve the condition of affected ecosystems**, combat desertification/land degradation, promote sustainable land management and **contribute to land degradation neutrality**.

25 https://www.unccd.int/convention/governance/strategic-framework-2018-2030

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- To improve the living conditions of affected populations.
- To mitigate, adapt to, and manage the effects of drought in order to enhance resilience of vulnerable populations and ecosystems.
- To generate global environmental benefits through effective implementation of the UNCCD.
- To mobilize substantial and additional financial and nonfinancial resources to support the implementation of the Convention by building effective partnerships at global and national level.

The progress indicators relevant to land degradation for reporting on strategic objectives are the following:

Strategic objective 1: To improve the condition of affected ecosystems
- SO 1-1 Trends in land cover
- SO 1-2 Trends in land productivity or **functioning of the land**
- SO 1-3 Trends in **carbon stocks above and below ground**

Strategic objective 2: To improve the living conditions of affected populations
- SO 2-2 Trends in access to safe drinking water in affected areas

Strategic objective 3: To mitigate, adapt to, and manage the effects of drought in order to enhance resilience of vulnerable populations and ecosystems
- Monitored through qualitative information

Strategic objective 4: To generate **global environmental benefits** through effective implementation of the UNCCD
- SO 4-1 Trends in carbon stocks above and below ground
- SO 4-2 Trends in abundance and distribution of selected species

Land degradation neutrality (LDN) is the goal of both the SDGs and the UNCCD. The UNCCD is active on the concrete development and the implementation of the land degradation-neutrality (LDN) principle. The LDN objective is to compensate losses with gains, and to achieve a position of no net loss of healthy and productive land. LDN is defined as "a state whereby the amount and quality of land resources necessary to support ecosystem functions and services to enhance food security remain stable, or increase, within specified temporal and spatial scales and ecosystems." To achieve LDN requires concurrently avoiding new degradation of land, **reducing existing degradation** by adopting sustainable land management and **ramping up efforts to restore and return degraded lands to a natural or more productive state**.

The UNCCD's objectives for LDN include:
- maintaining or improving the sustainable delivery of ecosystem services,
- maintaining or improving land productivity to enhance global food security,
- Increasing the resilience of land and the populations dependent on it,
- seeking synergies with other social, economic, and environmental objectives and
- reinforcing and promoting responsible and inclusive land governance.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Global Mechanism, provider of advisory services to to facilitate the mobilization of financial resources to implement the UNCCD, has published a policy brief **"**Land degradation neutrality target setting -Initial findings and lessons learned"[26]. It is based on two separate technical data and policy reviews of the LDN target setting country reports and associated documents conducted by December 2018. It summarizes the results from these reviews and is intended to provide policy-relevant information for the UNCCD country Parties, key decision- and policymakers, national and international development partners, the UNCCD and other international organizations for further guidance, awareness raising and advocacy on LDN. Key messages are:

- Government leadership strategically guiding all relevant sectors is needed.
- There should be established institutional and technical environments for implementing the LDN target setting process in each country.
- LDN and related elements should be included in legislation and strengthen the monitoring and enforcement of them.
- LDN monitoring should be improved (e.g. verifiable indicators at local and national levels).
- The knowledge sharing between countries should be strengthened.
- Substantial investment programmes are needed.
- The use of checklist of LDN transformative projects and programmes[27] could improve implementation of LDN.

Land use and land management are key in reducing or preventing land degradation, climate change mitigation, biodiversity loss halt and development of sustainable land use systems (SLUS). In 2024 UNCCD published a technical report "Sustainable land use systems: The path to collectively achieving land degradation neutrality"[28] that provides practical guidance on pursuing SLUS and navigating potential barriers and opportunities, considering the local context. It introduces with recommendations to policymakers on measures to support the development and implementation of SLUS. The report presents a holistic approach to achieve land LDN targets, reduce inequalities, achieve social justice, improve economic viability and, consequently, help achieve several SDGs. The report is based on a literature review, a multi-stakeholder survey, a case study analysis and an analysis of national reports submitted to the UNCCD.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

26 Global Mechanism of the UNCCD. 2019. Land Degradation Neutrality Target Setting: Initial findings and lessons learned. Bonn, Germany. Available at: https://www.unccd.int/resources/publications/land-degradation-neutrality-target-setting-initial-findings-and-lessons

27 Checklist for Land Degradation Neutrality Transformative Projects and Programmes (LDN TPP) Available at: https://www.thegef.org/sites/default/files/documents/LDN%20TPP%20checklist%20final%20draft%20040918.pdf

28 Cowie, A., E. Huber-Sannwald, B. Kishchuk, M. et al. (2024). Sustainable Land Use Systems: The path to collectively achieving Land Degradation Neutrality. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD). Bonn, Germany. Available at: https://www.unccd.int/sites/default/files/2024-12/P235777-01_SPI_SLUS_WEB.pdf

2.6. UN Framework Convention on Climate Change

2.6.1. Policy guidelines and decision-making

At the international level, the most important climate policy guidelines are:

- United Nations Framework Convention on Climate Change (UNFCCC, 1992, effective 1994)
- Kyoto Protocol (1997, effective 2005) and
- Paris Climate Agreement (2015, effective 2016).

The Climate Framework Agreement is the cornerstone of international climate policy. Its aim is to stabilise greenhouse gas emissions from human activities to a harmless level. The Climate Framework Agreement sets out objectives, principles and other general frameworks for international efforts to mitigate climate change.

The Kyoto Protocol included emission reduction targets only for developed countries. The agreement was divided into two commitment periods, the latter ending in 2020. The treaty was ratified by 192 parties.

The Paris Agreement[29] covers the period after 2020. It is the first truly global and binding climate agreement that commits all its parties to contribute to reducing GHG emissions. The goal is to keep the temperature rise well below 2°C relative to pre-industrial levels, and to seek measures to limit warming to less than 1.5°C. The Agreement endeavours to reverse global greenhouse gas emissions as soon as possible and to achieve in the second half of this century a balance between anthropogenic greenhouse gas emissions and sinks that bind emissions. In addition to the emission reduction targets, the Agreement has set a long-term target for adaptation to climate change and a target to align financial flows towards low-carbon and climate-resilient development. The TTreaty has been ratified by 193 parties.

In order to achieve the objective of the Paris Agreement, all partiesparties Parties to the agreement are expected to take ambitious and, over time, tougher action to reduce emissions, adapt to climate change, increase climate finance, develop and transfer technology, strengthen operational capabilities and increase transparency. The Paris Agreement does not contain any quantified emission reduction commitments, but the parties commit to preparing, communicating, maintaining and achieving their successive national emission targets. The Parties are obliged to prepare a national contribution every five years, and the latest national target must always be more ambitious than the previous one. The national contributions notified by the parties, i.e. the actions to which each country is committed, can be found in the public register maintained by the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC).

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

29 Paris Agreement text in English. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf

COP is the highest decision-making body of the UNFCCC. Its first session (COP 1) was held in Berlin in 1995 and since then COP meetings have been held annually (in 2020 the meeting could not be held due to the coronavirus pandemic).

2.6.2. Enforcement and implementation

Parties to the UNFCCC report their greenhouse gas emissions and carbon sinks annually to the UNFCCC. In addition, the UNFCCC requires its parties to report to it every three to five years on the climate action they have taken to implement the UNFCCC and the Kyoto Protocol. In the European Union the Member States present every two years to the Commission country reports on their policies and their impact on the development of greenhouse gas emissions. According to the Paris agreement, progress reported in the national reports in relation to the targets will be reviewed every five years. The first comprehensive review was carried out in 2023.

The Code for the Implementation of the Paris Agreement was adopted for the most part at the 2018 Katowice Climate Conference and finalised at the Glasgow Climate Conference in 2021. The rules are comprehensive and common to all parties to the agreement, although certain limited flexibilities have been agreed upon in the rules for developing countries.

The Code of Conduct for the Implementation of the Paris Agreement covers, inter alia:

- the implementation of a mechanism to accelerate emission reduction targets, i.e. a global review,
- more detailed guidance on the national commitment,
- guidance on reporting, audit and evaluation,
- rules for reporting on climate finance,
- the implementation of technology development and transfer,
- Guidance on Adaptation Communications,
- the rules of the Committee for the Implementation and Compliance of the Agreement and
- the rules of the market mechanisms subject to the agreement.

For the successful implementation of the Paris Agreement, it is essential that all countries tighten their climate policies, as the emission reduction targets and measures announced so far are inadequate to limit the temperature increase in line with the Paris Agreement target.

In the context of UNFCCC, **soil carbon sequestration** is recognised as an important way to mitigate and adapt to climate change. At COP 21 in 2015 in Paris, the French government launched an initiative to increase the global soil carbon stock with 4 ‰ annually, in order to stop the increasing CO2 accumulation in the atmosphere. The focus is on agricultural and forest soils.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

2.7. Aarhus Convention

2.7.1. Scope

The United Nations Economic Commission for Europe (UNECE) adopted the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters on 25th June 1998 in the Danish city of Aarhus. at the Fourth Ministerial Conference in the 'Environment for Europe' process. Together with its Protocol on Pollutant Release and Transfer Registers, the Convention protects the rights of all people of present and future generations to live in an environment adequate to his or her health and well-being. These are the only legally binding global instruments on environmental democracy that put Principle 10 of the Rio Declaration on Environment and Development in practice.

The main provisions of the Aarhus Convention can be divided into three main parts:

- **access to environmental information** held by public authorities (Articles 4 and 5),
- **promotion of public participation** in decision-making that impacts on the environment (Articles 6-8), and
- **access to justice** in environmental matters (Article 9).

Meeting of the Parties is the decision-making body of the Convention. It meets regularly and is responsible for the implementation and development of the agreement.
The signatory Parties to the Convention should:

- take the necessary legislative, administrative or other measures to implement provisions in the Convention,
- allow government officials and authorities to assist and advise citizens on issues related to access to information, participation in decision-making, and access to justice,
- promote citizens' environmental education and public awareness of environmental issues
- recognize and support associations, groups or organisations that aim to protect the environment
- The signatory party to the agreement must ensure that no person who requests information, participates in decision-making, or exercises his or her right of appeal or access to justice in environmental matters is punished, persecuted, or harassed in any way because of their actions.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

2.7.2. Access to environmental information

The signatory countries shall ensure that **the authorities make environmental information available to the public upon request** within the time limits set out in Article 4.2. Paragraphs 3 and 4 of the same article define the grounds for refusing a request for information. It should be ensured that it is possible to separate confidential information from public information without affecting the confidentiality of the information to be separated.

According to article 5 the authorities must have the up-to-date information on the environment required for their tasks and have systems in place to inform them of proposed and existing activities with significant environmental impacts. Article 5(9) also requires contracting parties to compile a coherent information system on soil contamination, the data of which have been collected in a consistent manner.

If there is an immediate threat to human health or the environment, the authorities should inform immediately and without delay the exposed population to prevent or mitigate the harm caused by the threat.

Public authorities must operate transparently within the framework of national legislation when sharing environmental information, and the information must be effectively available. The publication of environmental information in electronic databases must be gradually increased and the national state of the environment report published every 3-4 years.

2.7.3. Public participation in decision-making on environmental issues

Article 6 concerns **public participation** in environmental decision-making, such as the processing of permit decisions for activities listed in Annex I (mainly industrial activities) and other activities with potentially significant environmental impacts. The **public must be involved in the early stages in a timely and effective manner**. The views expressed by the public should be duly taken into account in the decision. The decision should be communicated without delay. Article 7 examines public participation in the preparation of plans, programmes and action programmes regarding the environment and Article 8 the preparation of executive regulations and/or generally applicable legally binding normative instruments.

2.7.4. Access to justice in environmental matters

All citizens may, within the framework of national law and subject to certain conditions, submit a case for re-examination if they consider that their right to information has been infringed (e.g. a request for information has not been answered, it has been unjustifiably denied, or it has not been duly taken into account). They can also to challenge the

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

substantive and procedural legality of any decision, act or omission subject to the provisions of article 6. Each Party shall ensure that public have access to administrative or judicial procedures to challenge acts and omissions by private persons and public authorities which contravene provisions of its national law related to the environment.

3. Summary of the relevant EU strategies and action plans

In the European Union law, it is important to effectively achieve the objectives set for regulation, to support Union law as a whole and to guarantee its internal integrity. The objectives pursued are not only the objectives of a particular piece of legislation, but on the contrary, the values and objectives underlying the entire legal structure are described, for example, in the strategies and plans behind the legislation.

The following summary of the identified strategies relevant to risk management and development of contaminated land has been compiled as a reference framework for the review of the Directives. The relevant, non-binding action plans related to the strategies are also briefly discussed. The strategies are given as a commission communications which it uses for a variety of purposes:

- to evaluate policies,
- to identify problems in certain policy area
- to clarify current policies and provide a framework on how to interpret policies or
- to set out the direction of future policies in broad and general terms.

The interpretation given in a Communication is non-binding.[30] Here, the 8th Environmental Action Programme[31] (8th EAP) which is EUs legally agreed common agenda for environment policy until 2030, is an exception. It provides a framework for the EU's overall environmental policy development and guide the policymaking by identifying priorities and setting out a long-term vision and goals. Because the Commission Communication on the European Green Deal, EU growth strategy of green and inclusive transition and climate-neutrality by 2050, contained a roadmap of key actions relevant for the field of environment and climate in years 2022-2024, there was no defined actions for the attainment of its priority objectives for the period up to 2025. After the mid-term review, the key actions for the year 2025 – 2030 should be defined and an annex to the Decision on 8th EAP added by a legislative proposal.

The 8th EAP shall have six interlinked thematic priority objectives for the period up to 31 December 2030:

- achieving the 2030 greenhouse gas emission reduction target and climate neutrality by 2050,

30 https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vh7dptp45uyn

31 Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- improving adaptive capacity, resilience and adaptation and reducing the vulnerability to climate change,
- accelerating transition to sustainable, resource-efficient, renewable energy-based, non-toxic circular economy
- achieving a toxic-free environment and protecting the health and well- being of people, animals and ecosystems from environment-related risks and negative impacts,
- protecting, preserving and restoring biodiversity, and enhancing natural capital and
- reducing environmental and climate pressures related to production and consumption.

The EU Green Deal[32] is a roadmap covering widely different sectors in society. It aims to achieve climate neutrality by 2050, decouple economic growth from resource use, transition to clean, circular economy, resource and energy efficiency, design of a fair, healthy and environmentally friendly food system, preserve and restore biodiversity and reduce pollution towards zero.

Both the 8th EAP and the Green Deal build on implementation of other sectoral strategies. They also stress the importance of more effective implementation of EU legislation to achieve the objectives.

The following summary covers the following strategies and plans:

- EU Soil Strategy for 2030 (COM(2021) 699)
- Zero Pollution Action Plan (COM(2021) 400)
- Circular Economy Action Plan (COM(2020) 98)
- Biodiversity Strategy (COM(2020) 380)
- EU Climate Change Adaptation Strategy (COM(2021) 82
- Soil Mission report 'Caring for soil is caring for life'[33]
- Bioeconomy Strategy[34]
- Chemical Strategy for Sustainability (COM(2020) 667)
- Roadmap to a Resource Efficient Europe COM(2011) 571
- Communication on Pharmaceuticals in the Environment (COM(2019) 128)
- Council Recommendation on EU Actions to Combat Antimicrobial Resistance (2023/C 220/01)

Regarding CLM, the Soil Strategy and Zero Pollution Action Plan are the most relevant. The long-term vision of the soil strategy is that by 2050 all soil ecosystems in the EU are healthy, and that soil protection, sustainable use and restoration of soil have become a

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

32 Communication from the commission to the European Parliament, the European Council, the Council, The European Economic and Social Committee and the Committee of the Regions. The European Green Deal. COM(2019)640 final. Brussels 11.12.2019.

33 Veerman, C., Pinto Correia, T., Bastioli, C., et al. (2020) European Commission: Directorate-General for Research and Innovation, Caring for soil is caring for life – Ensure 75% of soils are healthy by 2030 for food, people, nature and climate – Report of the Mission board for Soil health and food, Publications Office, 2020, Available at: https://data.europa.eu/doi/10.2777/821504

35 United Nations (2015), Transforming our world: the 2030 Agenda for Sustainable Development.

norm. The strategy has medium- and long-term objectives stemming from the strategies and programmes already adopted. The medium-term objectives by 2030 include:

- Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation - neutral world (Sustainable Development Goal 15.3).[35]
- Significant areas of degraded and carbon-rich ecosystems, including soils, are restored.[36]
- Reach good ecological and chemical status in surface waters and good chemical and quantitative status in groundwater by 2027.[37]
- Significant progress has been made in the remediation of contaminates sites. [38]

Long-term objectives by 2050 of the soil strategy are:

- Reach no net land take. [39] [40]
- Reduce soil pollution to levels no longer considered harmful to human health and natural ecosystems and respect the boundaries our planet can cope with, thus creating a toxic-free environment. [41]
- Achieve a climate-neutral Europe[42] and, as the first step, aim to achieve land-based climate neutrality in the EU by 2035.[43]
- Achieve for EU a climate-resilient society, fully adapted to the unavoidable impacts of climate change by 2050. [44]

In addition to the above-mentioned soil strategy and programmes (8th EAP and Green Deal), the goal of a non-toxic environment was included in the Biodiversity Strategy, the Soil Mission report and the Chemicals Strategy for Sustainability. Identifying polluted sites, maintaining register for those sites, assessing risks and carrying out necessary risk management measures are considered important actions in the Soil Strategy, the Zero Pollution Action Plan, the Circular Economy Action Plan and the Biodiversity Strategy. According to the Soil Strategy and the Zero Pollution Action Plan, soil pollution should be prevented at source. The Soil Strategy, the Zero Pollution Action Plan and the Biodiversity Strategy include demands for reducing the releases of microplastics into the environment. Other measures mentioned in the Zero Pollution Action Plan include decreasing of remaining emissions to soil, preparing EU priority watch list for soil contaminants and ensuring the implementation of polluter pays principle for relevant operators of large industrial installations and in the case of major accidents.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

35 United Nations (2015), Transforming our world: the 2030 Agenda for Sustainable Development.

36 EU Biodiversity Strategy for 2030, COM(2020)380.

37 Water Framework Directive 2000/60/EC

38 EU Biodiversity Strategy for 2030, COM(2020)380.

39 Roadmap to a Resource Efficient Europe, COM/2011/0571

40 7th EU Environment Action Programme, Decision No 1386/2013/EU

41 Pathway to a Healthy Planet for All, EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM(2021)400.

42 Climate Law Regulation (EU) 2021/1119.

43 LULUCF regulation (EU) 2018/841

44 EU Climate Adaptation Strategy, COM/2021/82.

The Chemicals Strategy for Sustainability identifies development needs for regulatory frameworks on very persistent chemicals and endocrine disruptors and innovative methodologies for remediating PFAS contamination in the environment

In order to promote a circular economy, the Commission proposes to increase the reuse of clean excavated soil and the recycling of contaminated land. As one possible measure, the Commission mentions passport for excavated soil. This is proposed also in the Zero Pollution Action Plan and the Circular Economy Action Plan. Reuse of excavated soil is considered important also in the Soil Mission report, which is the Mission Board's proposal to the European Commission for a mission in the area of Soil health and food.

When soil is sealed and natural areas are taken for construction, key ecosystem services of soil are irreversibly lost. Soil strategy suggests limiting land take and sealing. To reach no net land take by 2050 the Member States should set targets to reduce their net land take by 2030 and integrate land take hierarchy (Fig. 2) into their Urban Greening Plans.

The Biodiversity Strategy goes a little further by advancing to systematically integrate healthy ecosystems, green infrastructure and nature-based solutions into urban planning. Prioritising of land re-use and recycling is also mentioned in the Soil Mission report. Demand to decrease the area of sealed soil is included in the Circular Economy Action Plan, the Biodiversity Strategy and the Soil Mission report.

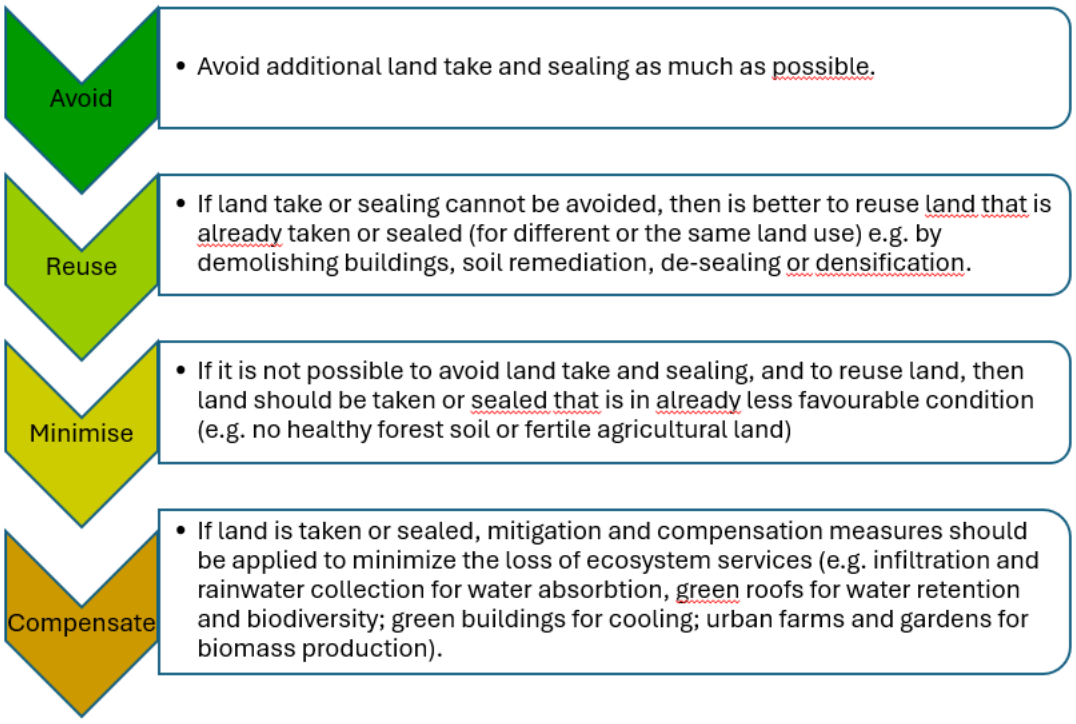


Figure 2. Land take hierarchy[45]

45 EU Soil Strategy for 2030. COM(2021) 699 final

The EU Strategy on adaptation to Climate Change emphasises the importance of nature-based solutions and requires that they should be given a bigger role in land-use management and infrastructure planning. There is also a need to create more green space. The Commission has prepared a climate proofing guidance for new major infrastructure projects and in planning to extend it to existing infrastructure.

To stop biodiversity loss, in the Biodiversity Strategy the Commission requests to step up the protection and restoration of nature. Member States have to ensure no deterioration in the status of all protected habitats and species by 2030. This requirement should be taken into consideration when assessing the risks from soil pollution and remediation needs. In urban areas the loss of green urban ecosystems should be stopped and ambitious urban greening plans developed. Significant areas of degraded and carbon-rich ecosystems shall be restored by 2030. The introduction and establishment of alien species in the EU environment should be minimized, and where possible, prevented.

