European Union Network for the Implementation and Enforcement of Environmental Law

Criteria for the assessment of Environmental Damage (CAED)

Final Report

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Introduction to IMPEL

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

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

During the previous years IMPEL has developed into a considerable, widely known organisation, being mentioned in a number of EU legislative and policy documents, e.g. the 7th Environment Action Programme and the Recommendation on Minimum Criteria for Environmental Inspections.

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

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

Title of the report: Criteria for the Assessment of the Environmental Damage (CAED)	**Number report:** 2019/18
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Executive Summary

Keywords
Environmental Liability Directive (ELD), Environmental Damage, Imminent threat of environmental damage, Environmental investigations, Environmental incidents, Environmental non-compliance, Environmental offences, Eco-criminal acts, Environmental crime

Target groups
Competent authorities for environmental damage assessment and enforcement, industrial operators, environmental protection agencies, nature protection bodies, environmental inspectorates, environmental guard departments, environmental monitoring and research institutions, technical universities, environmental associations, NGOs, insurance companies and associations, environmental consultants.

As part of its 2016-2020 Strategic Work Programme, the IMPEL Network set up this project in the environmental damage thematic area, concerning the criteria for the determination of the environmental damage and imminent threat of damage, called CAED - Criteria for the Assessment of the Environmental Damage.

The CAED project takes guidance on key terms and definitions of Environmental Damage as a springboard and focusses on the technical/administrative procedures necessary to make determination of Environmental Damage. The project therefore builds on the ELD Multi Annual Rolling Work Programme and has strong links with the European Commission's publication, later in 2020, of guidance on environmental damage and imminent threat of environmental damage.

The ultimate goal of the project is to produce a guide proving criteria for the assessment of the environmental damage and imminent threat of damage under ELD national legislation of Member States, based on reference parameters relating to 'evidence' and to 'clue' of environmental damage or imminent threat of damage.

The objective of this year's CAED project was to identify, both from a regulatory, practical and technological point of view, how the clues and the evidences of environmental damage and threats of damage can be detected, identified and evaluated. This was done by the analysis of a collection of ascertainment practices of 32 'ELD cases' and 'non-ELD cases' across Member States to identify criteria to assess environmental damage and imminent threat of environmental damage.

This report also provides an evaluation of guidance provided by some jurisdictions, with particular reference to the parts related to the determination of environmental damage.

Finally, the CAED project intends to contribute at improving the evidence base, envisaged as one of the working areas of the Multi-Annual ELD Work Programme (MAWP) for the period 2021-2024, by providing a better picture of the state of implementation of ELD in the process of the determination of the environmental damage and imminent threats of damage.

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2. DG Environment (Mr. Hans Lopatta)
3. Bayern AG
4. CEFIC (European Chemical Industry Council)

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Disclaimer

1) This report is the result of a project within the IMPEL network. The content does not necessarily represent the view or the official position of IMPEL, the national administrations or the European Commission.

2) This report reflects only the authors' views and the authors themselves are not liable for any use that may be made of the information contained therein.
3) The project team is not liable for the information and facts given in the case studies.
4) This report is subject to the Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information.

This project report is intended as a reference document for competent authorities and practitioners. It does not prescribe what a competent authority should do. Instead, it aims to provide information to assist competent authorities in making better decisions about the ascertainment of environmental damage. In this way, it should contribute to improve protection of the environment and promote compliance with the polluter pays principle.

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1 THE CAED PROJECT

1.1 Introduction

As part of its 2016-2020 Strategic Work Programme[1], the IMPEL Network set up this project in the environmental damage thematic area, concerning the criteria for the determination of the environmental damage and imminent threat of damage, called CAED - Criteria for the Assessment of the Environmental Damage. This project takes guidance on key terms and definitions of Environmental Damage as a springboard and focusses on the technical/administrative procedures necessary to make determination of Environmental Damage.

The Criteria for the Assessment of the Environmental Damage (CAED) project is primarily concerned with the Environmental Liability Directive 2004/35/CE (ELD)[2] which concerns the environmental liability for the prevention and remediation of environmental damage. However, is not limited to the scope of the ELD but, also, intends to explore other non-ELD national legislation of EU Member States (MSs) related to environmental damage.

The CAED project concerns the environmental damage to the natural resources protected by the ELD, namely, protected species and natural habitats (included in Habitat and Birds Directives), waters (under Water Framework and Marine Strategy Directives) and land. In addition, the project intends to include areas protected by national legislation (such as protected areas, national and regional parks, wetlands) and international conventions (RAMSAR).

The CAED project aims to provide a practical guide and useful tools to enhance competent authorities and practitioner's capability to promptly and effectively determine the clues and evidences of the environmental damage and the imminent threat of damage caused by environmental incidents, non-compliances, offences and criminal actions.

This report is the product of this first year of the project. It contains 32 case studies organised in factsheets (Annex II), provided by different contributors, and their evaluations developed by a project team of experienced practitioners, covering the relevant regulations such as ELD and other national legislations, working in various different technical fields and having different professional experiences. The project team was brought together under the European Network for the Implementation and Enforcement of Environmental Law (IMPEL Network).

This report identifies MSs common and different approaches to the administrative procedure for the process of determination of environmental damage and imminent threat of damage, strengths, and weaknesses.

At this regard, the report proposes a new approach, made of three procedural steps: the screening process, the determination of clues, the determination of evidence.

[1] https://www.impel.eu/publications/multi-annual-strategic-programme-2016-2020/

[2] Further information on the ELD and its implementation is provided in Annex V.

Moreover, the report also provides some evaluation of the guidance provided by some MSs, with particular reference to the parts related to the determination of environmental damage.

The report is divided into the following main chapters:

- Chapter 1 contains the project background, scope and objectives, concepts and methodology, questionnaire-based survey genesis, settings and content
- Chapter 2 contains questionnaire-based survey results and related topics
- Chapter 3 provides the evaluations of the questionnaire-based survey results

…and the following main Annexes:

- Annex I provides information on the legal framework and the role of authorities in various MSs
- Annex II provides the case studies factsheets from the contributors
- Annex III provides other case studies found in literature
- Annex IV provides the questionnaire form and content
- Annex V provides legislative background related to ELD

This report is the first of the IMPEL Network products concerning the ELD implementation and the environmental damage assessment in general, moreover, it is the first European report entirely devoted to the ascertainment/investigation phase of the whole process of the environmental damage assessment.

1.2 Project background

The CAED project has been inspired by:

- the Report 'Towards a common understanding of ELD key terms and concepts, Support in the implementation of REFIT actions for the ELD – phase 1, 2017'[3]
- the Regulation 2019/1010/EU which places a requirement on the European Commission to adopt 'Guidelines on environmental damage' before the end of 2020 and to publish a report on experience gained in application of the ELD by 2023
- the 'REFIT Evaluation on the effectiveness, efficiency and relevance of the Environmental Liability Directive', 2016[4]
- The Report from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions under Article 14(2) of Directive 2004/35/EC on the environmental liability with regard to the prevention and remedying of environmental damage (COM/210/0581 final)[5]

[3] Towards a common understanding of ELD key terms and concepts, Support in the implementation of REFIT actions for the ELD – phase 1, 2017 https://circabc.europa.eu/webdav/circabc/env/envgov/Library/E-Environmental%20Liability/b-ELD%20Expert%20Groups/18%20-%20meeting%2005_10_2017/02-meeting%20documents/DOC5%20-%20Common%20Understanding%20Document%20Sept%202017.pdf) .

[4] REFIT Evaluation of the Environmental Liability Directive, Commission Staff Working Document, SWD(2016) 121 final (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016SC0121&from=EN)

[5] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0581:FIN:EN:PDF

- published guidelines on the determination of environmental damage by European Commission and some Member States[6]

In summary, these publications conclude that the ELD works in principle, that there are differences in the implementation between EU MSs and that there are issues to be addressed such as the low availability of data on ELD cases, low awareness amongst stakeholders and ambiguities on key concepts and definitions.

The Multi-Annual ELD Rolling Work Programme (MARWP) 2017-2020[7], the preceding work of the European Commission and the anticipated 2021-2024 MAWP includes actions to address these issues. The actions include training and capacity building, facilitating the exchange of best practices, establishing an ELD-information system and publication of country fiches about ELD legal frameworks, implementation and cases and finally, publication of European Commission guidance on Environmental Damage.

The CAED project, also, intends to address these abovementioned issues.

1.3 Project scope and objectives

There is a variety of environmental events, such as environmental incidents, non-compliances and offences, considered by European and national laws, requiring different competent authorities to promptly and effectively determine possible environmental damages.

This diversity of situations may generate inefficient actions in determining environmental damage and, thus, failure in effectively preventing, mitigating and remediating the damage.