The Soil Strategy and the Soil Mission report identify the need for adopting long-term measures to prevent or mitigate degradation and combatting desertification. The EU Strategy on adaptation to Climate Change suggests wider use of drought management plans.

Pharmaceuticals in the environment and the consequent antimicrobial resistance are a new emerging issue identified in the Commission Communication on Pharmaceuticals in the Environment in the Environment.[46] Residues of several pharmaceuticals have been found in surface and ground waters, soils and animal tissues in varying concentrations across the Union. Pharmaceuticals pose a risk because of the toxicity or other properties. Antimicrobial (antibiotic or antifungal) pharmaceuticals, in particular, may play a role in accelerating the development, maintenance and spread of resistant bacteria and fungi, i.e. inducing antimicrobial resistance (AMR). Knowledge gaps still exist regarding the environmental concentrations of these pharmaceuticals and the resulting levels of risks, especially their concentrations in soils, and about the presence of antimicrobial resistant micro-organisms and AMR genes. Some of the actions proposed in the strategic approach to pharmaceuticals include:

- Increase awareness and promote prudent use of pharmaceuticals,
- Support the development of pharmaceuticals intrinsically less harmful for the environment and promote greener manufacturing including e.g. reviewing environmental quality standards for pharmaceuticals and taking emissions of pharmaceuticals into consideration when reviewing Best Available Techniques Reference Documents under the Industrial Emissions Directive for relevant sectors,
- Improve environmental risk assessment and its review process,
- Reduce wastage and improve the management of waste e.g. improving collection schemes for unused pharmaceuticals, use Union programmes to finance the improvement of efficiency of urban wastewater treatment technologies to remove

46 Communication European Union Strategic Approach to Pharmaceuticals in the Environment, COM(20219) 128

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

pharmaceuticals and assess possibilities to improve management of contaminants in livestock manure,
- Expand environmental monitoring, e.g., considering the inclusion of cytotoxic pharmaceuticals and X-ray contrast media into the Watch List under the Water Framework Directive, assessing the feasibility of monitoring antimicrobial resistant microorganisms and antimicrobial resistance genes,
- Consider supporting further research to fill knowledge gaps.

In 2011 the Commission published its Communication on Action plan against the rising threats from Antimicrobial Resistance[47] and in 2017 the European One Health Action Plan against Antimicrobial Resistance[48]. Despite these efforts, in July 2022 the Commission, together with the Member States, identified AMR as one of the top three priority health threat. Council recommendation on stepping up EU actions to combat AMR in a One Health approach[49] states that further actions are needed in the areas of human health and the environment. It encourages the Member States to draw up, update and implement National Action Plans against AMR. In the previous plans measures concerning the environment were often inadequate. Most of the proposed measures should be implemented in the health sector. The Council recognises the need for developing surveillance of AMR, among others, in water and soil. In agriculture, good practices for the treatment of manure and sewage sludge should be developed to reduce the exposure of the environment to substances with antimicrobial properties and to AMR determinants. The safe disposal of unused, expired and leftover antimicrobials is important.

The common agricultural policy (CAP)[50] aims to protect the environment by setting principles for agricultural practices to tackle climate change, to protect natural resources and to enhance biodiversity. It contributes to the attainment of the objectives of the European Green Deal[51] and supports particularly the European Farm to Fork Strategy[52] and the Biodiversity Strategy. The objectives of these two strategies as well as of those in the Soil Strategy and the Zero Pollution Action Plan, among others, are equivalent. These objectives are related to soil deterioration and pollution by harmful substances, such as pesticides and antimicrobial resistance, which are also regulated in specific statutes. The measures presented in the common agricultural policy and in the Farm to Fork Strategy aim to ensure the good quality of the soil and thereby the safety of food and feed and as such, are prospective and do not directly affect CLM. Therefore, they are not discussed in this report.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

47 COM (2011) 748

48 https://health.ec.europa.eu/document/download/353f40d1-f114-4c41-9755-c7e3f1da5378_fi?filename=amr_2017_action-plan.pdf

49 (2023/C 220/01)

50 https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27_en

51 Communication from the commission to the European Parliament, the European Council, the Council, The European Economic and Social Committee and the Committee of the Regions. The European Green Deal. COM(2019)640 final. Brussels 11.12.2019.

52 A Farm to Fork Strategy for fair, healthy and environmentally-friendly food system. COM(2020) 381. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/DOC/?uri=CELEX:52020DC0381

4. Key European Union regulations on environmental pollution

4.1. Soil protection and Directive proposal

Soil protection has links to many different environmental policies. So far it has been an intentional or unintended consequence of measures taken in other environmental sectors, such as water protection, greenhouse gas reduction or waste management.. Harmful substances in soil can enter watercourses or groundwater, reducing their quality. The deposition of harmful substances into the soil through air emissions can cause local soil contamination or widespread diffuse pollution. Direct discharges of harmful substances into the soil, accidents and environmental damages may have polluted the soil locally. So far, there is no specific EU level legislation regarding soil protection and CLM. Such statute is however on the way. This paragraph examines the proposal for Soil Directive as well as existing legislation concerning other environmental sectors as far as it has an impact on the management, remediation and re-use of contaminated land.

On the 5th of July 2023, the Commission proposed a new directive "Directive on Soil monitoring and resilience"[53]. When this report was written, there were two versions of this Directive proposal in addition to the original one: proposals of the Parliament and one proposal of the Council. This text the relies on the Council's general approach[54] and gives an outline of its content. Currently the trilogue negotiations are ongoing (situation in February 2025).

The suggested Directive aims to ensure that EU soils are in healthy condition by 2050, at the latest, and maintain this good state, so that they can supply multiple ecosystem services at the extent sufficient to meet environmental, societal, and economic needs. It also aims to reduce soil pollution to levels no longer considered harmful to human health. The Directive contributes to preventing and mitigating the impacts of climate change, increasing resilience against natural disasters, and ensuring food security.

To achieve the main objective, the Directive would obligate all Member States to monitor and assess the state of all soils, continuously improve soil health, maintain healthy soils, tackle all aspects of soil degradation and avoid or reduce soil sealing and soil destruction or compensate the effects of sealing and destruction. Some soil descriptors and criteria are set at EU-level, some will be established by the Member States. At the EU-level will be set descriptors and criteria for salinization, erosion, loss of soil organic carbon and subsoil compaction. The MSs should set criteria for extractable phosphorus, concentrations of heavy metals and organic pollutants identified relevant by Member States, soil water holding capacity, land take and soil sealing. Aspects of soil degradation to be monitored

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

53 Proposal for a Directive on Soil Monitoring and Resilience (Soil Monitoring Law). COM(2023) 416 final. 5 7 2023. Available at: https://environment.ec.europa.eu/document/download/ff3bd94e-fddf-4d92-8c32-bec1c02a06cc_en

54 Proposal for a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law) - General approach. 10910/24 + ADD 1. Council of the European Union. 17.6.2024.

without criteria are excess nitrogen content, acidification, topsoil compaction and loss of biodiversity.

The Directive proposal lays down a framework and measures on:

- monitoring and assessment of soil health,
- sustainable soil management and
- management of contaminated sites.

The Member States shall define sustainable soil management practices (e.g. maintaining vegetative cover, minimise physical soil disturbance, fertilization according to need) that obey the sustainable soil management principles set down in the soil monitoring law. They must also define practices to be avoided.

As far as diffuse pollution is concerned, the measures in the Directive are related to soil monitoring and assessment of its condition. The MSs shall set criteria for soil heavy metal concentrations (As, Sb, Cd, Co, Cr(total), Cu, Hg, Pb, Ni, Tl, V, Zn) and for the organic pollutants of their choice (by considering the environmental quality standards for water and air quality standard). If operational trigger values are exceeded, measures must be taken to improve soil health.

Regarding local soil pollution, the Member States must establish a risk-based and stepwise approach to identify and investigate potentially contaminated sites, conduct site-specific risk assessment and, if necessary, take risk reduction measures.

The public concerned at a specific contaminated site, shall be given opportunities to participate in the establishment and concrete application of the risk-based approach and to provide information relevant for the identification of potentially contaminated sites, the investigation of potentially contaminated sites and the management of contaminated sites. The Member States shall establish a hierarchy of responsibility to determine the party or parties responsible for site-specific investigations and assessment and management of risks. The MSs shall draw up a register of contaminates sites and potentially contaminated sites, make it public and ensure that it is regularly reviewed and updated. The public should be given an opportunity to request correction of information contained in the register.

The Council provides the following definitions related to soil contamination (9563/24):

- **Potentially contaminated site** means a delineated area where soil contamination or contamination of bedrock or parent material caused by point-source anthropogenic activities is suspected with high probability based on relevant evidence.
- **Contaminated site** means a delineated area with confirmed soil contamination or contamination of bedrock or parent material caused by point-source anthropogenic activities.
- **Soil contamination** means the presence of a substance in the soil at a level that may be harmful to human health or the environment.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- **Contaminant** means a substance liable to cause soil contamination or contamination of bedrock or parent material.
- **Risk** means the likelihood of harmful effects to human health or the environment resulting from exposure to soil contamination or to contamination of bedrock or parent material.
- **Soil investigation** means a process which can be performed in multiple and iterative phases to assess the presence and level of contaminants in the soil, in the bedrock or parent material and, if relevant to characterise and delineate the extent of a contaminated site and, if relevant, to assess the site-specific risks the contaminated site poses to human health or the environment.
- **Soil remediation** means a set of actions that reduce, isolate or immobilise contaminants in the soil, the bedrock or the parent material.
- **Risk reduction** measures mean measures that aim to reduce the risks of contaminated sites to human health and the environment by modifying the source pathway-receptor linkage without changing the characteristics of the contamination itself, or via soil remediation.

Member States shall systematically identify potentially contaminated sites and for this purpose they shall lay down a list of potentially contaminating activities. In the identification the Member States shall consider where relevant:

- operation of an active or inactive potentially contaminating activity,
- activities mentioned in the Annex I of the old EID (2010/75/EU),
- activities referred to in the Directive (2012/18/EU) on the control of major-accident hazards involving dangerous substances,
- activities referred in the Annex III to directive (2004/35/CE) on environmental liability regarding the prevention and remedying of environmental damage,
- occurrence of a potentially contaminating accident, calamity, disaster, incident or spill and
- relevant information resulting from the soil health monitoring.

The Annex III of the draft Directive contains references to 19 different Directives and Regulations regarding industrial activities, waste management, water discharges, hazardous substances, transport, air emissions of veracity, genetically modified organisms (GMO), and waste shipments.

Member States shall ensure that potentially contaminated sites existing before or at the date of entry into force of the Directive are identified and recorded in the register of contaminated and potentially contaminated sites within 10 years of its entry into force. The information of this register must be publicly accessible and kept up to date.

Member States shall ensure that identified potentially contaminated sites are investigated and they must set a time frame, content, form and the prioritisation of the soil investigations. They shall lay down the **specific methodology for assessing the site-specific risks of contaminated sites and define what constitutes an unacceptable risk for human health and the environment**. **A site-specific risk assessment shall be carried out** unless it can be clearly established from the results of

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

soil investigations that the site is not contaminated or that soil remediation is necessary. When remediation is needed **MSs shall ensure that appropriate risk reduction measures are taken within appropriate timeframe**. Annex V includes indicative list of risk reduction measures and Annex VI indicative phases and principles for site-specific risk assessment.

The Directive obliges to report every six years on the results of soil monitoring, soil status assessment and trends, and to summarise developments in sustainable management practices and soil pollution management activities.

4.2. Polluting activities

4.2.1. Industrial emissions directive

The revised Industrial and Livestock Rearing Emissions Directive ((EU) 2024/1785) entered into force 8 August 2024. This Directive is the main EU instrument regulating in an integrated manner the environmental impacts of Europe's large-scale, high-pollution-risk industrial installations listed in Annex I (Table 1 Appendix 2: e.g. energy industries, chemical industries, waste management, production of metals, pulp and paper, food and drink and the intensive rearing of pigs and poultry). Its aim is to prevent or, where that is not practicable, to continuously reduce emissions into air, water, and land, to prevent the generation of waste, improve resource efficiency, and to promote the circular economy and decarbonisation, to achieve a high level of protection of human health and the environment as a whole.
The Member States shall make sure that the entrepreneur works according to the following principles

- all the appropriate preventive measures are taken against pollution,
- the best available techniques are applied,
- no significant pollution is caused,
- the necessary measures are taken to prevent accidents and limit their consequences,
- ensure that environmental quality standards are not exceeded,
- the necessary measures are taken upon definitive cessation of activities to avoid any risk of pollution and return the site of operation to the satisfactory state.

The Directive requires that periodic monitoring is carried out as set out in the BAT conclusions, where applicable, and at least once every 4 years for groundwater and once in every 9 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

Member States shall ensure that all permit conditions are regularly reviewed by the competent authority and brought into conformity with the Directive where appropriate.

If the activity involves the use, production or release of relevant hazardous substances and there is a possibility of soil and groundwater contamination at the site of the

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

installation, **the competent authority shall require the operator to deliver a baseline report before starting operation of an installation or before a permit for an installation is updated**. The baseline report shall contain the information necessary to determine **the state of soil and groundwater contamination** to make a quantified comparison with the state upon definitive cessation of activities. **Hence, this comparison sets the starting point for the required risk reduction measures**: if the activity has caused significant pollution of soil or groundwater, the operator shall take necessary measures to return the site to the baseline level.

The draft Directive provides the following key definitions:
Substance means any chemical element and its compounds, except radioactive substances and genetically modified micro-organisms and genetically modified organisms.
Pollution means the direct or indirect introduction, as a result of human activity, of substances, vibrations, heat, noise or odours into air, water or land, which can be harmful to human health or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment.
Emission means the direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources in the installation into air, water or land.
Emission limit value means the mass, expressed in terms of certain specific parameters, concentration and/or level of an emission, which may not be exceeded during one or more periods of time.
Environmental quality standard means the set of requirements which must be fulfilled at a given time by a given environment or particular part thereof, as set out in Union law.
Environmental performance limit value means a performance value included in a permit, expressed for specified conditions in terms of certain specific parameters.
Best available technique means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

- **Techniques** include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned,
- **Available technique** means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator,
- **Best** means most effective in achieving a high general level of protection of the environment as a whole.

Hazardous substances means substances or mixtures as defined in Article 3 of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.
Baseline report means information on the state of soil and groundwater contamination by relevant hazardous substances.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Communication from the Commission (2014/C 136/03) includes guidance concerning baseline reports. It provides information on the legal provisions concerning a baseline report and covers the following topics:

- Determining whether a baseline report is required to be produced,
- Designing baseline investigations,
- Designing a sampling strategy and
- Developing the baseline report.

The guidance also includes a checklist (in Annex) for baseline investigation and report. This guidance does not define the actions required at the definitive cessation of activities.

4.2.2. Extractive waste directive

Waste from the extractive industries comprises a large stream of residues generated within the EU, such as tailings (i.e. the waste solids or slurries that remain after the treatment of minerals by a number of techniques), waste rock and overburden (i.e. the material that extractive operations move during the process of accessing an ore or mineral body, covering the pre-production development stage), and topsoil (i.e. the upper layer of the ground). Extractive industries are regulated by the specific directive (2006/21/EC). While the Directive on Waste (75/442/EEC) defines whether the residues listed above are considered as waste.

According to Article 3 (15) 'waste facility' means any area designated for the accumulation or deposit of extractive waste, whether in a solid or liquid state or in solution or suspension, for the following time-periods:

- no time-period for Category A waste facilities and facilities for waste characterized as hazardous in the waste management plan,
- a period of more than six months for facilities for hazardous waste generated unexpectedly,
- a period of more than one year for facilities for non-hazardous non-inert waste
- a period of more than three years for facilities for unpolluted soil, non-hazardous prospecting waste, waste resulting from the extraction, treatment and storage of peat and inert waste.

The waste facilities means "any area designated for the accumulation or deposit of extractive waste, whether in a solid or liquid state or in solution or suspension"..

Category A waste facilities are classified as major-accident hazards. The classification criteria are set out in Annex III and in the Commission Decision 2009/337/EY.

According to Article 3 (3) **'inert waste'** means waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise react physically or chemically, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The **total leachability and pollutant content of the waste and the**

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater. Commission completed the definition of inert waste in its decision 2009/359/EC.

The type of ore in the mines and the quantities of rocks mined affect the environmental impact of the extractive waste placed in the mining areas. Inert waste would not pose a remarkable risk of environmental pollution or a risk to human health. However, especially sulphide mining related waste can cause such risks. **A serious risk to health or environmental degradation may arise from leaks or damming of the bottom structures of waste facilities, where harmful substances and/or environmentally acidifying waters or aqueous sludges spread outside the waste facility**. The acid mine drainage is a significant environmental risk factor in some cases.

Directive on the management of waste from extractive industries provides for measures, procedures and guidance to prevent or reduce any adverse effects on the environment, in particular water, air, soil, fauna and flora and landscape, and risks to human health. It covers the management of waste directly resulting from the prospecting, extraction, treatment and storage of mineral resources and the operation of mines and quarries: topsoil overburden, waste rock and tailings. Hence, the Directive sets **requirements for** the construction and management of waste facilities (article 11**), the closure and after-closure procedures (article 12) and prevention of water status deterioration, air and soil pollution (article 13)**. The Best Available Techniques (BAT) Reference Document for the Management of Waste from Extractive Industries (JRC, 2018)[55] supports the planning of the practical after-closure measures.

According to the Directive Member States shall take

- the necessary measures to ensure that extractive waste is managed without endangering human health or causing harm to the environment e.g. water or soil.
- the necessary measures to prohibit the abandonment, dumping or uncontrolled depositing of extractive waste.

Member States shall also ensure that

- the operator takes all measures necessary to prevent or reduce as far as possible any adverse effects on the environment and human health brought about as a result of the management of extractive waste.
- the operator draws up a waste management plan for the minimization, treatment, recovery and disposal of extractive waste.
- **major-accident hazards are identified, and necessary measures are taken to along the mining activity life cycle** to prevent such accidents and to limit their adverse consequences for humans and/or the environment, including any transboundary impacts (a major-accident prevention policy, a safety management system, an internal emergency plan).

The competent authority shall draw up an external emergency plan. All extractive waste facilities need a permit granted by the competent authority and it shall contain at least the following:

55 https://publications.jrc.ec.europa.eu/repository/handle/JRC109657

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- the identity of the operator,
- he proposed location of the waste facility, including any possible alternative locations,
- the waste management plan pursuant to Article 5
    - where applicable, the proposed classification for the waste facility, i.e does the waste facility belong to category A (risk of major accident)
    - waste characterisation
    - a description of the waste generating operation and waste treatment
    - description of how the environment and human health may be adversely affected and the preventive measures
    - the proposed control and monitoring procedures
    - the proposed plan for closure, including rehabilitation, after-closure procedures and monitoring
    - measures for the prevention of water status deterioration and for the prevention or minimisation of air and soil pollution
    - a survey of the condition of the land to be affected by the waste facility.
- adequate arrangements by way of a financial guarantee or equivalent
- the information provided by the operator in accordance with Article 5 of Directive 85/337/EEC (1) if an environmental impact assessment is required under that Directive.

Prior to the commencement of deposit operations and at regular intervals, thereafter, including the after-closure phase, the competent authority shall inspect any waste facility having permit decision in order to ensure that it complies with the relevant conditions of the permit. Member States shall ensure that an inventory of closed waste facilities, including abandoned waste facilities, located on their territory which cause serious negative environmental impacts or have the potential of becoming in the medium or short term a serious threat to human health or the environment is drawn up and periodically updated.

The Commission's decision (2009/335/EC) on the determination of the size of the financial guarantee states that the determination must consider, among other things, the measures necessary for the decommissioning of the extractive waste site, the rehabilitation of land, if necessary, and restoration of biodiversity, and their costs.

4.3. Hazardous substances

4.3.1. Regulation on persistent organic pollutants

The obligations of the Stockholm Convention have been implemented in the European Union by Regulation (EU) 2019/1021 of the European Parliament and of the Council (the so-called EU POPs Regulation). This POPs regulation covers some 30 compounds or groups of compounds. The list of POPs is supplemented by new substances or groups of substances as the knowledge of their environmental fate and impacts increases.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

The POPs Regulation (2019/1021) aims to protect human health and the environment with specific control measures that:

- prohibit or severely restrict the production, placing on the market and use of POPs,
- minimize the environmental release of POPs that are formed as industrial by-products,
- make sure that stockpiles of restricted POPs are safely managed; and
- **ensure the environmentally sound disposal of waste consisting of or contaminated by POPs**.

The producer and holder of waste must, as far as possible, make efforts to prevent its contamination by POPs. Thus, the entire POP waste treatment procedure should primarily be arranged in such a way that the other waste generated by the treatment is never contaminated with POPs.

If the waste contains POPs, their concentration determines whether it is to be considered as POP waste and how the waste should be treated. The POPs Regulation included two concentration limit values for waste in: the low concentration limit and maximum concentration limit (see Table 1 Appendix 3). The concentration limits of several POPs were amended by Regulation (EU) 2022/24003. In addition, three new POPs or groups of compounds were added, and the calculation method of dioxins and furans was changed to cover dioxin-like PCBs. The revised concentration limits have been applied since 10 June 2023.[56]

Waste is considered as POP waste **if its POPs concentration is equal to or exceeds the low concentration limit (Fig. 3)**. In this case, **the waste must be treated using the methods set out in the Regulation in such a way that POPs are destroyed or irreversibly transformed so that the remaining waste and releases do not exhibit the characteristics of POPs**. The accepted recovery and disposal methods (Annex V, Part 1) are

- Physico-chemical treatment (disposal method D9)
- Incineration without energy recovery (disposal method D10),
- Incineration using waste as energy (recovery method R1),
- Recovery and recycling of metals and metal compounds (recovery method R4), permitted only for certain metallic wastes and by certain methods.

Waste below the low concentration limit may also be treated by other methods in accordance with Union legislation, but it must not be diluted in order to fall below the limit values. Regulation also prohibits disposal or recovery operations that may lead to recovery, recycling, reclamation or re-use as such, of the substances listed in Annex IV.

POP waste may be deposited in hazardous waste landfills up to the maximum concentration, provided that: it has been solidified or partially stabilised where technically feasible, it complies with the provisions of the Landfill Directive (1999/31/EC) and the Council Decision on criteria and procedures on for the acceptance of waste at landfills

56 Häkkinen, E. (2024) Guide for the Treatment of POPs Waste. Publications of the Ministry of the Environment 2024:24. Ministry of the Environment. Helsinki. (in Finnish)

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

(2003/33/EC), and it has been demonstrated that the chosen method is the best for the environment. If the concentration of a POP exceeds the maximum concentration limit, the waste can only be placed deep in bedrock or a salt mine per a derogation procedure.

The POPs Regulation allows the pre-treatment of POP waste before it is disposed of or converted to an irreversibly less hazardous form provided that the POP isolated from the waste during the pre-treatment is treated as per the requirements of the Regulation. Also, if only part of a product or waste is contaminated with POPs, that part must be separated and then disposed of in accordance with the requirements of the regulation.

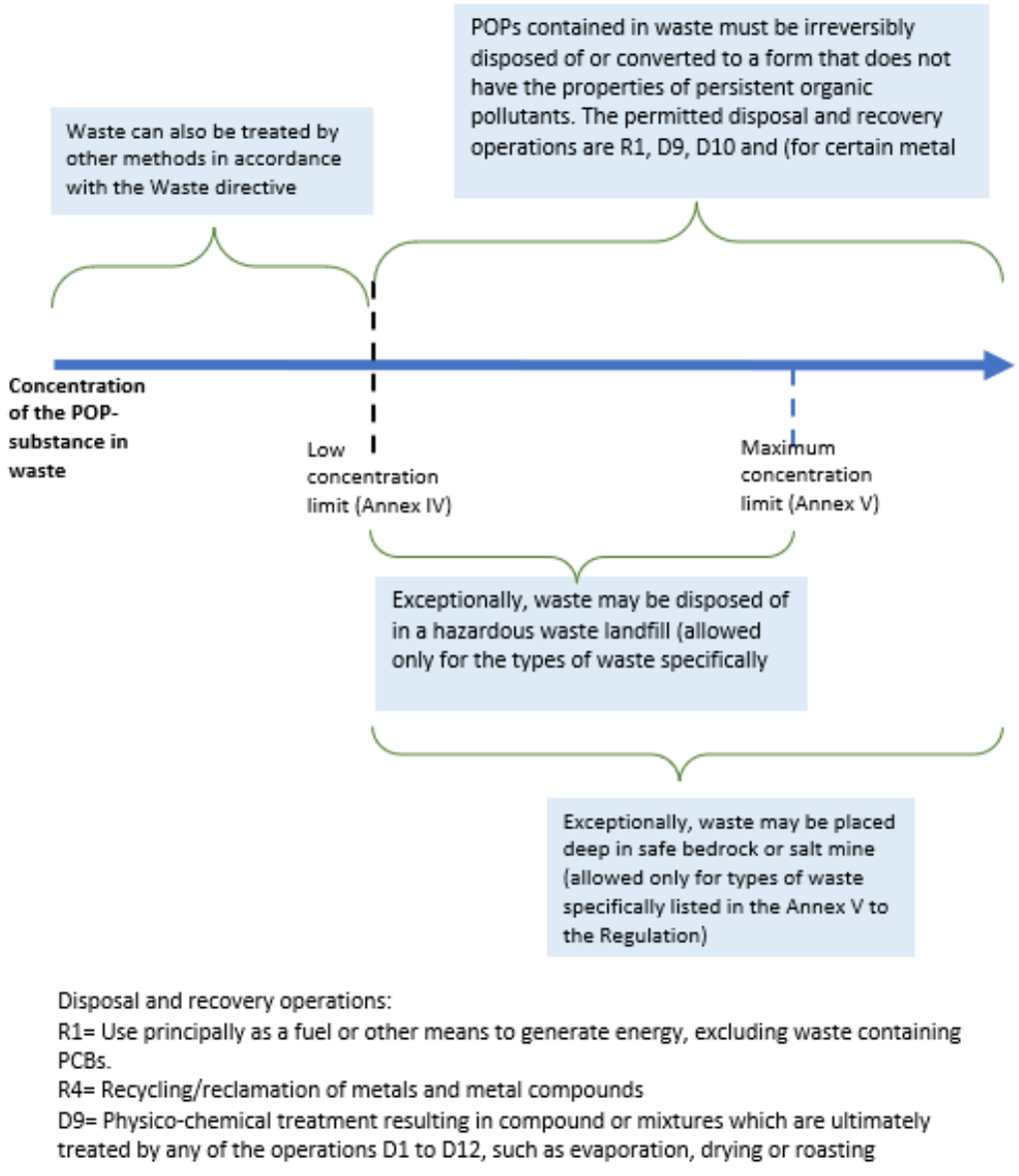


Figure 3. The impact of POP-regulation concentration limits to the waste disposal and recovery[57]

57 based on Häkkinen, E. (2024) Guide for the Treatment of POPs Waste. Publications of the Ministry of the Environment 2024:24. Ministry of the Environment. Helsinki. (in Finnish)

4.3.2. Mercury legislation

In the European Union there are several regulations concerning mercury and mercury compounds that implement the Minamata Convention (see 2.3). From these, the "Regulation (EU) 2017/852 on mercury, and the repealing Regulation (EC) No 1102/2008" are relevant in the context of CLM.

The objective of the Regulation 2017/852 on mercury is to ensure a high level of protection of human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds, by demanding traceability of mercury waste shipments from the operators of facilities undertaking

- the temporary storage of mercury waste,
- conversion and the solidification of mercury waste and
- the permanent storage of mercury.

In the Regulation 2017/852 Article 15 states that, the Commission organises an exchange of information with the Member States regarding the measures taken at national level to **identify and assess sites contaminated by mercury and mercury compounds and to address the significant risks such contamination may pose to human health and the environment**.

Other regulations also include requirements on mercury and mercury compounds:

- Both the Directive on the control of major-accident hazards involving dangerous substances (2012/18/EU) and the revised Industrial and Livestock Rearing Emissions Directive (IED 2.0) lay down requirements aimed at ensuring the environmentally sound storage of metallic mercury and mercury compounds.
- Emissions and releases to air, water and soil are regulated by the revised Industrial and Livestock Rearing Emissions Directive (IED 2.0) in combination with the Water Framework Directive and Environmental Quality Standards Directive (EQSD) that establishes maximum concentration levels of mercury in surface water bodies, sediment and biota.
- Metallic mercury as waste and waste containing or contaminated with mercury qualify in most cases as 'hazardous waste' under the Waste Framework Directive. In parallel, the Landfill Directive sets specific requirements for the storage of mercury waste. (https://environment.ec.europa.eu/topics/chemicals/mercury_en)

4.3.3. REACH regulation on chemicals

REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals, 1907/2006) is a chemical regulation that binds the Member States of the European Union. It came into force in spring 2007. REACH aims to ensure a high level of health and environmental protection throughout the EU, while increasing the competitiveness of the EU chemical industry through high safety requirements and promotion of product development. It also promotes alternative methods for the hazard assessment of substances to reduce the

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

number of tests on animals. REACH applies primarily to European manufacturers of chemical substances, as well as to importers who import substances into the EU. The regulation also imposes obligations on downstream users of chemicals. It does not apply to waste as defined in the Waste Directive 2006/12/EC.

According to the Regulation manufacturers, importers and downstream users must ensure that they manufacture, place on the market or use substances that do not have an adverse effect on human health or the environment. The provisions of the Regulation are based on the precautionary principle. REACH places responsibility on industry to manage the risks from chemicals and to provide safety information on them. To that end, manufacturers and importers must gather information on the properties of their chemical substances and to register that information in a central database in the European Chemicals Agency (ECHA), who coordinates the in-depth evaluation of the information provided on chemicals. If the risks cannot be managed, authorities can restrict the use of chemicals in different ways and require their substitution with less hazardous ones.

REACH regulation also applies to **substances of very high concern (SVHC)**. These are substances that may have serious and often irreversible effects on human health and the environment. Substances with the following hazard properties may be identified as SVHCs:

- Substances meeting the criteria for classification as carcinogenic, mutagenic or toxic for reproduction (CMR) category 1A or 1B in accordance with the CLP Regulation.
- Substances which are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) according to REACH Annex XIII.
- Substances on a case-by-case basis, that cause an equivalent level of concern as CMR or PBT/vPvB substances.

Annex XIII includes criteria for the identification of PBT and vPvB substances. Through the Authorisation process Member State or ECHA proposals for a SVHC are assessed, identified substances are added to the Candidate List and assessed further for possible inclusion on Authorisation List. **ECHA maintains the Candidate list of substances of very high concern for Authorisation**. The authorisation process aims to ensure that these are progressively replaced by less dangerous substances or technologies where technically and economically feasible alternatives are available.

EU or EEA suppliers of articles which contain substances on the Candidate List in a concentration above 0.1% w/w have to inform customers about the safe use of such articles and also update the safety data sheet when needed. Moreover, they as well as the EU and EEA producers or importers of such articles have to notify ECHA if the quantity of the substance in the article totals over one tonne per producer or importer per year. Companies supplying articles containing substances of very high concern (SVHCs) on the Candidate List in a concentration above 0.1% must submit information on these articles to ECHA. This information will be published in the SCIP database to ensure that the information on articles containing Candidate List substances is available to waste operators and consumers.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.3.4. CLP regulation

Revised Regulation on Classification, Labelling and Packaging of Chemicals (CLP) ((EU) 2024/2865) entered into force in December 2024. This Regulation ensures clear chemical labelling, particularly for online sales, and introduces simpler and clearer requirements so that chemicals can move freely across the EU. The revision enhances chemical safety and information transparency.
The CLP Regulation is based on the United Nations' Globally Harmonised System (GHS). It complements REACH Regulation and ensures that workers and consumers are informed of the hazards associated with chemicals by the symbols and standard phrases used in product labelling and safety data sheets. It sets out detailed criteria for labelling: warning signs, signal words, general hazard statements, and prevention, measures, storage and waste management clauses for each hazard class and category. It also sets out general packaging standards to ensure the safe supply of hazardous substances and mixtures. .

Classification of substances and mixtures involves **identifying the hazards of the substance or mixture and comparing the hazard information with the criteria laid down in the CLP Annex I. The classification is based on the hazardous properties of a substance or mixture and not on the likelihood of exposure and risk considerations**.

When relevant information about the intrinsic properties of a substance or a mixture (e.g. toxicological data) meets the criteria for classification (CLP Regulation Annex I), the hazards of the substance or mixture are identified by assigning them a specific hazard class and category. The hazard classes in the CLP Regulation cover physical hazards, health hazards, environmental hazards and other hazards. CLP regulation together with REACH place the responsibility for hazard classification and related provisions such as packaging, hazard communication and development of safety data sheets on the suppliers of substances and mixtures before placing them on the market. A substance must be self-classified when it has no harmonised classification in Annex VI to CLP and it presents hazardous properties.

For hazards of highest concern (carcinogenicity, mutagenicity, reproductive toxicity and respiratory sensitizing) and for other substances on a case-by-case basis, classification and labelling should be harmonised throughout the EU to ensure an adequate risk management. This is done through harmonised classification and labelling (CLH). Harmonised classifications are listed in Annex VI to the CLP Regulation and should be applied by all manufacturers, importers or downstream users of such substances and of mixtures containing such substances. Annex VI currently contains classification data for approximately 4,500 substances. Both the harmonised classifications and the classifications made by the operators themselves are available from the Classification and Labelling (C&L Inventory) database maintained by the ECHA.

Regulation (EC) 1272/2008 has been amended and corrected several times since its entry into force. In 2023 the European Commission amended the CLP Regulation by means of

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

a delegated act, which sets out new hazard classes and criteria for the classification, labelling and packaging of substances and mixtures. The new hazard classes are:

- ED HH in Category 1 and Category 2 (Endocrine disruption for human health)
- ED ENV in Category 1 and Category 2 (Endocrine disruption for the environment)
- PBT, vPvB
- PMT (persistent, mobile, toxic), vPvM (very persistent, very mobile).

Although wastes are exempted from the CLP Regulation and the assessment of the hazardousness of wastes is carried out in accordance with the criteria of Annex III of the Waste Directive, the criteria in Annex I of the CLP regulation is used in the assessment of hazardous properties of wastes.

4.4. Water protection

4.4.1. Protection of different waterbodies

Water is a necessity for life and at the same time, a limited resource that needs to be protected and used in a sustainable way, in terms of both quality and quantity. Three key directives aim to tackle the problem of deterioration and depletion of water resources, namely the Water Framework Directive (2000/60/EY) (later WFD), the Groundwater Directive (2006/118/EC) (later GWD), and the Directive on Environmental Quality Standards (2008/104/EY) (later EQSD). The WFD and the EQSD have been amended with Directive 2013/39/EU. The WFD is supported by some specific EU legislation of a more limited scope, e.g., the Drinking Water Directive (2020/2184/EU), the Bathing Water Directive (2006/7/EC), the Nitrates Directive (91/676/EEC), the Urban Wastewater Directive (91/271/EEC) and the Floods Directive (2007/60/EC). Here, the focus is on water management regulations related to harmful substances in surface and groundwater, which are the most relevant in the context of CLM.

The WFD (2000/60/EC) regulates the protection and restoration of inland surface waters, transitional areas of estuaries, coastal waters and groundwater. It aims to prevent and reduce pollution, promote sustainable water use, protect and improve the aquatic environment and mitigate the effects of floods and droughts. The overall objective is to achieve a good ecological and chemical status for surface waters and a good quantitative and chemical status for groundwater bodies status by 2027 at the latest.

According to the WFD, the Member States have to analyse the characteristics of each river basin district and conduct a review of the impact of human activity on the status of surface waters and on groundwater, as well as an economic analysis of water use according to the technical specifications set out in Annexes II and III. Moreover, monitoring programmes shall be established for monitoring the status of waters.

The Member States must ensure that all discharges into surface waters are controlled according to the combined approach, which can include emission controls based on best

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

available techniques, relevant emission limit values, or best environmental practices to control diffuse impacts.

The Member States also need to draw up programmes of measures to achieve the environmental objectives established under Article 4. Each programme of measures shall include the 'basic' measures and, where necessary, 'supplementary' measures. Basic measures are the minimum requirements to be complied in accordance with article 11, paragraph 3. Such measures may include, for example, measures necessary for the implementation of several other directives (16 altogether) mentioned in Article 10 and Annex VI. The measures can include the prevention of the entry of pollutants into water or emission control based on a permit or registration.

At the time of the **implementation of the programmes of measures set out in the river basin management plans** Member States shall implement the necessary measures:

1) for **surface waters** to:

- **prevent deterioration of the status of all bodies of surface water,**
- **protect, improve and restore all bodies of surface water**,
- protect and improve all artificial and heavily modified water bodies,
- progressively reduce pollution from priority substances and eliminate or phase out emissions and losses of priority hazardous substances and

2) for **groundwater** to:

- **prevent or limit the entry of pollutants into groundwater** to prevent deterioration of the status of all bodies of groundwater,
- **protect, improve and restore all groundwater bodies**,
- ensure a balance between abstraction and groundwater formation and
- reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity to progressively reduce pollution of groundwater.

River basin management plans are based on natural geographical river basins, and they contain:

- description of the characteristics of the area,
- **information on pressures on the area and the impact of human activities**,
- map on monitoring network and results of the monitoring programmes in map form,
- environmental targets,
- summary of the economic analysis of water use,
- summary of the programme of measures,
- summary on citizen engagement activities and
- a list of competent authorities.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

The WFD defines pollution as the direct or indirect release of substances or heat by human activities into the air, water or soil in such a way that it can harm human health or the quality of aquatic ecosystems or the quality of terrestrial ecosystems directly dependent on aquatic ecosystems, or that it harms material property or impairs or prevents the recreational use of the environment or other legitimate uses of the environment.

The WFD is complemented by a separate the Groundwater Directive (2006/118/EC). The GWD aims to prevent and combat groundwater pollution in the European Union (EU). It lays down procedures for assessing the chemical status of groundwater and measures to reduce the concentrations of pollutants in groundwater. It provides criteria for the identification of increases in monitored substances and starting points for trend reversals. All threshold values for pollutants are to be set by the Member States except in the case of nitrates (fertiliser) and pesticides, for which the limits are set by specific EU legislation.

The Directive on environmental quality standards in the field of water policy (EQSD) (2008/105/EC, updated with 2013/39/EU) lays down environmental quality standards (EQS) for hazardous priority substances, priority substances and certain other pollutants as provided for in Article 16 of WFD to achieve good surface water chemical status in accordance with the provisions and objectives of the WFD Article 4. This Directive establishes **limits on concentrations of 45 priority substances** presenting a significant risk to, or via, the aquatic environment at the EU level (Directive 2013/39/EU Annex 1).

4.4.2. Surface water

The environmental objectives for surface waters are based on the aim to reach a good chemical and ecological status of surface waters and good ecological potential and good chemical status of modified water bodies.

The Member States must monitor the water status and to establish a coherent and comprehensive overview of water status in accordance with the requirements of article 8 and Annex V. The monitoring is divided into surveillance monitoring and operational monitoring. The latter is targeted to water bodies identified as being at risk of failing to meet their environmental objective.

The European Parliament and the Council shall adopt specific measures against pollution of water by individual pollutants or groups of pollutants presenting a significant risk to or via the aquatic environment, including such risks to waters used for the abstraction of drinking water. These measures include, e.g., proposing a list of priority substances; identification of the priority hazardous substances; review the adopted list of priority substances; submit proposals of controlling measures; and submit proposals for quality standards applicable to the concentrations of the priority substances in surface water, sediments, or biota. The Commission may prepare strategies against pollution of water by any other pollutants or groups of pollutants, including any pollution which occurs as a result of accidents.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.4.2.1. Status of surface waters

The status of surface and groundwater is assessed and classified based on the intensity of change caused by human activities The status of surface waters is determined by its ecological or chemical condition, the worse of these being the determining factor. The classification of the ecological status of surface water is five-step (excellent, good, satisfactory, avoidable, bad), while the chemical state is either good or poor. Good ecological status of surface waters covers the quality of the structure and functioning of aquatic ecosystems classified in accordance with Annex V (biological elements, hydromorphological elements supporting the biological elements, general chemical and physico-chemical elements supporting the biological elements and specific pollutants).

The WFD further requires the Member States to set and meet quality standards for substances playing a role locally or regionally but not EU-wide ('river basin specific pollutants'), the monitoring of which contributes to ecological status assessment. When identifying these substances, the Member States shall take into account the substances listed in Annex VIII of the WFD.

4.4.2.2. Environmental Quality Standards

Environmental quality standard refers to concentrations of certain pollutant or group of pollutants in water, sediment or biota which should not be exceeded to protect human health and the environment.

The Member States shall apply the EQS set out in Directive 2013/39/EU Annex 1 Part A for surface water bodies as required in Part B. Two types of EQSs are set for priority substances in surface waters in the EQSD: annual average concentrations (AA-EQS) and maximum allowable concentrations (MAC-EQS). The former protects against long-term chronic pollution, and the latter against short-term acute pollution.

For certain substances it is not possible to ensure protection against indirect effects and secondary poisoning at the Community level by EQS for surface water alone and therefore EQS for biota have been established for some substances:

- Brominated diphenylethers
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- Mercury and its compounds
- Polyaromatic hydrocarbons (PAH)[58]
- Dicofol
- Perfluorooctane sulfonic acid and its derivatives (PFOS)
- Dioxins and dioxin-like compounds

58For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28), the biota EQS and the corresponding AA-EQS in water refer to the concentration of benzo(a)pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs and, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- Hexabromocyclododecane (HBCDD)
- Heptachlor and heptachlor epoxide.

The Member States should analyse long-term trends in sediment or biota based on monitoring of surface water status for the substances listed below, and take measures to ensure that their concentrations do not increase significantly:

- Anthracene
- Brominated diphenylethers
- Cadmium and its compounds
- C10-13 Chloroalkanes
- Di(2- ethylhexyl)- phthalate (DEHP)
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclohexane
- Lead and its compounds
- Mercury and its compounds
- Pentachlorobenzene
- Polyaromatic hydrocarbons (PAH)[59]
- Tributyltin compounds (Tributyltincation)
- Dicofol
- Perfluorooctane sulfonic acid and its derivatives (PFOS)
- Quinoxyfen
- Dioxins and dioxin-like compounds
- Hexabromocyclododecane (HBCDD)
- Heptachlor and heptachlor epoxide

Article 5 of the EQSD obliges **the Member States to establish an inventory, including maps, if available, of emissions, discharges and losses of all priority substances and pollutants** listed in Part A of Annex I for each river basin district or part of a river basin district lying within their territory including their concentrations in sediment and biota, as appropriate. Results shall be published in the river basin management plans.

In the EQSD amendment (2013/39/EU) the Commission established a new policy tool: **a watch list**. Its aim is to **gather monitoring data on substances for which these data are insufficient, but which may pose a significant risk to or via the aquatic environment** at Union level. Highly toxic substances, used in many Member States and discharged to the aquatic environment but not or rarely monitored, should be considered for inclusion in the watch list, as well as emerging pollutants. Substances found to pose a significant risk should be considered for inclusion in the priority substances list. An EQS would then also be set for the Member States to comply with.

The first watch list of substances was set out in the Commission Implementing Decision (EU) 2015/495. Since then, it has been updated in 2018, 2020 and 2022 and it will be

59 see the previous footnote

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

updated every 24 months. The surface water watch list can contain a maximum of 14 substances or groups of substances at any one time. When updating the list, the Commission removes any substance for which a risk-based assessment, as referred to in Article 16(2) of Directive 2000/60/EC, can be concluded without additional monitoring data. The latest list ((EU) 2022/1307) contains pharmaceuticals, pesticides, fungicides, a herbicide, an insecticide and a veterinary pharmaceutical, antibiotics, a human pharmaceutical and a group of three sunscreen agents.

In selecting the representative monitoring stations, the monitoring frequency and the timing for each substance, the Member States are to take into account the use patterns and possible occurrence of the substance. Even though the minimum monitoring frequency is once per year, the Member States should consider, for all the substances, a monitoring frequency of at least twice per year to consider their fluctuating usage, to ensure that data of sufficiently high quality are collected, and that the watch-list mechanism can thus provide properly effective support to subsequent risk–assessment processes. The Member States must report to the Commission the results of their monitoring.

4.4.3. Groundwater

The WFD also lays down key subjects for groundwater, such as definitions, environmental objectives, programmes of monitoring and measures. While GWD establishes criteria for the assessment of good chemical status and criteria for the identification and reversal of significant and sustained upward trends and for the definition of starting points for trend reversals. It also complements the WFD's provisions in preventing or limiting pollutant releases into groundwater.

In the WFD 'groundwater' means all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil while 'body of groundwater' means a distinct volume of groundwater within an aquifer or aquifers. Under the WFD, groundwater quality standards apply only to groundwater bodies, not to other types of groundwater.

The deterioration ban applies to all groundwater areas that are bodies of water. The prohibition against weakening does not apply to other water in the soil or bedrock outside the bounded bodies of groundwater. However, measures should also be taken to prevent and limit the entry of pollutants into such waters, but they do not appear to be subject to environmental targets (WFD 4§).

The status assessment of groundwater bodies is preceded by a risk assessment that considers the risk both to the quality and quantity of groundwater. A more precise chemical classification is only made for groundwater areas that have been designated as high-risk areas based on a risk assessment. Groundwater areas for which there is insufficient information to assess risks have been designated as clearing areas. Other bodies of groundwater are assumed to be in good condition.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Groundwater bodies are either in good or poor condition. The classification takes into account the quantitative status and chemical status (quality) of groundwater. The quantitative status of groundwater is based on the groundwater level, and it is good when:

- the groundwater level of the body of groundwater remains such that the long-term average annual water abstraction does not exceed the available groundwater resources,
- changes in flow direction due to changes in the groundwater level do not cause saltwater or other adverse effects to enter the groundwater body,
- human activity does not change the groundwater level so that:
    - the environmental objectives of surface waters associated with groundwater are not achieved,
    - the condition of these waters deteriorates substantially or
    - causes substantial harm to terrestrial ecosystems directly dependent on the groundwater body.