It is evident that, with proper planning of ascertainment actions, the success of the preventive or remedial measures can be strengthened and possibly improved.

The overall aim of the CAED project is, indeed, the administrative procedure enhancement as regards the ascertainment phase of the complete environmental damage assessment process.

The ultimate goal of the project is to produce a guide identifying criteria for the assessment of the environmental damage and imminent threat of damage under ELD, based on 'evidence' and 'clues' of environmental damage or imminent threat of damage. The project intends to identify best actions to implement for conducting a proper investigation of the environmental damage and for ensuring the immediate prevention of the imminent threats of damage and the effective remediation of the environmental damage.

The objective of the first year of the CAED project was to identify, both from a regulatory, practical and technological point of view, how the clues and the evidence of environmental damage and imminent threat of damage are detected, identified and evaluated. This was done by the analysis of a collection of ascertainment practices of ELD and non-ELD environmental cases in various MSs.

[6] http://ec.europa.eu/environment/legal/liability/eld_guidance.htm
[7] https://ec.europa.eu/info/sites/info/files/mawp_2017_2020_1_en_0.pdf

The CAED project looks at the early stages of environmental damage assessment, referred to as the phase of the 'ascertainment' and this first year relates to environmental damage in a broad sense, that means not only with reference to the Environmental Liability Directive (ELD) definition of the environmental damage, but also to the non-ELD national legislation related to environmental damage.

The phases of the environmental damage assessment that involve the quantification of the damage for the equivalency analysis, as well as the choice and design of preventive and remedial measures, are not included in the scope of the project.

Finally, the ambition of the project is to be a useful external support to the work of EU Commission and the DG Environment in capacity building of ELD implementation.

1.4 The Administrative Procedure

The ELD deals with the 'pure ecological damage' and it is based on the powers and duties of competent authorities for claiming actions by the responsible subject (if present) to prevent, mitigate, remediate and compensate the damage. This can be done by the competent authorities through two main ways, the administrative procedure and the civil proceeding.

The administrative procedure, if properly activated and conducted, can be faster than the civil proceeding for the purpose of prevention and the remediation of the environmental damage based on the liability system of the ELD. In environmental damage prevention and remediation, time is a key factor for environmental protection.

The administrative procedure involves a sequence of procedural steps that, for instance, may be identified as: activation phase (the event is discovered/notified by/to the authority), immediate action phase (the event is investigated by the authority), assessment phase (the imminent threat of damage or/and the damage is determined), design phase (the preventive or/and remedial measures are designed), execution phase (the preventive or/and remedial measures are conducted) and monitoring phase (the efficiency of preventive or/and remedial measures is monitored).

However, clear and effective procedural, methodological and technical references, are necessary to guide the process of the damage assessment in the administrative procedure. The production of a guidance for the process of the damage assessment in the administrative procedure is the future goal of this project.

1.5 The Determination of the Environmental Damage

This project focuses on the early stages of environmental damage assessment, referred to as the phase of 'ascertainment', or the 'determination of environmental damage'[8].
The ascertainment can be divided into three steps of actions:

[8] This phase includes the activation phase (the event is discovered/notified by/to the authority), immediate action phase (the event is investigated by the authority), assessment phase (the imminent threat of damage or/and the damage is determined).

1) The **screening** of cases of potential environmental damage and imminent threats of damage *(to identify whether there are potential (or actual) adverse effects on natural resources)*
2) The **determination of clues** of environmental damage and imminent threats of damage for the identification of candidate significant environmental damage and imminent threat of damage cases *(to establish whether there are potential (or actual) sustained adverse effects on natural resources)*
3) The **determination of evidence** of environmental damage and threats of damage for the confirmation of cases of significant environmental damage and imminent threat of damage *(to confirm whether there are actual significant adverse effects on natural resources (i.e. confirmed ELD cases for ELD resources))*

Figure 1 below shows the three steps:

Figure 1 - Three steps of the ascertainment.

These steps may or may not be conducted in a sequential manner.

1.5.1 The screening process

Screening is a preliminary and precautionary evaluation of cases to identify potential environmental damage and imminent threat of damage. At this stage the competent authority should be able to dismiss cases of non-potential environmental damage and imminent threat of damage, e.g. minor non-compliances which may be dealt with under regulations other than those of environmental liability.

The screening phase starts from the discovery by, or notification of, the event to the competent authority. It uses the information and data available at that early stage and ends with the decision to take action to investigate the event in order to find further information and data. The screening can be done in the absence of the site-visit, but not necessarily.