In the WFD the chemical status of a body of groundwater is good (table 2.3.2 of Annex V) when the concentrations of pollutants:

- do not indicate access to groundwater by saltwater or other contaminants,
- do not exceed the quality standards applicable under other relevant Community legislation,
- do not impede the achievement of the environmental objectives of surface waters associated with groundwater and do not cause substantial deterioration in the ecological or chemical quality of these surface waters,
- do not cause significant harm to terrestrial ecosystems directly dependent on the groundwater body,
- changes in electrical conductivity do not indicate the entry of saltwater or other contaminants into the groundwater body.

According to the Groundwater Directive, **harmful concentrations of harmful pollutants in groundwater must be avoided, prevented or reduced to protect the environment and in particular human health.** Measures laid down in the GWD include the specification of the "prevent and limit" objective, the criteria for assessing good groundwater chemical status and the criteria for identifying significant and sustained upward trends and for determining where trends shall be reversed to downward trends.

The GWD also aims to ensure consistency with the EU Nitrates Directive (91/676/EEC), the Plant Protection Products Directive (1107/2009/EC) and the Biocides Regulation (No 528/2012/EU). Therefore, the GWD has set quality standards for these substances as EU-level criteria for the chemical status of groundwater bodies.

The criteria for assessing the chemical status of groundwater (GWD Article 3) include:

- groundwater quality standards as referred to in Annex I (nitrates and active substances in pesticides, including their relevant metabolites, degradation and reaction products),

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- threshold values established by Member States for pollutants, their groups or pollution indicators that may pose a threat to the quality of groundwater bodies; at least the substances listed in Annex II, Part B, shall be considered:
    - Cadmium
    - Lead
    - Mercury
    - Ammonium
    - Chloride
    - Sulphate
    - Nitrites
    - Phosphorus (total)/Phosphates (Member States may decide to establish threshold values either for phosphorus (total) or for phosphates.)
    - Trichloroethylene
    - Tetrachloroethylene
    - Conductivity.

When setting threshold values for good groundwater status, the Member States should consider the impacts of groundwater on, and its interaction with surface waters, groundwater-dependent terrestrial ecosystems and wetlands. Also, the data on human toxicity and ecotoxicity should be considered.

According to the GWD groundwater status is good if:

- the conditions set out in Table 2.3.2 of Annex V to WFD are being met (previously mentioned in this text) or
- the values for the groundwater quality standards listed in Annex I (nitrates and active substances in pesticides, including their relevant metabolites, degradation and reaction products) and the relevant threshold values established by Member States (Annex II part B) are not exceeded at any monitoring point in that body or group of bodies of groundwater, or
- the value for a groundwater quality standard or threshold value is exceeded at one or more monitoring points but an appropriate investigation in accordance with Annex III confirms that:
    - (i) on the basis of the assessment, referred to in paragraph 3 of Annex III, the concentrations of pollutants exceeding the groundwater quality standards or threshold values are not considered to present a significant environmental risk, taking into account, where appropriate, the extent of the body of groundwater, which is affected,
    - (ii) the other conditions for good groundwater chemical status set out in Table 2.3.2 in Annex V to WFD are being met, in accordance with paragraph 4 of Annex III to the GWD,
    - (iii) for bodies of groundwater that are used for the abstraction of drinking water, the requirements of Article 7(3) of WFD are being met, in accordance with paragraph 4 of Annex III to the GWD,
    - (iv) the ability of the body of groundwater or of any of the bodies in the group of bodies of groundwater to support human uses has not been significantly impaired by pollution.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

In cases of (ii) and (iii) the Member States should, where relevant and necessary, and based on relevant monitoring results and of a suitable conceptual model of the body of groundwater, assess:

- the impact of the pollutants in the body of groundwater,
- the amounts and the concentrations of the pollutants being, or likely to be, transferred from the body of groundwater to the associated surface waters or directly dependent terrestrial ecosystems,
- the likely impact of the amounts and concentrations of the pollutants transferred to the associated surface waters and directly dependent terrestrial ecosystems,
- the extent of any saline or other intrusions into the body of groundwater, and
- the risk from pollutants in the body of groundwater to the quality of water abstracted, or intended to be abstracted, from the body of groundwater for human consumption.

The GWD also requires that the Member States shall identify any significant and sustained upwards trend in the concentrations of pollutants, groups of pollutants or indicators of pollution found in bodies or groups of bodies of groundwater identified as being at risk and define the starting point for reversing that trend, in accordance with Annex IV. In reversing the trends, the Member States shall use the programme of measures of the WFD. **When existing plumes from point sources and contaminated land may threaten the achievement of the environmental objectives of the WFD in bodies of groundwater, the Member States shall carry out additional assessments to verify that plumes from contaminated sites do not expand, do not deteriorate the chemical status of the body or group of bodies of groundwater, and do not present a risk for human health and the environment**.

The programme of measures shall include all measures necessary to prevent inputs into groundwater of any hazardous substances. In identifying such substances, the Member States shall take account of hazardous substances listed in WFD's Annex VIII items 1 to 6 and substances in items 7- 9, when they are assessed to be hazardous. For other non-hazardous pollutants in Annex VIII and any other non-hazardous pollutants that present an existing or potential risk of groundwater pollution, all necessary measures to limit inputs should also be included in the programme of measures. Such measures shall consider, at least, the Best Environmental Practice and Best Available Techniques specified in the relevant Community legislation. Inputs of pollutants from diffuse sources of pollution having an impact on the groundwater chemical status shall be taken into account whenever technically possible. Certain exemptions in preventive and limiting measures are possible according to Article 6(3).

Prevention of deterioration implies a prohibition of groundwater deterioration, not an obligation to remediate. It is needs to be noted, that the provisions of GWD and the **EQSs** that are used for the assessment of chemical quality of groundwater **are meant for classification and long-term monitoring purpose with an objective to maintain or reach the good chemical status of groundwater bodies**. Hence, **the EQSs are not meant to be used as strict remediation targets in case of contamination at a specific**

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

site. They **can however be used as indicators of harmful impacts on groundwater quality and of the consequent risks**.

The monitoring network shall be designed to provide a coherent and comprehensive overview of the chemical status of groundwater within each river basin and to detect the presence of long-term anthropogenically induced upward trends in pollutants. The surveillance monitoring concerns only groundwater bodies identified as being at risk according to the characterisation exercise undertaken in accordance with Annex II and groundwater bodies, which cross a Member State boundary. The core parameters to be monitored in all the selected groundwater bodies are oxygen content, pH value, conductivity, nitrate and ammonium. Also, parameters which are indicative of the impact of pressures shall be monitored. Operational monitoring should be carried out for all those groundwater bodies or groups of bodies which on the basis of both the impact assessment and surveillance monitoring are identified as being at risk of failing to meet environmental objectives.

4.4.4. Proposal for amending directives

The EU Commission published in October 2022 its proposal for amending the WFD, GWD and EQSD. In the amending directive (COM (2022) 540 final), **23 critical substances are suggested to be added to the list of priority substances for surface waters, including pharmaceuticals, pesticides and a group of 24 per-and polyfluoroalkyl substances**. The proposal would revise the EQSs for existing priority substances, incorporate river basin-specific pollutants in a new annex II to the EQSD and introduce obligation for the Member States to progressively reduce pollution from river basin-specific pollutants. **Five new substances and substance groups are proposed to be added to the list of quality standards for groundwater**. The Member States should also assess the cumulative effects of estrogenic hormones in surface waters. Watch list for pollutants in groundwater would be mandatory. The surface water watch list would contain a maximum of 10 substances or groups of substances. The Member States would need to monitor the substances on the list at least twice a year over two years, except for substances sensitive to climatic or seasonal variabilities, for which the monitoring should be more frequent. **Micro-plastics and selected antimicrobial resistance genes** should be included in both watch lists as soon as suitable monitoring methods have been identified. The proposal is in the process of being considered. Parliament's first reading was completed in April 2024 and the Council's position in June 2024. Trilogues are scheduled to begin in January 2025 (Legislative Train Schedule 2025).[60]

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

60 https://www.europarl.europa.eu/legislative-train/spotlight-JD%2023-24/file-integrated-water-management-surface-and-groundwater-pollutants

4.4.5. Directive on the quality of water intended for human consumption

According to the WFD the Member States must identify, within each river basin district all bodies of water used for the abstraction of water (more than 10 m^3/d or serving more than 50 persons) and those intended for such use in the future. The monitoring of these bodies should be conducted according to Annex V. All identified water bodies must meet the environmental objectives and EQSs of surface water, and distributed, supplied, bottled water as well water used in a food business must meet the requirements of the Directive on the quality of **water intended for human consumption** (2020/2184). **The Member States must ensure the necessary protection for these water bodies to avoid deterioration in their quality** in order to reduce the level of purification treatment required in the production of drinking water. Hence, the Member States may establish safeguard zones for those bodies of water. Identified surface water bodies which provide more than 100 m^3/d as an average must be monitored for all priority substances discharged and all other substances discharged in significant quantities which could affect the status of the body of water, and which are controlled under the provisions of the Drinking Water Directive. Monitoring frequencies should be in accordance with Table 1.

Table 1. Monitoring frequencies of water abstraction points according to the size of the community they serve.

Community served	Frequency
< 10 000	4 per year
10 000 – 30 000	8 per year
> 30 000	12 per year

The Directive on the quality of water intended for human consumption (recast Drinking Water Directive (DWD)) ((EU) 2020/2184) defines **essential quality standards for water intended for human consumption**. In the DWD 'water intended for human consumption' means:

- all water, either in its original state or after treatment, intended for drinking, cooking, food preparation or other domestic purposes in both public and private premises, regardless of its origin and whether it is supplied from a distribution network, supplied from a tanker or put into bottles or containers, including spring waters,
- all water used in any food business for the manufacture, processing, preservation or marketing of products or substances intended for human consumption.

The Member States are obligated to ensure that water intended for human consumption is wholesome, clean and meets, at minimum, the following requirements:

- water is free from any micro-organisms and parasites and from any substances which, in numbers or concentrations, constitute a potential danger to human health,

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

- requirements set out in Parts A (Microbiological parameters), B (Chemical parameters) and D (Parameters relevant for the risk assessment of domestic distribution systems) of Annex I.

The Member States also need to ensure that they have taken all other measures necessary to comply with Articles 5 to 14. They shall set quality standards for water intended for human consumption for the parameters set out in Annex I of the DWD that are at least as stringent as the values set out in this Annex. If necessary due to protection of human health, values for additional parameters not included in Annex I, should be set.

The Member States must ensure that the supply, treatment and distribution of water intended for human consumption is subject to a risk-based approach that covers the whole supply chain from the catchment area, abstraction, treatment, storage and distribution of water to the point of compliance specified in Article 6. Risk assessment and risk management of the catchment areas should meet the requirements set in Article 8 including:

- characterisation of the catchment areas for abstraction points,
- **identification of hazards and hazardous events in the catchment areas and an assessment of the risk they could pose to the quality of water and possibility that deterioration of water could cause health risks** and
- appropriate monitoring in surface water or groundwater, or both, in the catchment areas for abstraction points, or in raw water, of relevant parameters, substances or pollutants selected according with points (c)(i) to (c)(vii) of the Article.

The Member States should select from points (c)(i) to (c)(vii) the parameters, substances or pollutants that are considered relevant for monitoring in light of the hazards and hazardous events identified or in light of the information provided by the water suppliers. The Member States must ensure that the risk management measures to prevent or control the risks identified are taken as relevant, starting with the preventive measures (Article 8(4)).

Article 13 and Parts A and B of Annex II requires that the Member States monitor of the quality of water intended for human consumption regularly to ensure that the requirements of the Directive, and particularly, the parametric values set in Article 5 (referring to Annex I) are met. Samples of water intended for human consumption shall be taken so that they are representative of its quality throughout the year.

In Article 13(8) the Commission is empowered to adopt implementing acts to establish and update a watch list addressing substances or compounds of concern to the public or the scientific community on health grounds ('the watch list'). In 2022, the first watch list for water intended for human consumption was adopted (Commission implementing decision of 19.1.2022 establishing a watch list of substances and compounds of concern for water intended for human consumption as provided for in Directive (EU) 2020/2184). It requires that drinking water across the EU is to be monitored for the potential presence of two endocrine disrupting compounds (beta-estradiol and nonylphenol) throughout the whole water supply chain.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.4.6. Floods Directive

The Floods Directive (2007/60/EC) aims to establish a framework for the assessment and management of flood risks to reduce the negative consequences of flooding on human health, economic activities, the environment and cultural heritage in the EU. It elicits the Member States to implement a three-step process: conduct national preliminary flood risk assessments, produce flood hazard and risk maps, and put in place flood management plans. The components of flood risk management plans are set out in the Annex to the Directive.

Floods can release pollutants stored in the ground and spread them even more widely. Flood risk management is an integral part of integrated river basin management. Synergies can be achieved by coordinating flood risk management plans, river basin management plans, and public participation procedures. **The Member States must establish flood risk management targets for areas that are vulnerable to flooding, to reduce the harmful consequences that could result from flooding**. Flood risk management plans must include measures to achieve the reduction objective.

4.5. Nature protection

4.5.1. Habitats Directive

Europe's diversity of wild animals, plants and habitats has been lost over the years due to urban sprawl, intensive agriculture, forestry and fisheries, pollution, among others. The Habitats Directive (92/43/EEC) aims to protect over a thousand animal and plant species, and 230 habitat types. The overall objective is to ensure that measures are taken to maintain or restore these species and habitat types to a favourable conservation status within the EU.

To achieve the goal, a coherent European network of protected areas will be established, including the natural habitat types listed in the Directive's Annex I and the habitats of the species listed in its Annex II. Areas are selected on scientific grounds using the criteria laid down in the Directive (Annex III). The Member States must establish necessary conservation measures and if needed, management plans for these areas. **Deterioration of habitats and species habitats and disturbance affecting species occurrence should be prevented with the necessary measures**. Any plan or project, other than protection or management measures of the area, that could significantly affect the area should be carefully assessed. The competent authorities may approve the project or plan only if it does not affect the integrity of the area concerned. If, for imperative reasons of overriding public interest, a project that affects negatively to the state of the area has to be carried out, the responsible Member State must take the necessary compensatory measures.

The Member States shall take measures to ensure the strict protection of the animal and plant species listed in Annex IV and prohibit, inter alia, the deliberate

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

disturbance of animal species, the weakening and destruction of breeding and resting sites, and the deliberate picking, harvesting, cutting, unhooking or destruction of plants.

In the case of contaminated sites, it **must be ensured that no harmful substances enter the protected areas and that measures taken in the contaminated area do not adversely affect the conditions of the protected areas, other valuable habitats or protected species**.

4.5.2. Birds Directive

The populations of wild bird species that occur naturally on European soils are declining, threatening the preservation of biological balance in the environment. The aim of the Birds Directive (2009/147/EC) is to conserve all species of naturally occurring birds in the area of European Union. It covers the protection, management and control of these species and lays down rules for their exploitation.

The Member States shall maintain populations of naturally occurring bird species at levels consistent with ecological, scientific and cultural requirements and ensure the preservation, maintenance or restoration of adequate diversity and area of habitats of these bird species. The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat. The same applies to regularly migratory bird species not listed in Annex I and their nesting, feathering, wintering and resting areas. The Member States must **pay attention to the protection of wetlands and particularly to wetlands of international importance**. In all of these areas, the MSs **must prevent habitat pollution or deterioration, as well as disturbances affecting the birds**. Outside these protection areas, the MSs shall also strive to **avoid pollution** or deterioration of habitats. Moreover, **the MSs must prohibit certain actions e.g. deliberate harmful disturbance of these birds particularly during the period of breeding and rearing**.

The Member States are expected to encourage research, and any work required as a basis for the protection, management and use of the population of all species of bird referred to in Article 1. Particular attention shall be paid to research and work on the subjects listed in Annex V, e.g., determining the role of certain species as indicators of pollution and studying the adverse effect of chemical pollution on population levels of bird species.

The Birds and Habitats Directives form the cornerstones of EU biodiversity policy. They provide a strong legislative framework for all EU countries to protect the most valuable and threatened biodiversity. Together these two directives have also created the Natura 2000 network.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.5.3. Regulation on nature restoration

The Regulation on nature restoration ((EU) 2024/1991) came into effect 18 August 2024. Its objective is to contribute to the long-term and sustainable recovery of the diversity and resilience of the terrestrial and aquatic ecosystems of the Member States through the restoration of degraded ecosystems. At the same time, efforts will be made to mitigate climate change and improve the achievement of the Union's overall objectives of adaptation to climate change, food security and zero soil degradation. The Regulation establishes a framework for the Member States' restoration measures, which together are to cover 20% of land and marine areas by 2030 and all ecosystems in need of restoration by 2050.

Focus is on the implementation of the EU Biodiversity Strategy and strengthening existing legislation (e.g. Habitats and Birds Directives). The NRL sets binding targets to restore degraded ecosystems. It contains the following specific targets to protect:

- targets based on existing legislation (for wetlands, forests, grasslands, river and lakes, heath & scrub, rocky habitats and dunes),
- pollinating insects,
- forest ecosystems,
- urban ecosystems,
- agricultural ecosystems,
- marine ecosystems,
- river connectivity.

Each Member State will develop a National Restoration Plan for setting out restoration needs and measures to fulfil the obligations (incl. monitoring) and achieving the targets of the regulation. The MSs are expected to submit these Plans to the Commission within two years of the Regulation coming into force (by mid-2026). They must also quantify the area that needs to be restored and ensure that areas, where good status and adequate quality of species habitats has been achieved, do not significantly degrade.
Moreover, the Member States must identify synergies with measures taken in relation to climate change mitigation, climate change adaptation, land degradation neutrality, disaster prevention, common agricultural policy, NATURA 2000, Habitat Directive (see 4.5.1 Habitats Directive), river basin (see 4.4.1) management plans, marine strategies, national air pollution control programmes, national biodiversity strategies and action plans and strategic critical raw material projects (see 4.10.3 Critical Raw Materials Act).

The Regulation defines ‘restoration’ as “the process of actively or passively assisting the recovery of an ecosystem in order to improve its structure and functions, with the aim of conserving or enhancing biodiversity and ecosystem resilience”. This can be done, e.g, through improving the state of habitat not in good condition, restoration measures to re-establish vanished habitat types, other measures in accordance with Article 4 and Article

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

5 and fulfilling the obligations under Articles 8 to 12[61] including reaching satisfactory levels for the indicators referred to in Articles 8 to 12.

Article 4 of the Regulation refers to all terrestrial, coastal and freshwater habitat types belonging to the following six groups (Annex I): 1) **wetlands (coastal and inland), 2) grasslands and other pastoral habitats**, 3) river, lake, alluvial and riparian habitats, 4) forests, 5) **steppe, heath and scrub habitats** and 6) **rocky and dune habitats**. This article sets quantitative targets and deadlines for the restoration of habitats in need of restoration measures.

In urban areas the focus of the Regulation is on total national area of urban green space and urban tree canopy and the aim is increasing trend until the satisfactory level is reached. The Member States must ensure that there is **no net loss in the total national area of urban green space** and of urban tree canopy cover in urban ecosystem areas between 2024 – 2030. The MSs may exclude from the total national areas the urban ecosystem areas in which the share of urban green space exceeds 45 % and the share of urban tree canopy cover exceeds 10 %.

In addition to restoration measures, the Member States must take measures to **enhance biodiversity in agricultural and forest ecosystems** and restore drained peatlands. Annex VII of the Directive provides examples of **restoration measures** stopping, reducing or **remediating pollution and converting brownfield sites, former industrial areas and quarries into natural sites**.

4.5.4. Regulation regarding invasive alien species

The appearance of alien species in new locations is not always a cause for concern. However, a significant subset of alien species can become invasive and have serious adverse impact on biodiversity and related ecosystem services, as well as other social and economic impact, which should be prevented. According to the Regulation (EU) No 1143/2014 (see below), invasive alien species is defined to be an alien species whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services. While alien species means any live specimen of a species, subspecies or lower taxon of animals, plants, fungi or micro- organisms introduced outside its natural range; it includes any part, gametes, seeds, eggs or propagules of such species, as well as any hybrids, varieties or breeds that might survive and subsequently reproduce.

The Union, as a party to the Convention on Biological Diversity is bound by Article 8(h) of that Convention to as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species. As a Party to the Convention on the Conservation of European Wildlife and Natural

61 Restoration of urban ecosystems (8§), natural connectivity of rivers and natural functions of the related floodplains (9§), pollinator populations (10§), agricultural ecosystems (11§), and forest ecosystems (12§)

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Habitats, the Union is committed to take all appropriate measures to ensure the conservation of the habitats of the wild flora and fauna species. The "Regulation on the prevention and management of the introduction and spread of invasive alien species" ((EU) No 1143/2014) implements the commitments of these above-mentioned conventions as well as supports the achievement of the objectives of Water Framework Directive , Marine Strategy Framework Directive, Directive on the conservation of wild birds and Directive Habitats Directive on the conservation of natural habitats and of wild fauna and flora.

The Regulation sets out rules to **prevent, minimise and mitigate the adverse impact on biodiversity of the introduction and spread** within the Union, **both intentional and unintentional, of invasive alien species**. It applies to all invasive alien species. The core of the Regulation is the **list of Invasive Alien Species of Union concern** (Union List) ((EU) 2016/1141) which is amended by (EU) 2022/1203. The species included on this list are subject to **restrictions and measures** set out in the Regulation. Member States can also have national list of Invasive Alien Species.
It is prohibited to intentionally bring into the territory of the Union, keep, breed, transport to, from or within the Union, place on the market, use or exchange, permit to reproduce, grown or cultivated or released into the environment invasive alien species of Union concern.

Early detection and rapid eradication at an early stage of invasion are key actions, which requires research, monitoring and surveillance of such species. The Member States must ensure that the methods used in eradication effectively, completely and permanently remove the population of the invasive alien species concerned. When invasive alien species are widely spread, the management measures must consist of lethal or non-lethal physical, chemical or biological actions aimed at the eradication, population control or containment of a population. When taking measures, it **must be ensured that human health and the environment, especially non-targeted species and their habitats, are taken into consideration and ensure to spare animals any avoidable pain, distress or suffering**.

Invasive alien species may occur in contaminated areas, in which case the necessary measures for their eradication or containment must be taken into account when planning risk management measures and waste treatment. For example, **excavated land masses may contain seeds of invasive alien plant species or pieces of roots through which species can spread broader in the environment**. Hence, in the planning and implementation of risk reduction measures, such as phytoremediation, and in treatment of waste materials, it is also important to ensure that there is no risk of spreading of invasive alien species.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.6. Wastes

4.6.1. Waste legislation

The Waste Framework Directive (2008/98/EC) aims to protect the environment and human health from the harmful effects of waste and to enable transition to circular economy by preventing and reducing the generation of waste, reducing the effects of waste management and material use, and improving the efficiency of material use. The Member States must also ensure that waste management is:

- not causing risk to water, air, soil, plants and animals,
- not causing a nuisance through noise or odours and
- not adversely affecting the countryside or places of special interest.

In the Directive

- 'waste' means any substance or object which the holder discards or intends or is required to discard and
- 'hazardous waste' means waste which displays one or more of the hazardous properties listed in Annex III.

The general definition of waste in accordance with the Waste Act is applied to the soil excavated in connection with the remediation of a contaminated site.
The Directive does not apply to (article 2 1b and 1c):

- land (in situ) including unexcavated contaminated soil and buildings permanently connected with land,
- **uncontaminated soil** and other naturally occurring, excavated material that will be **used on site** for defined purposes in its natural state, i.e., without significant conversion operations,

Mining wastes are excluded from the scope of the Directive to the extent they are covered by other Community legislation (article 2 2d). Despite the exclusion the hazardousness of wastes from the extractive industries should be classified in line with the criteria of the List of Wastes (Commission Decision 2014/955/EU).

The decision as to whether a substance or object can be considered 'waste' within the meaning of the Waste Framework Directive is an important decision, and equally important is the decision as to whether it should be classified as 'non-hazardous waste' or 'hazardous waste'. Classifying waste as hazardous is a key decision throughout the waste management chain. There are **strict requirements for the handling of hazardous waste**, particularly regarding the traceability, labelling and packaging of waste, as well as a **ban on mixing**. Hazardous waste may only be treated in treatment facilities that have received a special permit to do so.

In waste policy and waste management, the following order of priority according to the **waste hierarchy** should be applied:

1. prevention,
2. preparing for re-use,
3. recycling,

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4. other recovery, e.g. energy recovery, and
5. disposal.

The priority order of the waste hierarchy should also be followed in managing the risks and cleaning up of contaminated land. The treatment of waste should follow the requirements set in the Best available techniques (BAT) reference document for waste treatment, that is binding per the Commission Decision ((EU) 2018/1147).

The classification of waste as hazardous or non-hazardous waste is largely based on the classification of substances as hazardous under EU chemicals legislation. The criteria for the classification of waste are set out in Annex III to the Waste Directive (Commission Regulation (EU) No 1357/2014 and Council Regulation (EU) 2017/997). The regulations **list the properties that make the waste hazardous, as well as the criteria and concentration limits used to assess this**. Regulations as such are valid legislation in all EU Member States. The definition of hazardous waste has been supplemented by the **EU Waste List** (Commission Decision 2014/955/EU). This List specifies which wastes in the Community are considered hazardous waste. Under the Waste Directive
As an EU Decision, the LoW is binding in its entirety and addressed to the Member States and does not require transposition. It recognises three types of entries:

- 'Absolute hazardous entries': Wastes which are assigned to absolute hazardous entries cannot be allocated to non-hazardous entries and are hazardous without any further assessment,
- 'Absolute non-hazardous entries': Wastes which are assigned to absolute non-hazardous entries cannot be allocated to hazardous entries and are non-hazardous without any further assessment,
- 'Mirror entries', where waste from the same source might under the LoW be allocated to a hazardous entry or to a non-hazardous entry depending on the specific case and on the composition of the waste.

If the waste belongs to a waste entry that has always been classified as hazardous waste or always as non-hazardous waste, there is no need to make a separate assessment of the classification of the waste. If, on the other hand, the waste is classified under a so-called mirror entry, i.e., the same waste can be identified as both non-hazardous waste and hazardous waste, the waste must be classified on a case-by-case basis in accordance with the criteria set out in Annex III to the Waste Directive (such as concentration limits for hazardous substances). Whether or not substances identified as constituents of the waste are considered hazardous must be assessed on the basis of classification, labelling and packaging (CLP) criteria. A hazardous waste entry referring to hazardous substances in waste is used if the waste contains substances classified as hazardous under the chemicals' legislation in concentrations such that the waste has one or more of the hazardous properties HP 1 to HP 8 or HP 10 to HP 15 (Table 2).

Annex III to the Waste Directive specifies the concentration limits for substances posing a health and environmental hazard and the formulae for assessing their interactions.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Table 2. Properties of waste which render it hazardous (Waste Framework Directive Annex III).

Hazardous properties	
HP1	Explosive
HP2	Oxidising
HP3	Flammable
HP4	Irritant — skin irritation and eye damage
HP5	Specific Target Organ Toxicity (STOT)/Aspiration Toxicity
HP6	Acute Toxicity
HP7	Carcinogenic
HP8	Corrosive
HP9	Infectious
HP10	Toxic for reproduction
HP11	Mutagenic
HP12	Release of an acute toxic gas
HP13	Sensitising
HP14	Ecotoxic
HP15	Waste capable of exhibiting a hazardous property listed above not directly displayed by the original waste

By way of derogation from Annex III to the Waste Directive, the concentration limit (the so-called lower POP limit) of Annex IV to the EU POPs Regulation (see Appendix 3) is applied as the concentration limit for hazardous waste (Commission decision on waste list (2014/955/EU)) for the following substances:

- aldrine,
- chlordane,
- chlordecone,
- DDT (1,1,1-trichloro-2,2-bis (4-chlorophenyl)ethane),
- dieldrin,
- endrin,
- heptachlor,
- hexabromobiphenyl (HBB) and/or
- hexachlorocyclohexanes (HCH) (including lindane),
- hexaclorobenzene (HCB),
- mirex,
- PCB.
- pentachlorobenzene (PeCB),
- polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF),
- toxaphene.

For the classification of other POPs as hazardous waste, general waste classification concentration limits apply.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

The following steps can be distinguished in the waste hazard assessment based on the composition of the waste and the concentrations of hazardous substances[62]:

1. Determine the chemical composition of the waste as accurately as possible.
2. Determine whether the substances or compounds in the waste are classified as hazardous in the harmonised list of substances in Annex VI to the EU CLP Regulation (1272/2008) on classification of chemicals.
3. In the harmonised list of substances, the dangerousness of unclassified substances and compounds is investigated with the help of other sources of information.

Computational assessment of waste health and environmental hazard characteristics:

4. Determine whether the concentration of a single hazardous substance or compound in the waste is such that it must be taken into account in the calculation of the hazardous properties of the waste.
5. Determine whether the concentrations of hazardous substances in the waste exceed the concentration limits for hazardous waste.
6. Find out if the lower concentration limits of Annex IV to the EU POPs Regulation are exceeded for the POPs listed in Annex 4 to the Waste Regulation.

The Commission notice on technical guidance on the classification of waste (2018/C 124/01) provides clarifications and guidance on the correct interpretation and application of the relevant EU legislation regarding the classification of waste, namely identification of hazardous properties, assessing if the waste has a hazardous property and, ultimately, classifying the waste as hazardous or non-hazardous.

Companies are required to notify ECHA if the articles they produce contain substances of very high concern (see 4.3.3) in a concentration above 0.1 % (weight by weight). This notification is published in ECHA's database of substances of concern in products (SCIP). The SCIP database ensures that information on substances in the Candidate List in articles is available throughout the life cycle of products and materials, including the waste phase. The information in the database is made available to waste management operators and consumers.

The Waste Directive obliges the Member States to lay down "End of waste" (EoW)-criteria for certain waste which has undergone a recycling or other recovery operation. When these criteria are met, waste ceases to be waste. These can be issued not only at the national level, but also at the EU level, or a Member State can make a case-by-case decision. However, due their heterogeneity, it is highly improbable that any EoW criteria could be established and excavated soils exempted from waste status based on EoW mechanism.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

62 Häkkinen, E. (2019). Classification of waste as hazardous waste – updated guide. Publications of the Ministry of the Environment 2019:2. Ministry of the Environment. Helsinki. (in Finnish)

4.6.2. Directive on landfill of waste

The Landfill Directive (1999/31/EC) supports European Union's transition to circular economy and aims of the Waste Directive, such as the waste hierarchy's order of priority and reducing landfilling, particularly of waste suitable for recycling or other recovery. It sets stringent operational and technical requirements on landfilling to prevent or reduce, as far as possible, negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health.
From the scope of this Directive the following are excluded, among other things:

- the spreading of sludges on the soil for the purposes of fertilisation or improvement,
- the use of inert waste which is suitable, in redevelopment/restoration and filling-in work, or for construction purposes, in landfills and
- the management of waste from land-based extractive industries.

According to the Directive, 'landfill' means a waste disposal site for the deposit of the waste onto or into land (i.e. underground), including:

- internal waste disposal sites (i.e. landfill where a producer of waste is carrying out its own waste disposal at the place of production), and
- a permanent site (i.e. more than one year) which is used for temporary storage of waste.

Landfills are further divided into 3 categories:

- landfills for hazardous waste,
- landfills for non-hazardous waste, and
- landfills for inert waste.

Operating landfills must have a permit, and they can only accept the waste mentioned in the permit decision.

In the Landfill Directive, the definitions of hazardous waste and non-hazardous waste are the same as in the Waste Directive. Inert waste means waste that does not undergo any significant physical, chemical, or biological transformations. It will not dissolve, burn, or otherwise physically or chemically react, biodegrade, or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or to harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and not endanger the quality of surface water and/or groundwater.

Only pre-treated waste can be landfilled, excluding inert waste. The **landfilling of waste should be in line with the waste hierarchy and should not prevent increasing preparing for reuse and recycling**. The Council of the European union has in its decision 2003/33/EC established the criteria and procedures for the acceptance of waste at landfills in accordance with the principles set out in the Waste Directive and its Annex II. Section 2 of this Annex lays down the acceptance criteria for each landfill class, i.e., list of wastes

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

acceptable at landfills without testing, leaching limit values and other criteria depending on the landfill class. Waste may be accepted at a landfill only if it fulfils the acceptance criteria of the relevant landfill class. Section 3 of the Annex lists the methods to be used for the sampling and testing of waste.

The criteria for inert waste have had important implications for the management, and especially reuse, of excavated soils since the Waste Framework Directive specifies (Article 2) that only excavated soil that is reused on the site of excavation is excluded from its scope (see 4.6.1). Hence, some Member States have used the criteria for 'inert waste' (Landfill Directive, Annex II) when qualifying excavated soils for e outside the site of excavation. The problem is that these criteria were defined for waste[63], not for soils. Some of the inorganic substance leaching limit values for 'inert waste' imposed in the Council Decision 2003/33/EC are very low and may even lie below natural pedogeochemical backgrounds (e.g., for sulphate, selenium [64]). This has led to difficulties for the reuse of excavated soils and even to natural soils being disposed of in non-hazardous waste landfills, which is costly and inappropriate. Guidance documents aimed at the reuse of excavated soils have been drafted in specific Member States, but the "inert waste" criteria still remain an important reference in Europe for the reuse of excavated soils.

Landfill for non-hazardous waste may be used for:

- municipal waste,
- non-hazardous waste of any other origin, which meets the acceptance criteria,
- stable, non-reactive hazardous wastes, the leaching behaviour of the waste will not change adversely in the long-term and leaching limit values are not exceeded.

Landfill facilities may not accept any type of waste which does not fulfil the acceptance criteria.

4.6.3. Directive on the incineration of waste

The Directive on the incineration of waste (2000/76/EC) covers incineration and co-incineration plants excluding plants treating only certain types of waste like vegetable waste, untreated wood waste, cork waste, animal carcasses and radioactive waste. Incineration plant is "any stationary or mobile technical unit and equipment dedicated to the thermal treatment of wastes with or without recovery of the combustion heat generated". This includes the incineration by oxidation of waste as well as other thermal treatment processes such as pyrolysis, gasification or plasma processes in so far as the substances resulting from the treatment are subsequently incinerated. Co-incineration plant means any stationary or mobile plant whose main purpose is the generation of

63 Hjelmar, O., Van der Sloot, H., Guyonnet, D., et al. (2001) – Development of acceptance criteria for landfilling of waste : an approach based on impact modelling and scenario calculations. In: Christensen, T.R. Cossu, R. and Stegmann, R. (Eds). Proceedings SARDINIA-2001, Eighth International Waste Management and Landfill Symposium (Th.). S. Margherita di Pula, Cagliari (Italy). Vol. 3, pp. 711-721.

64 Coussy, S., Boissard, G., Belbeze, S., et al. (2019). French feedback on the use of inert waste landfill criteria for managing excavated soils. 17th international waste management and landfill symposium Sardinia 30 Sept.- 4 Oct. 2019. Ref. in Guyonnet, D. E-mail information 25 Feb. 2025.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

energy or production of material products. It uses wastes as a regular or additional fuel, or it thermally treats wastes for purpose of disposal.

In addition to the requirements of the Directive, the operation of the combustion plant must meet the requirements of the directives on industrial emissions, urban wastewater treatment, air quality and landfills, as well as the Water Framework Directive.

The permit decision issued by the competent authority lists the waste categories that can be treated in the plant, indicates the total capacity of the plant and defines the obligations for monitoring air and water emissions. When the facility handles hazardous waste, the amount of different hazardous waste that can be handled at the facility is stated in the permit decision. In addition, minimum and maximum mass flows for hazardous waste, their lowest and maximum calorific values and their maximum contents of pollutants, e.g., PCB, PCP, chlorine, fluorine, sulphur, heavy metals are specified in its permit decision.

The Directive requires that in the combustion process, the gas temperature should, even under the most adverse conditions, reach 850 degrees for two seconds in the combustion chamber. **If hazardous waste contains more than 1% of halogenated organic compounds, expressed as chlorine, temperature should rise to 1100 degrees for two seconds**. If waste is generated during soil remediation that must be disposed of by incineration, **the holder of waste must ensure that the facility is authorised to receive that waste, and that the incineration process meets the requirements for the treatment of that waste**.

The incineration facilities also need to comply with the Best available techniques (BAT) reference document for waste incineration and Commission implementing decision (EU) 2019/2010 establishing the best available techniques (BAT) conclusions for waste incineration.

4.7. Financing and liability

4.7.1. Taxonomy regulations

EU Taxonomy is part of the European Commission's action plan to finance sustainable growth, and it aims to direct private money towards more sustainable destinations. That way it contributes to the achievement of the EU's environmental goals and the green transition. The aim is to enhance the financing of the transition to a more sustainable economy by showing which companies' activities contribute to environmental objectives and what should be considered in terms of sustainable investments. The regulation increases the transparency of business operations for investors and clarifies which of the operator's functions create a more sustainable future.

The Taxonomy applies extensively to operators who want to utilise green funding in the development of their operations. Taxonomy reporting applies especially to companies

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

operating in the financial markets, such as banks, insurance companies and investors, as well as to all listed companies employing more than 500 people.

The Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment (Taxonomy regulation) establishes the basis for the EU taxonomy by setting out the four overarching conditions (Article 3) that an economic activity must meet in order to qualify as environmentally sustainable. Hence, **the economic activities must contribute significantly to one or more of the following environmental objectives** in accordance with Articles 10 to 16:

- climate change mitigation,
- adaptation to climate change,
- sustainable use and protection of water resources and marine resources,
- transition to a circular economy,
- prevention and reduction of environmental pollution and
- conservation and restoration of biodiversity and ecosystems.

In addition, the **activity must not cause significant harm to the other environmental objectives**. Environmentally sustainable projects should also respect human rights and workers' rights. In addition, the activities must meet the technical screening criteria set out in the Commission delegated act (2023/2486).

An **economic activity is considered to contribute significantly to the prevention and reduction of pollution if that activity contributes significantly to** any of the following activities:

- prevention or, if not practicable, reduction of emissions to air, water or soil other than greenhouse gas emissions,
- improving the quality of air, water or soil in areas where economic activity takes place, while minimising any adverse effects on or risks to human health and the environment,
- prevention or minimisation of adverse effects on human health and the environment resulting from the production, use or disposal of chemicals,
- cleaning up litter and other pollution, or
- enabling any of the activities listed in points (a) to (d) of this paragraph in accordance with Article 16.

According to Article 16, an economic activity is deemed to contribute substantially to one or more of the environmental objectives by directly enabling other activities to make a substantial contribution to one or more of those objectives, provided that such economic activity:

- (a) does not lead to a lock-in of assets that undermine long-term environmental goals, considering the economic lifetime of those assets; and
- (b) **has a substantial positive environmental impact, on the basis of life-cycle considerations**.

In the Commission delegated regulation (EU) 2023/2486, the Commission set technical screening criteria to determine the conditions under which a given economic activity is qualified as contributing substantially to pollution prevention and control, and technical

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

screening criteria to determine when an economic activity is causing significant harm to one or more of those environmental objectives. With regard to pollution prevention and control, the Regulation examines the following activities, among others:

- **Collection and transport of hazardous waste**
- **Treatment of hazardous waste**
- **Remediation of legally non-conforming landfills and abandoned or illegal waste dumps**
- **Remediation of contaminated sites and areas**.

4.7.2. Environmental Liability Directive

The Environmental Liability Directive (ELD), i.e., Directive 2004/35/CE on environmental liability regarding the prevention and remedying of environmental damage, is a general, cross-cutting environmental instrument, applying to several environmental subject-areas. As such, it complements other Union instruments that aim to protect the environment. The Directive establishes an EU-wide liability regime to prevent and remedy environmental damage to natural resources and their services based on the 'polluter-pays' principle. It is also the first specific polluter pays law enacted by the European Union. Other relevant principles to its interpretation are precautionary principle and principles that preventive action should be taken, and that environmental damage should primarily be rectified at source. The Directive is not a previous civil law regulation on damages, but a regulation aimed at preventing and repairing damage to biodiversity, water and soil. Its primary objective is to restore the environment or nature damaged in an incident to its pre-damage state.

The Directive defines damage as a measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly while environmental damage is:

- damage to protected species and natural habitats which endangers reaching or maintaining their favourable conservation status,
- water damages that significantly adversely affects the ecological, chemical and/or quantitative status and/or ecological potential of all waters covered by Water Framework Directive (2000/60/EC),
- land damage, which is any land contamination that creates a significant risk of human health being adversely affected as a result of the direct or indirect introduction, in, on or under land, of substances, preparations, organisms or micro-organisms. Significant risks for the environment are not covered by the ELD.

Environmental damage also includes damage caused by airborne elements to water, land or protected species or natural habitats. se change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly.
The criteria for the significance of any damage are presented in Annex I to the Directive.

The Directive lists **specific activities (Annex III) that pose a potential or actual risk to human health or the environment**. Annex III refers to several other directives

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

concerning industrial activities, waste management, water protection, chemicals, transport of dangerous goods or polluting goods, genetically modified organisms and transboundary shipment of wastes. **Operators carrying out these activities fall under strict liability**, and it is sufficient that a causal link is established between the environmental damage and the occupational activity. In case of damage to or imminent threat to protected species and natural habitats caused by any activities other than those listed in Annex III, operators are liable for fault-based damage. **Operators responsible for the damage (or immediate threat thereof) must prevent and limit the damage and remediate damaged site and bear the costs for preventive and remedial actions**.

When remedial measures are needed the operator shall identify them in accordance with Annex II and submit them to the competent authority for its approval, unless the competent authority itself has taken action. Remedying of environmental damage, in relation to water or protected species or natural habitats, is achieved through the **restoration of the environment to its baseline condition** by way of primary, complementary and compensatory remediation. Restoration of the environment should take place in an effective manner ensuring that the relevant restoration objectives are achieved. The baseline condition means the condition of the natural resources and services at the time of the damage, if that environmental damage would have not occurred, estimated based on the best information available. When **land damage** has occurred the Directive, requires necessary measures are taken taking account of its current use or approved future use at the time of the damage, to **remove any significant risk to human health rather than restore the land to the condition it was in before contamination**. If the land use is changed, all necessary measures shall be taken to prevent any future adverse effects on human health. A natural recovery option, an option in which no direct human intervention in the recovery process would be taken, shall be considered. There are certain situations in which the operator cannot be required to bear the costs of preventive or remedial measures, or the Member States may allow the operator not to bear the costs (Article 8(3) & (4)).

The Member States are obligated to promote financial security instruments and markets, including financial mechanisms in case of insolvency.

The liability is not retroactive. Hence, it concerns only damages emerged after its implementation on 30 April 2007 or damages caused by an emission, event or incident which took place after ELD implementation, when it derives from a specific activity that took place and finished before the said date. Directive shall not apply to damage, if the emissions, event or incident, that caused it, happened more than 30 years ago.

The concept of 'environmental damage' is further explained in the commissions notice (2021) with guidelines providing a common understanding of the term 'environmental damage'.[65] Also the European Union Network for the Implementation and Enforcement

65 European Commission (2021). Commission notice - Guidelines providing a common understanding of the term 'environmental damage' as defined in Article 2 of Directive 2004/35/EC of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage (2021/C 118/01). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0407(01)

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

of Environmental Law (IMPEL) has presented criteria for the assessment of environmental damage.[66]

4.8. Legislation on public participation and availability of information

The "Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC implements the obligations arising under the Aarhus Convention by providing for public participation in respect of the drawing up of certain plans and programmes related to the environment. It also improves citizen participation and access to justice in the directives already repealed (directives 85/337/EEC and 96/61/EC).

The Directive requires that the **Member States ensure that the public has an early and effective opportunity to participate in the preparation, modification or revision of plans or programmes**. The MSs **must define who has the right to participate** and the right must also include the relevant non-governmental organisations that meet the requirements of national legislation, such as organisations promoting environmental protection.

After the entry into force of the Directive public participation requirements in line with the Aarhus Convention have been included into the relevant legislation from the outset.

The objectives of the Directive on public access to environmental information (2003/4/EC) are to guarantee for any natural and legal person a right of access to environmental information held by or for public authorities, to determine the conditions and practical arrangements for the exercise of this right and to **ensure that public authorities make environmental information widely available to the public**.

Environmental information means any information in written, visual, aural, electronic or any other material form on:

- the state of the elements of the environment and the interaction among these elements,
- factors affecting or likely to affect the elements of the environment like emissions or discharges,
- measures (including administrative measures) affecting or likely to affect the elements and factors mentioned above and also measures or activities designed to protect those elements,
- the implementation of environmental legislation,
- cost-benefit and other economic analyses and assumptions used within the framework of the measures and activities, and

66 IMPEL (2021). Criteria for the assessment of the Environmental Damage (CAED). Practical guide. Report number: 2020/24. Available at: https://www.impel.eu/contents/libraryfile/caed-practical-guide-and-practical-tables-2021.zip

- the state of human health and safety, conditions of human life, cultural sites and built structures in as much as they are or may be affected by the state of the elements of the environment or through those elements, by any of the factors or measures mentioned above.

Public authority is defined as government or other public administration at national, regional or local level, any natural or legal person performing public administrative functions under national law, including specific duties, activities or services in relation to the environment and any natural or legal person having public responsibilities or functions, or providing public services, relating to the environment under the control of a body or person in public administration.

The Member States are required to ensure that public authorities make available environmental information held by or for them to any applicant at his request within the deadlines set by the Directive, if possible. Information should be provided in the requested form unless it is already publicly available in another form or format, or it is reasonable for the public authority to make it available in another form or format. The MSs shall ensure that public authorities inform the public adequately of their rights and to an appropriate extent provide information, guidance and advice to this end.