The conduction of the screening, and its efficiency, is affected by how an event is discovered and by what information is available for decisions.

In fact, it is important that the screening identifies and evaluates all potential adverse effects rather than understimating potential consequences of an event. Therefore, it is important, during the screening

process, to make precautionary assumptions about the potential adverse effects in order to not risk to dismissing events of significant environmental damage or threat of damage.

An important aspect in the screening process is to identify whether the natural resources are exposed (damage) or are at risk to be exposed (imminent threat) to the adverse effects of the source of potential damage[9].

Hence, when conducting the screening process, it is important to identify the link between the three key elements of 'source-pathway-receptor'. This approach is based on the risk assessment method that considers for an adverse effect to occur, a source must in some way have a pathway to affect a natural resource. The means by which the natural resource is exposed to the source represents the pathway. Morever, a pathway can only be identified if it is capable of exposing a receptor to an identified source that is capable of causing an adverse effect. For a source to pose a risk, there must be a relevant receptor present which can be affected and a pathway which connects the two. If any of the three elements is missing, then there is no risk and the assessment need go no further[10].

In brief, the screening should answer the following questions:
is there a potential adverse effect on a receptor protected by the ELD? Or
is the case a potential environmental damage and/or imminent threat of damage to such a receptor?

1.5.2 The determination of clues

The determination of clues is a process of evaluation of cases of potentially significant environmental damage and imminent threat of damage. The purpose of the determination of clues is to identify candidate cases of significant environmental damage (according to ELD regime) and imminent threat of damage and to dismiss non-candidate ones.

The determination of clues of environmental damage or imminent threat of damage starts from the decision to take action to investigate the event (the outcome of the screening phase) and ends with the decision to take action to find evidence of significant damage to natural resources.

The determination of clues can be conducted directly, skipping the screening phase.

The determination of clues involves the collection and evaluation of information, data, circumstances and other elements of fact or law indicating the possible existence of damage or imminent threat of damage in the light of the requirements of the ELD regulations (or non-ELD national legislation on damage to the environment).
For instance, to characterise the environmental impacts/consequences of an event it is recommended to consider the intensity, extent and duration (of the impacts), as well as the impacted receptors sensitivity to the source of the potential damage.

[9] In ELD regime, only ELD natural resources have to be considered in the evaluation.
[10] This approach usually underlines the contaminated land risk assessment methods. One example is available at https://www.claire.co.uk/useful-government-legislation-and-guidance-by-country/209-assessing-risks-to-human-health-info-ra2-2

Hence, the clues of damage should be sought:

- firstly, in the impacted receptor (e.g. massive fish kills, persistence of high concentrations of pollutants/contaminants exceeding EQS);
- secondly, in the characteristics of the source of potential damage compared to the sensitivity of the receptor (e.g. harmfulness, mass, volume of released substances compared to the related sensitivity of the receptor).

In case of exposure of a natural resource to the adverse effects of a source of potential environmental damage, possible questions to consider during the determination of clues of damage or even during the screening phase[11] are:

- Will the effects be reversible after the regularisation deriving from the prescription/order of the authority following the non-compliance?
- Is the permanence of the negative changes irrelevant in relation to the quality status of the natural resources affected?
- Is it reasonable to define the consequences of the event as irrelevant with respect to the characteristic significantly impaired by the state of the exposed natural resources?

The determination of clues may include:

- Site visits
- Direct observations (e.g., physical impacts, fish kills, chemical sheens, etc.)
- Interviews
- Identification of potentially exposed or affected resources and services
- Literature Review
- Mapping, tracking, video, and photography/imagery of the event
- Environmental monitoring, sampling and analysis
- Comparisons of data with guideline thresholds
- Estimation, counting of mortality numbers

In brief, the determination of clues should answer the following questions: is there evidence of sustained adverse effects on receptors protected by the ELD? or, is the case a candidate case of significant environmental damage and/or imminent threat of damage to the receptors considered?

The clues of damage are a trigger for further investigation and assessment to find the evidence of damage. Therefore, the pre-definition of the clues of damage for each natural resource protected under ELD can be very useful to easily recognise and dismiss non-candidate cases of being significant environmental damage. As a consequence, the pre-definition of the clues under ELD can save effort, time and money (because the collection of sound evidence can be an expensive and time-consuming process) on unsuccessful assessments.