As a general rule, **the authority should provide the requested information**, but certain grounds for refusal have been identified in the Directive. Grounds for refusal should be interpreted in a restrictive way, whereby the public interest served by disclosure should be weighed against the interest served by the refusal. The reasons for a refusal should be provided to the applicant in writing or electronically, if the request was in writing or if the applicant so requests within the time limits laid down in this Directive. Requests for information on environmental emissions cannot be denied.

Access to any public registers or lists established and maintained and examination of the requested information *in situ* shall be free of charge. Public authorities may charge for supplying any environmental information, but such charge shall not exceed a reasonable amount.

If the applicant for information is dissatisfied with the response he has received or with the processing of the request for information, he or she has the opportunity to appeal or to have the matter re-examined by a court or other independent and impartial body established by law, in which the actions or omissions of that authority may be re-examined and whose decisions may become final.

The Member States should ensure that public authorities organise the environmental information with a view to its active and systematic dissemination to the public, in particular by means of computer telecommunication and/or electronic technology, where available. The information to be made available and disseminated must be updated as appropriate and shall include at least:

- texts of international treaties, conventions or agreements, and of Community, national, regional or local legislation, on the environment or relating to it,

- policies, plans and programmes relating to the environment,
- progress reports on the implementation of the items referred to in the preceding paragraphs when prepared or held in electronic form by public authorities,
- the reports on the state of the environment,
- data or summaries of data derived from the monitoring of activities affecting, or likely to affect, the environment,
- authorisations with a significant impact on the environment and environmental agreements or a reference to the place where such information can be requested or found in,
- environmental impact studies and risk assessments concerning the environmental elements or a reference to the place where the information can be requested or found.

The MSs must ensure that national, and, where appropriate, regional or local reports on the state of the environment are published at regular intervals not exceeding four years. Such reports shall include information on the quality of, and pressures on, the environment. The MSs shall also, as far as it is within their power, ensure that any information that is compiled by them or on their behalf is up to date, accurate and comparable.

If there is an immediate threat to human health or the environment, the authorities shall immediately disseminate any available information that the public needs to prevent or mitigate the harm caused by the threat.

4.9. Other potentially relevant regulations

4.9.1. Directive on ambient air quality

The revised Ambient Air Quality Directive (EU) 2024/2881 entered into force on 10 December 2024. This Directive sets out air quality provisions with the aim of achieving improved air quality within the Union that is no longer considered harmful to human health, natural ecosystems and biodiversity at the latest by 2050. Furthermore, it contributes to achieving the Union's pollution-reduction, biodiversity and ecosystem objectives in accordance with the 8th Environment Action Programme, as well as enhanced synergies between the Union's air quality policy and other relevant Union policies.

According to the Directive 'ambient air' means outdoor air in the troposphere, excluding workplaces as defined in Article 2 of the Council Directive 89/654/EEC where provisions concerning health and safety at work apply and to which members of the public do not have regular access. The Directive defines and establishes objectives for ambient air quality, sets common methods and criteria to assess it and obliges the Member States to monitor air quality, long-term trends and the impacts of measures taken on ambient air quality. It also ensures comparable and publicly available information on air quality across the Union. The MSs are obliged to maintain good air quality and improve it when targets are not met. If the EU air quality standards are exceeded, the MS must prepare air quality

AWAITING FINAL APPROVAL BY THE EUROPEAN COMMISSION

plans to keep exceedance periods as short as possible. Air quality roadmaps must be adopted ahead of the attainment deadline of limit values and target values, and they set out policies and measures in order to comply with those limit values and target values within the attainment deadline. The plans must include an estimate of the polluted area (in km^2) and of the population exposed to the pollution.

The revised Directive sets new air quality standards: limit values, target values, average exposure reduction obligations, average exposure concentration objectives, critical levels, alert thresholds, information thresholds and long-term objectives. Here,
'limit value' means a level which is fixed on the basis of scientific knowledge, and which is to be attained within a given period and not to be exceeded once attained. Such values exist for several pollutants in air. Of these the **limit values for particulate matter, i.e., the daily average and annual mean of PM_{10} and $PM_{2,5}$, are relevant in the case of land remediation. These values can be used as indicative to reduced air quality and consequent risks to human health.** The Directive also presents alert thresholds and information thresholds for particulate matter (PM_{10} and $PM_{2,5}$) beyond which a brief exposure can be a health risk for sensitive population or the population as a whole and at which the Member States must take immediate actions.

4.9.2. Renewable Energy Directive

The Directive on the promotion of the use of energy from renewable sources (2018/2001) (RED II) aims to support the EU's climate neutrality and greenhouse gas reduction targets. Here, "renewable energy" means energy that is produced from renewable non-fossil sources, such as wind, solar (solar thermal and solar photovoltaic) and geothermal energy, biomass, landfill gas, roundwood, and biogas, among others. The Directive sets a binding target that by 2030 the share of energy from renewable sources must be at least 32 % in the EU's gross energy consumption. All Member States should ensure the attainment of this target. In addition, the MSs should endeavour to collectively achieve a higher EU target of 45 % by 2030 as per the REPowerEU Plan (COM/2022/230 final). An amending Directive (2023/2413, RED III) was issued in 2023. According to this Directive, in the production of energy from biomass, the MSs should ensure that it does not cause significant, adverse impact on biodiversity, the environment and the climate. Hence, the RED III tightens the sustainability criteria for forest biomass to be better in line with the EU's Biodiversity Strategy. The use of biomass should also follow the principle of cascading use and waste hierarchy (set in Directive 2008/98/EC).

The RED III also requires the MSs to identify their potential of renewable energy and available land surface, sub-surface, sea or inland water areas needed for the installation of renewable energy plants and their related infrastructure by 21 May 2025, in order to meet at least their national contributions to support the above-mentioned EU level renewable energy target for 2030. Moreover, by 21 February 2026, the MSs shall ensure that competent authorities adopt plans for designating renewables acceleration areas at least for one type of renewable energy sources. In those plans, competent authorities should prioritize artificial and built surfaces, transport infrastructure and their direct

AWAITING E'ROPEAN COMMISSION

surroundings, parking areas, farms, waste sites, industrial sites, mines, and degraded land not usable for agriculture while excluding areas designated for nature and biodiversity conservation, major bird migratory routes as well as other areas identified on the basis of sensitivity maps to eliminate any significant adverse environmental impact. The MSs also need to ensure public participation when drafting their plans.

It seems that particularly the amending Directive RED III of the original Directive on renewable energy sources (RED II) **enables MSs to identify and assign some contaminated sites as renewables acceleration areas to avoid reclaiming natural areas or arable land. This could act as a driver to remediation and redevelopment of contaminated land.**

4.9.3. Directive on public procurement

At the EU level, public procurement (PP) of products or services is regulated by a specific directive (2014/24/EU). This Directive includes rules regarding purchases by public parties and sets also monetary thresholds when a tendering procedure needs to be followed. The activities covered by the Directive are listed in its Annex II. In this Annex, **land and site reclamation, soil decontamination, reclamation of waste land and land rehabilitation** belong to the CPV[67] class 45.11. A contract dealing with soil remediation is a public works contract only if its subject-matter specifically covers the execution of these activities, even if the contract covers the provision of other services necessary for the execution of such activities.

As per the Directive, the awards of public contracts by or on behalf of authorities have to comply with some generic principles such as, the free movement of goods, freedom to provide services, equal treatment, and transparency, among others. The Union rules on public procurement are intended to cover only the disbursement of public funds aimed at the acquisition of works, supplies or services for consideration by means of a public contract, whether such acquisitions are implemented through purchase, leasing or other contractual forms. Economic operator, i.e. the party which offers to execute the activities or supply the products or provide the services, is understood broadly and to cover any persons and/or entities irrespective of the legal form and thus include firms, branches, subsidiaries, partnerships, cooperative societies, limited companies, universities, public or private, and other forms of entities than natural persons.

The Directive notes that the public authorities should make the best strategic use of public procurement to spur innovation. Buying innovative products, works and services plays a key role in improving the efficiency and quality of public services while addressing major societal challenges. It contributes to achieving best value for public money as well as wider economic, environmental and societal benefits. The Directive also stresses traceability and transparency of decision-making in procurement procedures for ensuring sound procedures, including efficiently fighting corruption and fraud.

67 CPV = Common Procurement Vocabulary

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

The thresholds for purchases laid down in the Directive[68] can be adjusted periodically to reflect the possible variations in the value of the euro. In addition to these, each Member State as well as different public organizations in MSs, can have their own thresholds, which need to be followed.

While the Directive on public procurement does not include any binding rules for considering sustainability aspects, some voluntary green public procurement criteria (GPP) have been issued, but not for any environmental activities, such as remediation/restoration. The Commission has, however, provided some guidelines and other supporting material for enhancing innovation procurement[69] as well as socially responsible PP[70].

4.9.4. Critical Raw Materials Act

In 2024, EU imposed a regulation (2024/1252) concerning critical raw materials (CRM), i.e., Critical Raw Materials Act. This Act aims to improve the functioning of the internal market in EU, which means ensuring the access to a secure, resilient and sustainable supply of important raw materials. The means to attain the objective include fostering their efficiency and circularity throughout the value chain.

The Act makes a difference between a strategic and a critical raw material. The prefix "strategic" refers to material's relevance for the green and digital transition and defence and aerospace applications. Supply and demand and predicted changes in these are the determining factors of strategic raw materials. While the identification of CRMs considers the economic importance and security of supply as key determinants. The Act includes separate lists of strategic raw materials and CRMs, these lists are updated every few years.

The Act lists several benchmarks to be attained to reach its generic objective. For example, regarding consumption, at least 25 % of the Union's annual consumption of strategic raw materials should be covered by recycling and significantly higher amounts should be recovered from waste. By 24 May 2025, the Commission shall impose acts to specify a list of waste streams that shall at least be considered as having a relevant recovery potential. The MSs should then within two years from the date of entry into force, increase the collection, sorting and processing of these wastes. Moreover, by the beginning of 2027, the Commission shall adopt regulation to supplement the Act with regulation which will provide recycling capacity benchmarks expressed as a share of the strategic raw materials available in relevant waste streams. The Commission will also recognize Strategic Projects

68(a) EUR 5 186 000 for public works contracts,

(b) EUR 134 000 for public supply and service contracts awarded by central government authorities and design contests organised by such authorities,

(c) EUR 207 000 for public supply and service contracts awarded by sub-central contracting authorities and design contests organised by such authorities

69 https://ec.europa.eu/docsroom/documents/45975/attachments/1/translations/en/renditions/native

70 https://ec.europa.eu/docsroom/documents/45767/attachments/1/translations/en/renditions/native https://op.europa.eu/publication-detail/-/publication/69fc6007-a970-11ea-bb7a-01aa75ed71a1

AWAITING EU COMMISSION

that support the objectives of the Act based on set criteria and will carry out activities to accelerate and attract private investments to these projects. Such activities may include, e.g., coordination of support to Strategic Projects that face financing difficulties.

It remains to be seen whether the amending acts of the "CRM act" will include waste from contaminated sites, e.g., former mining areas. The inclusion **could perhaps provide an economic incentive for remediation or solution to the potential financial barriers to remediation through the Strategic Project mechanism**. The Act already requires that the operators of extractive industry provide a preliminary estimate of the costs and economic benefits regarding the recovery or CRMs in their waste management plans (per Directive 2006/21/EC). It is clear that the market situation, i.e., the balance between supply and demand, as well as technological development, among others, can cause deviations from the estimates at the time when the recovery becomes topical.

4.9.5. Directive on genetically modified organisms

In the EU legislation, genetically modified/engineered organisms (GMO/GME) are defined as "organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination". The use of genetic modification has traditionally focused on the production of food and feed and hence, on the modification of different crop plant species, such as maize and soybean, among others. Later on, since 1990s', the use of GMOs to enhance bioremediation of contaminated soil has aroused increasingly more interest, leading to several studies on their use in CLM.[71] In CLM, GMOs have emerged as a means to attain higher bioremediation efficiency and environmental sustainability.[72] At the same time, GMOs pose a significant risk to human health and the environment since their release can result in the generation of antibiotic resistance, among others. Some sector-specific statutes acknowledge these risks (see 4.2.1, 4.7.2) besides the specific GMO legislation , whose aim is to both protect human health and the environment and to ensure the free movement of safe and healthy genetically modified products in EU.

The European GMO legislation mainly focuses on food and feed and there are specific statutes regarding the use, labelling, transboundary movement and controlling the compliance with the legislation. From the viewpoint of soil remediation, the Directive on the **deliberate release of GMOs into the environment** (2001/18/EC) is the most relevant. This Directive defines, a deliberate release as "any intentional introduction into the environment of a GMO or a combination of GMOs for which no specific containment measures are used to **limit their contact with and to provide a high level of safety for the general population and the environmen**t". The Directive **applies to both a release from experimental activities, e.g., field tests**, and placing on the market, e.g., commercial cultivation, importation and transformation of GM seeds, but it excludes

71 Hussain, I., Aleti,G., Naidu, R., et al. (2018). Microbe and plant assisted-remediation of organic xenobiotics and its enhancement by genetically modified organisms and recombinant technology: A review. Sci. Tot. Environ. 628–629, 1582-1599. https://doi.org/10.1016/j.scitotenv.2018.02.037

72 Wu, C., Li, F., Yi, S., Ge, F. (2021). Genetically engineered microbial remediation of soils co-contaminated by heavy metals and polycyclic aromatic hydrocarbons: Advances and ecological risk assessment. J. Environ. Manage. 296, 113185. https://doi.org/10.1016/j.jenvman.2021.113185

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

organisms produced using techniques which have conventionally been used in several applications and have a long safety record. The Directive requires that before a deliberate release of GMOs, a notification must be submitted to the national competent authority. This notification must include results of a full environmental risk assessment and appropriate safety and emergency response, and in the case a GMO product, precise instructions and conditions for use, as well as proposed labelling and packaging. The European Food Safety Authority (EFSA) has provided guidelines for the risk assessment of GMOs.[73] Although meant to be used in the case of food or feed production, the guidelines are presumably useful also in the case of soil remediation context even though criticism has been presented towards their efficiency in supporting the GMO regulation.[74]

4.9.6. Directives on occupational health and safety

Research and remediation of contaminated land is associated with accident and health hazards. Risk management regarding occupational health and safety proceeds from the identification of hazard and load factors to the assessment of the magnitude and significance of risks and the means of risk management. Research and remediation activities involve not only biological, physical and chemical hazards, but also the risk of accidents. The mental and physical strain of the work should also be considered.
When researching and remediating contaminated land, it is important to carefully plan the occupational safety measures in advance and to be prepared for unexpected hazardous situations with appropriate precautions and personal protective equipment. The occupational safety and health authorities should be contacted already at the planning stage of the work.

The EU framework Directive on health and safety at work[75] is complemented by several individual directives[76] and guidelines[77] that focus on specific topics of safety and health at work, such as different industrial sectors, chemical agents and substances and physical hazards, among others. These directives include also **exposure limit values that are indicative values for the assessment of occupational risks and can be used for the planning of measures to limit the risks**. MSs are free to impose stricter rules.

4.9.7. Legislation ensuring food safety

The statutes concerning food safety may also emerge as relevant when managing contaminated land. If the risk management actions include fertilisation or land amendment, then the quality of the fertiliser needs to be considered. The Directive (EU)

73 EFSA (European Food Safety Authority). (2011). Guidance for risk assessment of food and feed from genetically modified plants. Panel on Genetically Modified Organisms (GMO). EFSA Journal 9(5), 2150. Available at: https://doi.org/10.2903/j.efsa.2011.2150

74 Hilbeck, A., Meyer, H., Wynne, B. et al. (2020). GMO regulations and their interpretation: how EFSA's guidance on risk assessments of GMOs is bound to fail. Environ Sci Eur 32, 54. Available at: https://doi.org/10.1186/s12302-020-00325-6

75 Council directive on the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC)

76 https://osha.europa.eu/en/safety-and-health-legislation/european-directives

77 https://osha.europa.eu/en/safety-and-health-legislation/european-guidelines

2019/1009 and its amending directives concern fertiliser products and imposes limit values for contaminants to comply with. While this regulation only applies to fertiliser products and sets obligations to manufacturers, authorised representatives, importers and distributers, its **limit values of contaminants could serve as indicators of risks** to the environment and human health in the case of other organic or inorganic materials that are used for the purpose of fertilising. Similarly, although the Sewage Sludge Directive (86/278/EEC) only applies to agricultural soil, its equivalent limit values that are meant to protect the soil, vegetation, animals and man, can be used for the same purpose when sewage sludge is used in remediation. These statutes are supported by directives that aim to ensure the safety of food for human consumption. The Commission Regulation (EU) 2023/915 includes **maximum levels for certain contaminants in food**, such as halogenated POPs, some metals and PAHs. Here, food "means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans" (Regulation (EC) No 178/2002). In addition, the complementing Regulation (EC) 396/2005 sets **maximum residue levels (MRL) for pesticides in food and feed.** This statute has been regularly amended by several separate Directives that address specific pesticides. The MRLs apply to both fresh products and products after processing. The exceeding of the above-mentioned maximum levels in edible plants and plants used as animal feed **can indicate high concentrations in soil** calling for remediation actions.

5. Legislation in the life cycle of contaminated land management

The management of contaminated land can be divided into several phases starting from the identification and extending to the maintenance phase for verifying the success of concrete management actions, e.g., remediation. ISLANDR project describes this management process as a roadmap and produces different tools, guidance and recommendation for the different work phases. Figure 4. describes how the different statutes studied are positioned in this roadmap.

The various activities of the ISLANDR project also aim to support the implementation of different policy instruments, i.e. international agreements and EU strategies and legislation that need to be considered in the management of contaminated land (Table 4).

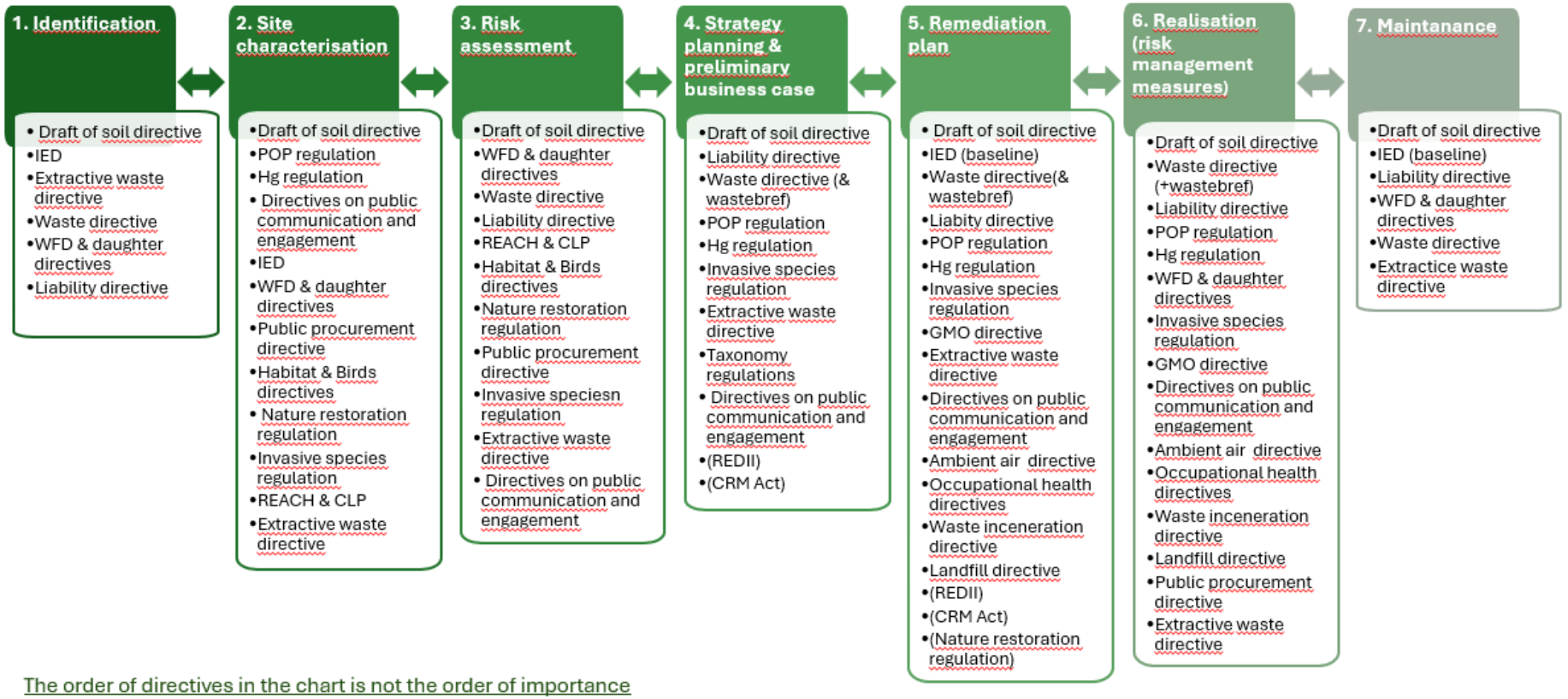
AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Table 3. Summary of the activities and outcomes of ISLANDR to enhance the adoption of the international conventions and EU strategies and legislation that are most relevant in the management of contaminated land and soil. SRBLM = Sustainable and Risk-Based Land Management, EUSO = European Soil Observatory, ITA = ISLANDR Test Area

Policy instrument	How ISLANDR contributes
Sustainable development goals	Develops a systematic and integrated sustainable and risk-based decision-making framework, considering both point source and diffuse contamination, integrates soil functionality as a receptor for SRBLM and provides a value-based approach for prioritising contaminated sites (WP3). Investigates local value perceptions of soil users and links this aspect to sustainability models and cost benefit assessment (WP4). Identifies solutions to overcome the barriers to SRBLM, e.g., reuse of land and soil (WP5), and needs of capacity building and prioritization of resources at different levels (WP6).
Soil strategy for 2030 & Roadmap to a resource efficient Europe (No net land take)	Provides a methodology for large scale risk assessment of contaminated soil (WP2) and integrated spatial planning models and strategies to plan and prioritize activities and promote the reuse of contaminated land (WP5).
Proposal for Soil Directive	Produces a methodology for identifying soil hotspots (point source, diffuse) and for collecting EUSO compatible data on soil pollution, compiles a Metadata catalogue of the European soil pollution data sources (WP1). Develops a risk-based soil health assessment (WP2). Provides recommendations on how to enhance the implementation of the Directive as a whole (WP6).
Circular Economy Action Plan and Waste Framework Directive	Provides guidance (WP6) and soil passporting template for excavated contaminated soils to enhance their recycling.
POP and mercury regulations	Provides examples of contaminated soil in ITAs.
REACH & CLP, emerging contaminants (CEC)	Provides a prioritization method for CECs in soil (WP2).
WFD, GWD	Presents a generic S-P-R framework for risk assessment (WP2).
Taxonomy regulations	Develops innovative financial models to support investment cases for decontamination and land re-use (WP4).
Aarhus Convention	Enhances practices of stakeholder involvement through implementation of various methods (e.g. Serious game) and concrete engagement in specific sites/regions around Europe (WP7, ITAs).

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Figure 4. Relevant directives and regulations in different phases of ISLANDR roadmap (IED = Industrial Emissions Directive, WFD = Water Framework Directive, REACH = Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals, CLP = Regulation on Classification, Labelling and Packaging of substances and mixtures, REDII= Directive on the promotion of the use of energy from renewable sources, CRM act = Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials, GMO directive = Directive on the deliberate release into the environment of genetically modified organisms)



The order of directives in the chart is not the order of importance

AWAIT

Funded by
the European Union

6.Summary and conclusions

6.1. Relevance of the statutes in contaminated land management

Even though currently no specific soil legislation exists in EU, soil contamination and its management has been addressed in several international agreements, EU strategies and legislation regarding protection of the environment or human health. Table 5 summarises the identified most relevant statutes that affect the management of contaminated land.

Table 4. Relevance of the studied legislation in the context of contaminated land management. The statutes are listed in a chronologically descending order.

Statute	Relevance
Proposal for Directive on soil monitoring and resilience 10910/24 + ADD 1 17.6.2024	Requires that Member States identify potentially contaminated sites, investigate them and asses their risks to human health and the environment, implement the necessary risk management measures, maintain register on soil contamination. MSs should also ensure that land take hierarchy principles are followed in land use.
Revised Industrial and Livestock Rearing Emissions Directive ((EU) 2024/1785)	Includes the requirement for determining the baseline for soil quality which is used as a benchmark to define the soil remediation need when the activity is ceased. The Directive lists the industries that it concerns.
Regulation (EU) 2024/2865 on classification, labelling and packaging of substances and mixtures	Requires chemicals to be classified on the basis of their hazardous properties. Hence, provides data for the identification of exposure routes and adverse impacts related to chemicals that need to be registered per REACH.
Regulation (EU) 2024/1991 on nature restoration and amending Regulation (EU) 2022/869	Sets request to Member States to restore degraded ecosystems so that they cover 20 % of land. In urban areas, the area of urban green space or the cover of urban tree canopy must not be reduced between 2024 – 2030.
Directive (EU) 2024/2881 on ambient air quality and cleaner air for Europe	Provides some guidelines for contaminants in air, the most relevant being the short-term quality limits for particulates. These can be used to assess the risks related to inhalation during remediation activities.
Regulation (EU) 2024/1252 establishing a framework for ensuring a secure and sustainable supply of critical raw materials	Might create an economic incentive for remediating contaminated soil if recovery of CRMs will be promoted in the future, i.e. remediation with recovery of CRMs (for example from closed mine sites) will be defined as Strategic Projects

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Funded by the European Union

Statute	Relevance
Proposal for amending WFD, GWD and EQSD (COM(2022) 540 final)	Provides a list of substances to be included in the list of priority substances and quality standards for these. The EQS can serve as an indication of potential impact on water quality, but they are not meant to be used as a threshold for launching remediation at a single contaminated site nor as remediation targets.
Directive on the quality of water intended for human consumption (EU) 2020/2184	Defines the criteria water quality criteria (Annex I, A-D) for the quality of water intended for human consumption to protect human health from adverse effects of contaminated water. and it includes, Member States can provide stricter criteria. Requires that the MSs also ensure that the supply, treatment and distribution of water intended for human consumption is subject to a risk-based approach that covers the whole supply chain including risk assessment and risk management of the catchment areas for abstraction points of water. Requires that Member States ensure that surface water or groundwater, or both, are monitored in the catchment areas for abstraction points, or in raw water, of relevant parameters, substances or pollutants. On the basis of risk assessment necessary risk management measures are taken.
Taxonomy Regulations ((EU) 2020/852 and (EU) 2023/2486)	Sets conditions that an economic activity must meet in order to qualify as environmentally sustainable and can receive green funding.
Regulation (EU) 2019/1021 on persistent organic pollutants	Sets concentration limit values for wastes and requirements for the waste management of persistent organic pollutants (POP). When POP concentration of waste is at or above low concentration limit the waste must be irreversibly disposed or converted to a form that does not have the properties of POPs.
Directive (EU) 2018 on the promotion of the use of energy from renewable sources	Becomes relevant if redevelopment of contaminated sites to renewable energy production sites will be nationally promoted, i.e. contaminated sites (or some of them) are defined as renewables acceleration areas (= incentive to remediate)
Regulation (EU) 2017/852 on mercury, and repealing Regulation (EC) No 1102/2008	Requires that Member States identify and assess sites contaminated by mercury or mercury compounds and carry out the necessary risk management activities.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Statute	Relevance
Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species	Requires that the possible occurrence of invasive alien species is taken into account and if detected, they should be eradicated.
Birds Directive (2009/147/EC)	Requires that habitat pollution or deterioration is prevented, and no disturbance is caused during the period of breeding and rearing of birds.
Directive on Environmental Quality Standards (2008/104/EY)	Includes EU-wide maximum allowable concentrations, i.e., environmental quality standards for 45 priority substances in surface water, sediment or aquatic biota. Watch list contains substances which may pose a significant risk to or via the aquatic environment at Union level. Note! The risk of groundwater contamination may also arise during remediation measures, e.g. use of sewage sludge as soil amendment (potential release of contaminants, including antibiotics that can cause the problem of antimicrobial resistance (AMR)).
Waste Framework Directive (2008/98/EC) List of waste (2014/955/EU) Commission regulation (EU) no 1357/2014 Council regulation (EU) 2017/997	Sets the priority order for waste management that should be followed (waste hierarchy). The list waste and complementing regulations provide criteria for classification of waste to non-hazardous and hazardous waste. The waste classification affects how waste can be treated. The Directive defines that unexcavated contaminated soil is not waste.
Floods Directive (2007/60/EC).	Requires that Member States identify areas at flood risk, draw up flood management plans and implement measures to reduce harmful consequences for human health and the environment. Floods, which can be increased due to climate change, can release and spread pollutants from contaminated land.
Extractive waste directive 2006/21/EC	Requires that Member States ensure that operator takes all measures necessary to prevent or reduce as far as possible any adverse effects on the environment and human health, including identification on major-accident hazards and necessary preventive measures. Puts the the operator responsible for the maintenance, monitoring, control and corrective measures in the after-closure phase for as long as may be required by the competent authority,

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Statute	Relevance
Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	Provides the list of chemicals of potential concern and hence. serves as a means for risk identification at contaminated sites.
Groundwater Directive (2006/118/EC)	Sets a deterioration ban to all groundwater areas that are bodies of water and criteria for quantitative and chemical status of groundwater. Criteria for assessing chemical status include groundwater quality standadrs and threshold values established by Member States for pollutants
Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage	Sets the principles for determining who is liable for managing contaminated land.
Directive 2003/35/EC providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC	Demands that public has an early and effective opportunity to participate in the preparation, modification or revision of plans or programmes.
Directive 2003/4/EC on public access to environmental information	Requires that public authorities ensure that public has access to environmental information held by them or for them. Environmental information should be made easily available for public.
Directive 2001/18/EC on the deliberate release into the environment of genetically modified organisms (GMO)	Sets the principles of and requirements for accepted use of GMOs in remediation
Water Framework Directive (2000/60/EY)	Defines the overall objective of water protection: to achieve good ecological and chemical status for surface waters and good quantitative and chemical status for groundwater bodies status by 2027 at the latest. Provides a list of priority substances, pollution by these in surface waters should be reduced and discharges, emissions and losses of priority hazardous substances must be stopped or phased out.
Directive on the incineration of waste (2000/76/EC)	Requires the waste holder to ensure that the incineration plant is authorised to receive the type of waste delivered to the plant and that the incineration process meets the requirements for the treatment of that type of waste.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Statute	Relevance
Directive on landfill of waste 1999/31/EY and Council Decision 2003/33/EC	Define three categories of landfills based on the type of waste, including contaminated soil, they can receive (inert, hazardous, non-hazardous waste), .
Habitats Directive (92/43/EEC)	Sets a precondition for contaminated land management: pollutant migration or risk management measures should not adversely affect the status of protected areas or other valuable habitats or protected species.
The Directive (EU) 2019/1009 on fertiliser products, Sewage Sludge Directive (86/278/EEC)	Impose the limit values for fertilisers and sewage sludge: these serve as an indication of risks if these materials are used in remediation.
Regulation (EU) 2023/915, Regulation (EC) 396/2005	Impose the maximum levels of contaminants in food and maximum residue levels (MRL) in food and feed: the exceeding of these in plants can indicate soil contamination that calls for risk management actions.

The regulatory instruments can be complemented by non-binding recommendations or guidelines. These can be provided by both at the EU level or nationally.

6.2. Policy instruments and their role in sustainability endeavour

The policy instruments affecting the practices of managing contaminated land and soil are abundant. At the highest level are the different international treaties and agreements, while the lowest level includes different non-binding guidelines and recommendations. In between, there are EU-level statutes that serve as the means to enhance the attainment of the objectives set in the treaties and strategies. Although currently no separate, specific EU-level soil legislation exists, soil contamination is acknowledged in or it is linked to several statutes focusing on other environmental compartments, wastes, and specific chemicals, among others. Some of the statutes are very specific and emerge only in some cases, such as those regarding the release of genetically modified organisms and regulation of public procurement. Furthermore, a specific environmental issue can be tackled in several separate statutes. This abundancy of legislation forms a rather complex network that undoubtedly creates a challenge to the practitioners to steer through.

Sustainable development demonstrated by the 17 Sustainable Development Goals (UN, 2015)[78] is a global objective adopted by all UN Member States and also taken as a priority objective for EUs policies. However, so far, its operationalisation seems to be limited to the strategic level. Hence, concerning the management of land contamination,

78 https://sdgs.un.org/goals

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

sustainability is currently not addressed in the legislation. Neither would the coming new Soil Directive, i.e. "Directive on Soil monitoring and resilience", which is currently under trilogue negotiations (situation Feb 2025), take a stand on sustainability of contaminated land management. This would, however, highlight risk-based land management which is a crucial element of sustainable CLM. Reasons for excluding sustainability might include difficulties in defining concrete, generic, harmonised criteria for sustainability, the difficulty in transforming sustainability to practical targets or case-specificity of sustainable solutions and consequently, the need for providing flexibility to the Member States in its implementation.

While sustainability as a definite objective regarding risk management actions seems to be lacking from the studied regulatory instruments, the ISO standard 18504:2017 provides procedures on sustainable remediation. It presents a standard methodology and advice on the sustainability comparison of alternative remediation strategies, among others.

6.3. About interpretation of legislation and its challenges

This study did not take a stand on how EU-level legislation should be interpreted. While EU regulations are to be implemented as such in all Member States, EU directives generally set only the minimum level of environmental protection and the MSs can decide how to implement these statutes in their national legislation. This leeway leads to different interpretations and consequently, divergent regulations in different MSs. It is ultimately the national legislation in each MS that determines the principles of practical CLM actions. The interpretation of the EU legislation is in fact not restricted to directives, but is instead affected by all other binding EU law, e.g., the Treaties, general principles of law, decrees and decisions[79]. Moreover, besides the binding policy instruments, the EU can issue non-binding rules, such as recommendations, statements, notifications and resolutions, among others, categorized as "soft law"[80]. Although not legally binding, these are of practical significance. According to the European Court of Justice (ECJ), the interpretation of EU statutes or rules must besides their wording, also consider the context and the objectives that they endeavour[81]. Priority should be given to an interpretation that ensures the efficiency of their impact. The leeway given to the MSs in the implementation of EU legislation and the existence of "soft law" has in some cases led to situations where principles of interpretation of national legislation need to be requested from ECJ. For example, in its solution to the case known as the "Grimaldi case", ECJ stressed that the national courts are bound to consider some non-binding Commission Recommendations

79 Ojanen, T. (2016). EU-oikeuden perusteita. Edita Puhlishing Oy, Helsinki.

80 Penttinen, S-L. and Talus, K. (2017). Avaimet EU-oikeuteen. Edita Publishing Oy, Helsinki.

81 European Court of Justice. (2009). Judgement of the Court (Fourth Chamber) of 19 November 2009. Case C-402/07 and 432/07. ECR I-10923. Ref. in Penttinen, S-L. and Talus, K. (2017). Avaimet EU-oikeuteen. Edita Puhlishing Oy, Helsinki.

when adjudicating disputes[82]. On the other hand, according to one analysis regarding this "Grimaldi obligation" the Member State courts have currently more leeway to decide whether to consider non-binding guidance if the soft law instrument is free-standing, i.e., it is not derived from primary or secondary law, or if the non-binding guidance is not given by institutions[83]. The same analysis also concludes that Member State courts have become more proactive in challenging EU's soft law. Hence, the interpretation of legislation is in fact a complex issue that can lead to case-specific examinations.

The scope of application of EU level legislation can also sometimes require clarification. This has emerged, for example in 2004 in the "van de Walle case" (ECLI:EU:C:2004:67). In this case ECJ (C-1/03) ruled that hydrocarbons that had unintentionally spilled to soil from an underground storage as well as the unexcavated soils that had been consequently contaminated are waste as per the Waste Framework Directive. This extension of waste legislation to soil that has not yet been excavated raised considerable concern and vivid discussion among practitioners due to potential remediation liabilities and the incurring costs in case of other contaminated sites, and it has been analysed by several legislation experts (e.g. McIntyre, 2005). Only in 2008 the situation was clarified as a result of a new Directive on waste and repealing certain Directives (2008/98/EC). Article 2, 1st paragraph of this Directive excludes "land (in situ) including unexcavated contaminated soil and buildings permanently connected with" from its scope of application meaning that soil that has not been excavated is not waste.

There are also several ECJ decisions, e.g., C-461/13 (known as " Weser case") and C-535/18, that take a stand on what should be considered as deterioration of the chemical quality of a waterbody. Although these cases do not relate to remediation of contaminated land, they serve as a guideline for the interpretation of regulatory water quality standards when assessing the impact of restricted soil contamination on a waterbody.

The Liability Directive that defines who is to be considered responsible for environmental contamination took effect on 30 April 2007, and it concerns those cases where contamination took place after this date. However, sometimes or even often, contamination is of older origin. Such historical contamination is a challenging and complex issue from the liability perspective and generally requires a case-specific investigation. It is also worth noting that in the context of land contamination, the Liability Directive only requires the management of human health risks, and hence it does not take any stand of the liability in case of other risks. Regarding liability, EU policymakers have avoided the problem of soil contamination and remediation and preferred to leave the issue to the MSs to identify their own legal solutions. This has resulted in enormous variability between countries, with solutions ranging from very severe statutory regimes imposing strict, retrospective liability for the remediation costs on either actual polluters

82 European Court of Justice. (1989). Judgment of the Court (Second Chamber) of 13 December 1989. Salvatore Grimaldi v Fonds des maladies professionnelles. Reference for a preliminary ruling: Tribunal du travail de Bruxelles - Belgium. Social policy - Occupational diseases - Effects of a recommendation. Case C-322/88. European Court Reports 1989 -04407. ECLI:EU:C:1989:646. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:61988CJ0322

83 Korkea-aho, E. (2018). National Courts and European Soft Law: Is Grimaldi Still Good Law? Yearbook of European Law. Vol 37. p.470–495. Available at: https://doi.org/10.1093/yel/yey008

or innocent landowners, to *ad hoc* and incidental application of various statutory regimes of different policy sectors, such as planning law, and legislation on protection of water bodies, waste management, public health. The question regarding liability (of remediation) emerged also in the Van de Walle case (see above). In its decision, ECJ enabled the national courts to define whether the liability for costs of the treatment of contaminated soil should be imposed on the producers of the chemical (in this case oil) that caused the contamination. [84]

While the EU strategies might address various environmental objectives, legislation is very differentiated. In practice this means that for example, the authority that decides on the permits for soil remediation cannot take stand on how and where excavated soil will be treated. He or she can only require that the waste has to be delivered to a waste operator who has a permit to treat such material. It would also be against the EU rules of free competition to rule where the excavated soil should be treated. Also, the waste management related permits can be handled by a different authority while there is no discussion between the authorities located in these two different sectors of legislation.

Sometimes legislation can create a barrier to implement a strategy or legislation in another sector due to controversial objectives. For example, strict binding criteria for waste meant to serve the "zero pollution" objective can hinder the reuse or recycling of waste materials such as, excavated soil, per the circular economy and resource efficiency objectives.[85] The implementation of the Habitat Directive can create a barrier to redevelopment of contaminated land due to protected species residing at the site. Such controversies have emerged in some ISLANDR partners countries. Furthermore, the classification of excavated contaminated soil as waste aggravates its reuse due to permit obligation. It is quite unclear how the contaminated excavated soil gets rid of the waste status, for example if the soil is treated without removing the contaminants (e.g. solidification). End-of-waste (EoW) procedure is a mechanism that enables the removal of waste status. However, this requires determination of specific EoW criteria and considering the time taken to have EU level EoW criteria even for very homogenous wastes, such as glass cullet and scrap metal, it is highly improbable that EoW criteria would be established for such an inhomogeneous material as contaminated soil. The implementation of EoW has in fact largely failed at the EU level and therefore, the responsibility for it has been mainly transferred to authorities at local (and national) level.[86] As a consequence, the complexity of the establishment of EoW criteria for excavated soil, the limited resources and required specific knowledge can aggravate the implementation of the EoW instrument at local level. Therefore, in practice such transfer of responsibility hardly leads to any speed-up of decision-making regarding the reuse (or recycling) of excavated soil.

AWAITING PEER REVIEW

84 McIntyre, O. (2005). The All-Consuming Definition of 'Waste' and the End of the 'Contaminated Land' Debate? Van de Walle and Others, J. Environ. Law 17(4), 109–27. https://doi.org/10.1093/envlaw/eqi005

85 Sorvari, J. and Wahlström, M. (2024). Industrial by-products. Chapter 17. In: Meskers, C., Worrell, E: & Reuter, M.A. (Eds). Handbook of Recycling, 2nd ed. Elsevier Inc. USA. pp. 259-285.

86 Johansson, N. and Forsgren, C. (2020). Is this the end of end-of-waste? Uncovering the space between waste and products. Resour. Conserv. Recycl. 155, 104656. https://doi.org/10.1016/j.resconrec.2019.104656

6.4. Final remarks and future prospects

Sustainability has emerged as a global concern that should be endeavoured in all human activities. In Contaminated Land Management, the attainment of sustainability requires means and actions varying from international to national, regional, industry and local level. These means and actions can besides the various policy instruments presented in this report, also include informational instruments, land management practices, and sustainable remediation methods (without forgetting their potential adverse environmental impact). Hence, the policy instruments as an element of CLM, extend to different levels: macro level (global, European, national), meso level (regional, local) and micro level (site). Consequently, consideration of sustainability requires the adoption of a wider perspective both spatially and strategically. At the strategic level this means a reconciliation of different objectives coming from different strategies and statutes. Here, the division of environmental legislation into sectors emerges as a barrier to a holistic approach in decision-making. Such an approach would require intensive collaboration over sectors of legislation, e.g., land use planning, land use, environmental protection and waste management, construction, and between authorities over branches of administration.

The world is changing and legislation along with it. The EU legislation is undergoing constant changes due to new data, e.g., on risks arising from chemicals, identified needs for elaborating statutes, changes in policy priorities, etc. This change can be seen also in the binding environmental quality standards. New needs for eliminating or reducing the risks of some chemicals emerge that necessitate the adoption of new or modified policy instruments. For example, the recognition of the ubiquitous presence of PFAS in the environment along with the increased data on their impacts on human health and the environment has led to recent updates of their threshold values[87] and suggestion of assigning PFAS as priority substances with threshold values per the legislation protecting waterbodies. Pharmaceuticals and antimicrobial resistance as the consequence of their release to the environment, as well as micro-plastics and hormone disruptors are also topical issues, which might be tackled in some regulatory risk management instruments in the near future. Along with new data on the impact of chemicals and their presence in the environment, the development of technologies, such as non-invasive and nature-based remediation methods may induce changes in legislation. Such techniques could support the objectives of soil protection by maintaining soil structure, soil functions and ecosystem services. Policy support, i.e., incentives, could promote this development. Final acceptance of new technologies assumes reliable and verified information on their efficiency, reliability and safety,

The constant renewing and supplementation of legislation requires being on alert for these changes to stay updated. The new statutes are unfortunately often issued as separate amending statutes, meaning that consideration of the relevant legislation on a

87 Reinikainen, J., Bouhoulle, E., Sorvari, J. (2024). Inconsistencies in the EU regulatory risk assessment of PFAS call for readjustment. Environ. Int. 186, 108614. https://doi.org/10.1016/j.envint.2024.108614

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

specific topic requires investigation of both the original statutes and all their separate amendments, which can be numerous in some cases.

The lack of EU-level legislation that addresses specifically soil and its protection is expected to soon be history along with the coming "Directive on Soil monitoring and resilience". This Directive aims to lift the protection of soil to the same level as the current protection of waterbodies and air. The Directive will improve the level of soil protection, establish harmonized obligations for the management of contaminated land in the EU and enhance the generation of monitoring data on the status of European soils. The Directive would be updated after a few years of its entry into force.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

APPENDIX 1. Lists of POPs in Stockholm Convention Annexes A, B and C

Table 1. Substances in Annex A of the Stockholm Convention to be eliminated from production and use.

Aldrin	Chlordane	Chlordecone
Decabromodiphenyl ether (commercial mixture, c-decaBDE)	Dechlorane Plus	Dicofol
Dieldrin	Endrin	Heptachlor
Hexabromobiphenyl	Hexabromocyclododecane (HBCDD)	Hexabromodiphenyl ether and heptabromodiphenyl ether
Hexachlorobenzene (HCB)	Hexachlorobutadiene	Alpha hexachlorocyclohexane
Beta hexachlorocyclohexane	Lindane	Methoxychlor
Mirex	Pentachlorobenzene	Pentachlorophenol and its salts and esters
Polychlorinated biphenyls (PCB)	Polychlorinated naphthalenes	Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds
Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds	Short-chained chlorinated paraffins	Technical endosulfan and its related isomers
Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromodiphenyl ether)	Toxaphene	UV-328 (2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol)

Table 2. Substances in Annex B of the Stockholm Convention to be restrict the production and use.

DDT	Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Funded by the European Union

Table 3. Unintentional releases of chemicals in Annex C of the Stockholm Convention to be reduced with the goal of continuing minimization and, where feasible, ultimate elimination.

Hexachlorobenzene (HCB)	Hexachlorobutadiene (HCBD)	Pentachlorobenzene
Polychlorinated biphenyls (PCB)	Polychlorinated dibenzo-p-dioxins (PCDD)	Polychlorinated dibenzofurans (PCDF)
Polychlorinated naphthalenes		

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Table 4. Basel Convention's technical guidelines on waste management concerning POPs listed in Annex A, B or C of Stockholm Convention.