This last concept is very important to understand that the clues of damage under ELD, from a theoretical point of view, should be identified as indexes of a certain burden/level of significance and can be represented by a combined list of cognitive or measurable indicators.

[11] E.g. for the confirmation of non-potential environmental damage cases of non-compliances/violations discovered during routine and non-routine inspections.

For instance, a combination of indicators on:

- the duration of the event *(question no. 3 of the case study factsheets)*
- the source of the impact *(question no. 8 of the case study factsheets)*
- the magnitude of the event *(question no. 10 of the case study factsheets)*
- the spatial extent *(question no. 10 of the case study factsheets)*

may be considered as clues of damage to evaluate.

Finally, even if in this project the determination of clues has been identified as a singular step in the ascertainment process, the determination of clues is often, in practice, part of the determination of evidence. However, it was decided to separate them as adequate clues can give useful directions on where to focus the determination of evidence and, in certain conditions (e.g. when multiple clues are found), they may represent a suitable alternative for the final decision of the Competent Authority or the civil judgement if the evidence is not found.

1.5.3 The determination of evidence

The determination of evidence is the process of evaluation of candidate significant environmental damage or imminent threat cases that confirm them as ELD cases (or cases of environmental damage under other non-ELD legislation). The purpose of the determination of evidence is to confirm the occurrence of significant environmental damage or imminent threat of damage cases in light of the requirements of the ELD (or other non-ELD legislation).

The determination of evidence starts with the decision to take action to find evidence of damage to natural resources and ends with the determination of the feasibility of the significant environmental damage confirmation. It is preliminary to the phase of quantification of damage and of definition and designing of remedial, complementary and compensatory measures.

The determination of evidence means the determination of 'measurable' and 'significant' adverse effects. Thus, the measurability of the gap between the baseline conditions and the level of the adverse effects is a key aspect in the technical procedure of the determination of evidence.

The determination of evidence of damage may include:

- Collection and analysis of data on the physical, biological, or chemical quality of affected natural resources
- Definition of the baseline ecology, biology, and physical attributes of the affected resources
- Collection of information on potentially affected ecological functions, the ecology and biology of potentially affected species, communities and habitats
- Review of published information for the location of the event and similar locations
- Descriptions of analogous situations in which damage has been characterised
- Modelling
- Consultation with sectorial experts

The determination of evidence is related to the determination of the causal link with the source (as a precondition to apply ELD), the assessment of the information and data collected about the environmental

quality status before and after the event, and the assessment of the damage in terms of the significance of the consequences over time to the natural resource.

In brief, the determination of evidence should answer the following questions: is there a significant adverse effect on receptors protected by the ELD? or, is the significant environmental damage and imminent threat of damage confirmed to the receptors considered?

1.6 Project methodology

The project was designed and executed by a project team comprised of representatives from IMPEL Network's members.

Firstly, a collection of existing guidance documents was conducted: guides, procedures and criteria in use for the determination of the environmental damage and imminent threat of environmental damage in the EU.

Secondly, a specific questionnaire-based survey was circulated among various subjects in different MSs to collect case studies and additional information.

The approach to deliver the project outcomes of this 1st year of work, within its scope, had 4 main components:

1. A kick-off meeting to share practical experiences and identify differences in the approach for the determination of damage, in the interpretation of the ELD, as well as in the ways of identifying the significance of the environmental damage
2. A questionnaire-based survey, developed by the project team, to collect specific information on the environmental damage and imminent threat of damage determination in cases subject or not subject to ELD regime
3. A second project team meeting and subsequent conference calls to analyse the information collected by the questionnaire-based survey and to evaluate the existing guidance documents
4. Editing of the report of the first year, including evaluations of case studies and provided guidance documents.

1.7 Genesis of the questionnare-based survey

In the CAED project kick-off meeting[12] of the project team, some differences emerged in the approach for the determination of damage, in the interpretation of the ELD, as well as the ways of identifying the significance of the environmental damage.

All practical difficulties and different approaches on the determination of the environmental damage were shared among the project team members.

[12] And, successively, in the second meeting.

Some of these are identified in the EU Commission reports on the ELD implementation effectiveness and in the document 'Towards a Common Understanding Document - ELD key terms and concepts'[13], for instance:

- for the assessment of biodiversity damage: the geographical reference to consider for the evaluation of the favourable conservation status;
- for the assessment of water damage: the time and spatial scales to consider for the assessment of the deterioration of the quality status; which types of waters are excluded from the ELD regime; how to deal with water bodies with the lowest quality status; and how to consider the link between water damage and significant risk to human health;
- for the assessment of land damage: how to assess site-specific risks to human health when 'threshold values' do not exist; how to consider contamination to groundwater from land; what means significant risk to human health; and how to assess land damage caused by the introduction of organisms and genetically modified microorganisms[14].