Stockholm Convention POPs	Basel Convention POPs technical guidelines									
	General technical guidelines									
	PCBs	Pesticides	DDT	Unintentional POPs	POP-BDEs	HBCD	POP-PFASs	HCBD	PCP	SCCP
Aldrin		x								
Chlordane		x								
Chlordecone		x								
Decabromodiphenyl ether (BDE-209) present in commercial decabromodiphenyl ether (decaBDE)					x					
Dicofol		x								
Dieldrin		x								
1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane (DDT)			x							
Endrin		x								
Heptachlor		x								
Hexabromobiphenyl (HBB)	x									
Hexabromodiphenyl ether (hexaBDE) and heptabromodiphenyl ether (heptaBDE)					x					
Hexabromocyclododecane (HBCD)						x				
Hexachlorobenzene (HCB)		x		x						
Hexachlorobutadiene (HCBD)		x		x				x		
Alpha hexachlorocyclohexane (alpha-HCH)		x								
Beta hexachlorocyclohexane (beta-HCH)		x								
Lindane		x								

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Funded by the European Union

Stockholm Convention POPs	Basel Convention POPs technical guidelines									
	General technical guidelines									
	PCBs	Pesticides	DDT	Unintentional POPs	POP-BDEs	HBCD	POP-PFASs	HCBD	PCP	SCCP
Mirex		x								
Pentachlorobenzene (PeCB)		x		x						
Pentachlorophenol (PCP) and its salts and esters		x							x	
Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds							x			
Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds							x			
Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)		x					x			
Polychlorinated biphenyls (PCBs)	x			x						
Polychlorinated dibenzo-*p*-dioxins (PCDDs)				x						
Polychlorinated dibenzofurans (PCDFs)				x						
Polychlorinated naphthalenes (PCNs)	x			x						
Short-chain chlorinated paraffins (SCCPs)										x
Technical endosulfan and its related isomers		x								
Tetrabromodiphenyl ether (tetraBDE) and pentabromodiphenylether (pentaBDE)					x					
Toxaphene		x								

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Table 5. Overview of technologies for the destruction and irreversible transformation of POPs in wastes.

Technology		POPs									
	HBB	HBCD	HCB, HCBD and PeCB	PCB	PCDDs/ PCDFs	PCN	PCP	Pesticides POPs	POP-PFASs	POP-BDEs	SCCPs
(a) Alkali metal reduction	ND*	ND	ND	Yes	ND	ND	ND	Yes for Chlordane, HCH	ND	ND	ND
(b) Advanced solid waste incineration (ASWI)	ND	Yes	ND	ND	ND	ND	Yes	ND	ND	Yes	Yes
(c) Base catalyzed decomposition (BCD)	ND	ND	ND	Yes	Yes	ND	Yes	Yes	ND	ND	ND
(d) Catalytic hydrodechlorination (CHD)	ND	ND	ND	Yes	Yes	ND	ND	ND	ND	ND	ND
(e) Cement kiln co-incineration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(f) Gas phase chemical reduction (GPCR)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(g) Hazardous waste incineration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(h) Plasma arc	ND	ND	ND	Yes	ND	ND	ND	Yes, for most pesticides, including chlordane, chlordecone, DDT, endosulfan, heptaclor	ND	ND	ND
(i) Plasma melting decomposition method (PMD)	ND	ND	ND	Yes	ND	ND	ND	ND	ND	ND	ND
(j) Supercritical water oxidation (SCWO) and subcritical water oxidation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(k) Thermal and metallurgical production of metals	ND	ND	ND	ND	Yes	ND	ND	ND	ND	Yes	ND

* ND stands for “not determined” and indicates that information is not available in the literature referred to in this document to confirm the use of the technology for certain POPs.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Funded by the European Union

APPENDIX 2. List of industries in the revised IED

Table 1. Annex I EID Directive 2010/75/EU -Categories of activities referred to in Article 10

1.	**Energy industries**
1.1.	Combustion of fuels in installations with a total rated thermal input of 50 MW or more
1.2.	Refining of mineral oil and gas
1.3.	Production of coke
1.4.	Gasification, liquefaction or pyrolysis of:
	(a) coal;
	(b) other fuels in installations with a total rated thermal input of 20 MW or more.
2.	**Production and processing of metals**
2.1.	Metal ore (including sulphide ore) roasting or sintering
2.2.	Production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
2.3.	Processing of ferrous metals:
	(a) operation of hot-rolling mills with a capacity exceeding 20 tonnes of crude steel per hour;
	(aa) operation of cold-rolling mills with a capacity exceeding 10 tonnes of crude steel per hour;
	(b) operation of smitheries with hammers the energy of which exceeds 50 kilojoule per hammer;
	(bb) operation of smitheries with forging presses the force of which exceeds 30 mega-newton (MN) per press;'.
	(c) application of protective fused metal coats with an input exceeding 2 tonnes of crude steel per hour.
2.4.	Operation of ferrous metal foundries with a production capacity exceeding 20 tonnes per day
2.5.	Processing of non-ferrous metals:
	(a) production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes;
	(b) melting, including the alloyage, of non-ferrous metals, including recovered products and operation of non-ferrous metal foundries, with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals.
2.6.	Surface treatment of metals or plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m3
2.7.	Manufacture of batteries, other than exclusively assembling, with a production capacity of 15 000 tonnes of battery cells (cathode, anode, electrolyte, separator, capsule) or more per year.';

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

3.	**Mineral industry**
3.1.	Production of cement, lime and magnesium oxide:
	(a) production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or in other kilns with a production capacity exceeding 50 tonnes per day;
	(b) production of lime in kilns with a production capacity exceeding 50 tonnes per day;
	(c)production of magnesium oxide in kilns with a production capacity exceeding 50 tonnes per day.
3.2.	Production of asbestos or the manufacture of asbestos-based products
3.3.	Manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
3.4.	Melting mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tonnes per day
3.5.	Manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain with:
	(a) a production capacity exceeding 75 tonnes per day; and/or
	(b) a kiln capacity exceeding 4 m3 and a setting density per kiln exceeding 300 kg/m3.
3.6.	Extraction including on-site treatment (operations such as comminution, size control, beneficiation and upgrading) of the following ores on an industrial scale:
	(b) bauxite, chromium, cobalt, copper, gold, iron, lead, lithium, manganese, nickel, palladium, platinum, tin, tungsten and zinc.
4.	**Chemical industry** (For the purpose of this section, production within the meaning of the categories of activities contained in this section means the production on an industrial scale by chemical or biological processing of substances or groups of substances listed in points 4.1 to 4.6)
4.1.	Production of organic chemicals, such as:
	(a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic);
	(b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters and mixtures of esters, acetates, ethers, peroxides and epoxy resins;
	(c) sulphurous hydrocarbons;
	(d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates;
	(e) phosphorus-containing hydrocarbons;
	(f) halogenic hydrocarbons;
	(g) organometallic compounds;
	(h) plastic materials (polymers, synthetic fibres and cellulose-based fibres);
	(i) synthetic rubbers;
	(j) dyes and pigments;
	(k) surface-active agents and surfactants.

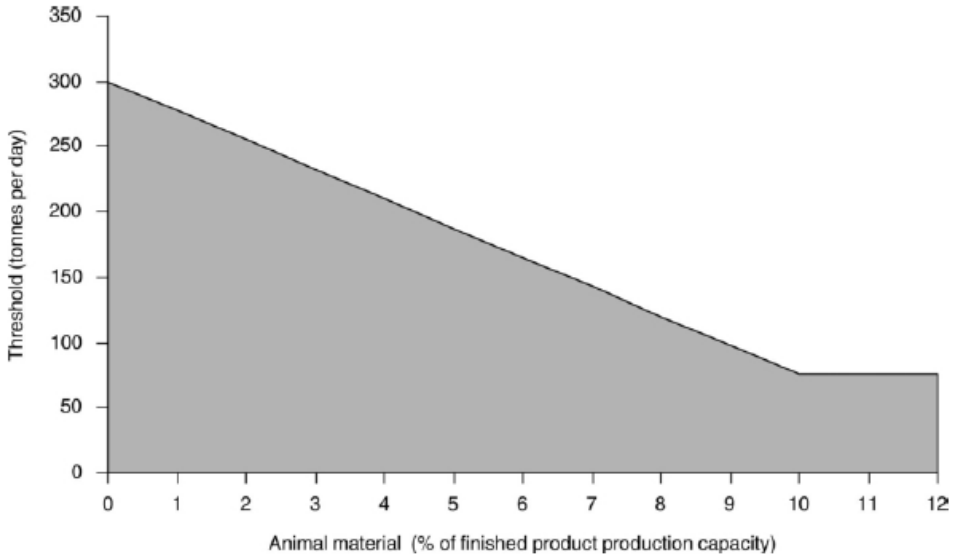
AWAITING APPROVAL BY THE EUROPEAN COMMISSION

4.2.	Production of inorganic chemicals, such as:
	(a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen except when produced by electrolysis of water, sulphur dioxide, carbonyl chloride;
	(b) acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids;
	(c) bases, such as ammonium hydroxide, potassium hydroxide, sodium hydroxide;
	(d) salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate;
	(e) non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide.
4.3.	Production of phosphorous-, nitrogen- or potassium-based fertilisers (simple or compound fertilisers)
4.4.	Production of plant protection products or of biocides
4.5.	Production of pharmaceutical products including intermediates
4.6.	Production of explosives
5.	**Waste management**
5.1.	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving one or more of the following activities:
	(a) biological treatment;
	(b) physico-chemical treatment;
	(c) blending or mixing prior to submission to any of the other activities listed in points 5.1 and 5.2;
	(d) repackaging prior to submission to any of the other activities listed in points 5.1 and 5.2;
	(e) solvent reclamation/regeneration;
	(f) recycling/reclamation of inorganic materials other than metals or metal compounds;
	(g) regeneration of acids or bases;
	(h) recovery of components used for pollution abatement;
	(i) recovery of components from catalysts;
	(j) oil re-refining or other reuses of oil;
	(k) surface impoundment.
5.2.	Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants:
	(a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour;
	b) for hazardous waste with a capacity exceeding 10 tonnes per day.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

5.3.	(a) Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC *:
	(i) biological treatment (such as anaerobic digestion or co-digestion);
	(ii) physico-chemical treatment;
	(iii) pre-treatment of waste for incineration or co-incineration;
	(iv) treatment of slags and ashes;
	(v) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.
	(b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, and excluding activities covered by Directive 91/271/EEC:
	(i) biological treatment (such as anaerobic digestion);
	(ii) pre-treatment of waste for incineration or co-incineration;
	(iii) treatment of slags and ashes;
	(iv) treatment in shredders of metal waste, including waste electrical and electronic equipment and end-of-life vehicles and their components.
	When the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for this activity shall be 100 tonnes per day.
5.4.	5.4. Landfills, as defined in Article 2(g) of Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste, receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste
5.5.	5.5. Temporary storage of hazardous waste not covered under point 5.4 pending any of the activities listed in points 5.1, 5.2, 5.4 and 5.6 with a total capacity exceeding 50 tonnes, excluding temporary storage, pending collection, on the site where the waste is generated
5.6.	Underground storage of hazardous waste with a total capacity exceeding 50 tonnes
6.	**Other activities**
6.1.	Production in industrial installations of:
	(a) pulp from timber or other fibrous materials;
	(b) paper or card board with a production capacity exceeding 20 tonnes per day;
	(c) one or more of the following wood-based panels: oriented strand board, particleboard or fibreboard with a production capacity exceeding 600 m3 per day.
6.2.	Pre-treatment (operations such as washing, bleaching, mercerisation), dyeing or finishing of textile fibres or textiles where the treatment capacity exceeds 10 tonnes per day.
6.3.	Tanning of hides and skins where the treatment capacity exceeds 12 tonnes of finished products per day

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

6.4.	(a) Operating slaughterhouses with a carcass production capacity greater than 50 tonnes per day
	(b) Treatment and processing, other than exclusively packaging, of the following raw materials, whether previously processed or unprocessed, intended for the production of food or feed from:
	(i) only animal raw materials (other than exclusively milk) with a finished product production capacity greater than 75 tonnes per day;
	(ii) only vegetable raw materials with a finished product production capacity greater than 300 tonnes per day or 600 tonnes per day where the installation operates for a period of no more than 90 consecutive days in any year;
	(iii) animal and vegetable raw materials, both in combined and separate products, with a finished product production capacity in tonnes per day greater than:
	— 75 if A is equal to 10 or more; or
	— [300- (22,5 × A)] in any other case,
	where 'A' is the portion of animal material (in percent of weight) of the finished product production capacity.
	Packaging shall not be included in the final weight of the product.
	This subsection shall not apply where the raw material is milk only.
	
	(c) Treatment and processing of milk only, the quantity of milk received being greater than 200 tonnes per day (average value on an annual basis).
6.5.	Disposal or recycling of animal carcases or animal by-products with a treatment capacity exceeding 10 tonnes per day.
6.6.	Electrolysis of water for production of hydrogen where the production capacity exceeds 50 tonnes per day.'
6.7.	Surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with an organic solvent consumption capacity of more than 150 kg per hour or more than 200 tonnes per year

AWAITING AT EUROPEAN COMMISSION

6.8.	Production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitisation
6.9.	Capture of CO2 streams from installations covered by this Directive for the purposes of geological storage pursuant to Directive 2009/31/EC
6.10.	Preservation of wood and wood products with chemicals with a production capacity exceeding 75 m3 per day other than exclusively treating against sapstain
6.11.	Independently operated treatment of wastewater not covered by Directive 91/271/EEC and discharged by an installation covered by Chapter II

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

APPENDIX 3. Limit values for POPs in waste

Table 1. The concentration limits for wastes in Annexes IV and V of the POPs Regulation.

Persistent organic pollutant	Low concentration limit	Maximum concentration limit
Aldrin	50 mg/kg	5000 mg/kg
Alpha-HCH, beta-HCH and lindane (sum)	50 mg/kg	5000 mg/kg
Chlordane	50 mg/kg	5000 mg/kg
Chlordecone	50 mg/kg	5000 mg/kg
DDT	50 mg/kg	5000 mg/kg
Dekabromidiphenyl ether and Hexabromodiphenyl ether and heptabromodiphenyl ether and tetrabromodiphenyl ether and pentabromodiphenyl ether (sum)	500 mg/kg from 30.12.2025 350 mg/kg[a] from 30.12.2027 200 mg/kg[b]	10 000 mg/kg
Dicofol	50 mg/kg	5000 mg/kg
Dieldrin	50 mg/kg	5000 mg/kg
Endosulfan	50 mg/kg	5000 mg/kg
Endrin	50 mg/kg	5000 mg/kg
HBB	50 mg/kg	5000 mg/kg
HBCDD	500 mg/kg	1000 mg/kg
HCB	50 mg/kg	5000 mg/kg
HCBD	100 mg/kg	1000 mg/kg
Heptachlor	50 mg/kg	5000 mg/kg
Mirex	50 mg/kg	5000 mg/kg
PCBs	50 mg/kg	50 mg/kg
[PCDDs, PCDFs and dioxin-like PCBs[c]]	5 mg TEQ/kg	5000 mg TEQ/kg
PCNs	10 mg/kg	1000 mg/kg
PCP and its salts and esters	100 mg/kg	1000 mg/kg
PeCB	50 mg/kg	5000 mg/kg
PFOA and its salts	1 mg/kg	50 mg/kg
PFOA-related compounds (sum)	40 mg/kg	2000 mg/kg
Perfluorohexane sulfonic acid (PFHxS) and its salts	1 mg/kg	50 mg/kg
PFHxS-related compounds (sum)	40 mg/kg	2000 mg/kg
PFOS and its derivates	50 mg/kg	50 mg/kg
Short-chain chlorinated paraffins (SCCPs)	1500 mg/kg	10 000 mg/kg
Toxaphene	50 mg/kg	5000 mg/kg

[a] If the concentration limit for the sum of concentrations of tetra, penta, hexa, hepta and decabromodiphenyl ethers in products as set out in Annex I to the POPs Regulation is higher than the new concentration limit for POP waste at that time, the higher concentration limit for waste as set out in Annex I shall also apply.

[b] If the concentration limit for the sum of concentrations of tetra, penta, hexa, hepta and decabromodiphenyl ethers in products as set out in Annex I to the POPs Regulation is higher than the new concentration limit for POP waste at that time, the higher concentration limit for waste as set out in Annex I shall also apply.

[c] The maximum concentration limit of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD and PCDF) and dioxin-like polychlorinated biphenyls (dl-PCBs) must be calculated according to the toxic equivalency factors (TEFs) set in the Annex V part 2 of the Regulation.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

APPENDIX 4. Checklist of regulations

Checklist for the identification of relevant directives along the life cycle of contaminated land management as illustrated by the ISLANDR roadmap.

Table A1. List of questions that help identify the relevant regulations that should be considered in the different phases of contaminated land risk management.

Question	Regulation and its relevance
Identification	
Is the site potentially contaminated and is it clear who is liable?	Liability Directive (2004/35/CE): defines the liability for remediation; Note: not applicable if contamination took place before 30 April 2007.
Site characterization & risk assessment	
Are there protected nature habitats that are at risk (at site or due to spreading of contamination)?	Habitats Directive (92/43/EEC): includes a) list of natural habitats to be protected and b) list of specific actions that are banned to ensure the required protection Nature Restoration Law ((EU) 2024/1991): issues requirements to restore some specific environments and to protect some key species or ecosystems at MS level, each MS define the specific measures on its national restoration plan.
Are there protected species that are at risk (at site or due to spreading of contamination)?	Birds Directive (2009/147/EC): includes a) list of natural birds to be protected and b) list of specific actions that are banned to ensure the required protection.
Is groundwater involved (already contaminated or risk of migration)?	WFD, GWD, SWD, DWD, EQSD: set principles of protecting water bodies and includes lists of priority substances that need specific attention and quality standards for protecting human health or the environment.
How harmful are the contaminants found at the site: are Substances of Very High concern (SVHC) involved?	REACH regulation (1907/2006): presents a list of substances considered as SVHC, also candidate list → indicates very harmful substances.
Do any edible plants or plants used as feed growing at the site contain high concentrations of contaminants?	Regulation (EU) 2023/915 and Regulation (EC) 396/2005: impose maximum levels for certain contaminants in food and maximum residue levels (MRL) for pesticides in food and feed; exceeding of these can indicate high concentrations in soil that call for risk management actions.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Question	Regulation and its relevance
Has stakeholder participation considered?[a]	Directives regarding public participation (2003/35/EC): demand that public has an early and effective opportunity to participate in the preparation, modification or revision of plans or programmes.
Does the public have an easy access to environmental data regarding land contamination? [a]	Directive on Public Access to Environmental Information (2003/4/EC): imposes the requirement for public authorities to ensure that public has easy access to environmental information held by them or for them.
Development of the preliminary business case	
Are there critical raw materials (CRM) at the contaminated site? Is their recovery feasible and profitable?	Critical Raw Materials Act (2024/1252): could serve as an incentive for remediation since it aims to enhance the recovery of CRMs from waste materials.
Does the party responsible for remediating the site cause unavoidable ecological harm in another place? If yes, could the remediation/restoration of the site act as a means to compensate the latter harm?	Nature Restoration Directive (2024/1991): serves as a potential incentive for remediation (e.g. brownfield sites); Note: each MS define the concrete restoration need and measures (national restoration plan).
Could the site serve as a site for producing renewable energy (solar, wind, biomass)? Are contaminated sites nationally defined as renewables acceleration areas?	Renewable Energy Directive (2018/2001): requires that the authorities prioritize for example waste sites, industrial sites, mines, and degraded land, for the production of renewable energy; a potential incentive for remediation is contaminated sites will be defined as renewables acceleration areas to promote the attainment of the targets set in the Directive.
Exploration of a strategy: remediation, redevelopment	
Are there stakeholders who should be involved or at least communicated?	Directive 2003/35/EC: includes requirements for public participation and availability of information.
Is the contamination caused by an activity regulated by Industrial Emissions Directive (IED) and if yes, how does the current status of soil deviate from that documented in the baseline report (if available)?	Industrial Emissions Directive (2024/1785): includes list of industrial activities which need to have a site-related baseline report.
Is the site a former mine site?	Extractive Waste Directive (2006/21/EC): defines the measures, procedures and guidance to prevent or reduce any adverse effects to the environment arising from mining waste.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Question	Regulation and its relevance
Could remediation include the use of genetically modified organisms (GMOs)?	Directive on intentional release of GMOs (2001/18/EC): defines when the regulation needs to be followed, format of permit and data needed in the preceding risk assessment.
Does the remediation include application of sewage sludge or use of other material for the purpose of fertilising of soil amendment?	WFD, GWD, EQSD: include lists of priority substances and quality standards for inorganic and organic substances, that might be released to the environment. The proposal for amending legislation (COM (2022) 540) includes, for example some pharmaceuticals that may give rise to antimicrobial resistance (AMR). Sewage Sludge Directive (86/278/EEC) and Directive on fertiliser products ((EU) 2019/1009): impose limit values that indicate risks to the environment and human health.
Do the planned remediation measures generate waste?	Waste Framework Directive (2008/98/EC): sets the priority order of managing waste (waste hierarchy) and defines that unexcavated soil is not waste.
If the remediation generates waste, is the classed as hazardous waste?	EU Waste List (Commission Decision 014/955/EU): presents a list of wastes classed as hazardous. Commission regulation ((EU) No 1357/2014) and Council Regulation ((EU) 2017/997): imposes criteria and concentration limits to define waste as a hazardous waste. CLP regulation (2024/2865): serves for assessment of hazardous properties of waste.
Is incineration and landfill disposal the possible options for treatment of excavated contaminated soil?	Directive on Incineration of Waste (2000/76/EC): sets requirements for incineration technology and emission limit values. Landfill Directive (1999/31/EC): provides the classification of landfills based on type of wastes to be placed on them. Regulation Persistent Organic Pollutants (2019/1021): requires to permanently destroy POPs when the set limit value for POP containing waste is exceeded.
If the remediation generates waste, does this waste include persistent organic pollutants (POPs)?	Regulation on Persistent Organic Pollutants (2019/1021): sets the requirement for ensuring the environmentally sound disposal of waste and for permanently destroying POPs when the set limit value for POP containing waste is exceeded
If the remediation generates waste, does this waste include mercury?	Mercury regulation (2017/852): sets the requirement for traceability of mercury containing waste; also Waste Framework Directive & Landfill Directive.

AWAITING APPROVAL BY THE EUROPEAN COMMISSION

Question	Regulation and its relevance
Does remediation include use or removal of foreign organisms, e.g. plants not natural to the habitat that the site represents?	Regulation on invasive alien species (1143/2014): sets requirements for the management to eliminate spreading in the environment.
Is landfill disposal of excavated soil or other material included in the remediation measures?	Directive on Landfill of Waste (1999/31/EC) and Council Decision 2003/33/EC: defines the three different landfill classes and type and contaminant concentrations allowed for wastes to be disposed of on these.
Does remediation include actions that could cause significant emissions to air?	Directive on Ambient Air Quality and Cleaner Air for Europe (2024/2881): limit values for particles in air (potential issue during remediation activities) Directive regarding occupational exposure limit values (2019/1831): indicative limit values for the protection of remediation workers
Does remediation include removal of biomass (e.g. phytoremediation) that is suitable for resource recovery (e.g. metals) or energy production?	Renewable Energy Directive (2018/2001): see above business case)
Realisation	
Is the responsible (for contaminated soil management) a public party?	Directive on public procurement (2014/24/EU): limit values for compulsory tendering

AWAITING APPROVAL BY THE EUROPEAN COMMISSION