Issues and differences in the approaches among jurisdictions, discussed by the project team and related to the practice of determination, are highlighted hereafter without going into details:

- *Temporal and spatial scales of application when determining significance of water damage and methods in absence of baseline monitoring* (e.g. independence of ELD assessment of deterioration of the quality status from periods, frequencies and spatial scale WFD monitoring, alternative methods in absence of baseline data, use of alternative monitoring to WFD monitoring stations)
- *Geographical criteria for the application of the assessment for biodiversity damage* (Geographical level of the assessment[15] depending on the baseline data, criteria for quantification of the indicators in the Annexes of Species and Habitats directives, considerations about the location of the damage (e.g. at the centre of a range or at the edge), baseline data derived from EIA assessments)
- *Possibility of deriving thresholds where no other standards are available (*determination of derived thresholds for land damage, significance of existing thresholds for land damage, waste leachate thresholds usages)
- *Link between ELD and risk to human health impacts under water damage, for example as result of deteriorations to drinking water supplies, impact on bathing waters* (considering deterioration of drinking water source of surface waters under ELD regime, link between surface water damage and risk to human health, risk or proven of negative impact on human health, considering changing of bathing water status under ELD regime)
- *Land damage and link to water damage (*considering local groundwater contamination derived from land contamination under ELD regime (where significant risk to human health determined))
- *Water damage deterioration of water status and failure to achieve good status (*considering the failure to achieve good status for the water bodies in lower status (e.g. long-term contamination

[13] https://circabc.europa.eu/webdav/circabc/env/envgov/Library/E-Environmental%20Liability/b-ELD%20Expert%20Groups/18%20-%20meeting%2005_10_2017/02-meeting%20documents/DOC5%20-%20Common%20Understanding%20Document%20Sept%202017.pdf

[14] Concerning land damage caused by the introduction of organisms and genetically modified microorganisms, the ELD Training Handbook on boxes in pages 17 and 18 lists some open questions regarding this issue.

[15] Information in 10x10 km cells is the requirement of the Habitat Directive.

that has resulted in more measures or more time to achieve the objective of good status) as water damage)

Following the discussion of the kick-off meeting, the project team developed a questionnaire to explore the abovementioned issues through a broader audience, by a questionnaire-based survey for the collection of case studies and other specific information on practical experience in the determination of damage and imminent threat of damage.
The expectations were to find differences but also common approaches in the determination of the environmental damage, as well as possible solutions for the actual issues.

Following the questionnaire-based survey, some common issues on the interpretation of the ELD were collected among the project team members and sent to the EU Commission for consideration.

1.8 Questionnaire settings and contents

As already mentioned, the objective of this first year of the CAED project was to appraise the differences and similarities in the approaches and issues to the determination of environmental damage and imminent threat of damage under the administrative procedure and to identify strengths, weaknesses, solutions and best practices.

This objective was realised by a questionnaire-based survey, which collected case studies and opinions from the practitioners.
The collection of case studies was also an occasion to explore existing methods and criteria for the determination of damage and imminent threat of damage.

The collected case studies concern ELD and non-ELD cases of damage or imminent threat of damage to 'natural habitats and protected species' (referred hereinafter as biodiversity), water and land.
Moreover, the case studies are presented according the scheme set by the project team and transposed into the questionnaire (see questionnaire form in Annex IV). After the collection of the completed questionnaires the case studies were transposed in factsheets, with the exception of answers to question no. 1, which were transposed in a table in Annex I.
In particular, the questionnaire focused on the ascertainment phase. The core questions were about the conduction of the screening, the determination of clues and the determination of evidence of environmental damage and imminent threat of damage.
Hence, the questionnaire was based on the concepts of 'screening', 'clues' and 'evidence' determination already explained in the paragraphs above.

The questionnaire covered topics related to the ascertainment by posing 15 specific questions (see Annex IV to see the questionnaire and the questions in detail) grouped into 8 main issues of interest, all interrogating different procedural and technical aspects of the environmental damage determination identified in each case study, as follows:

Question 1: authorities that conduct the ascertainment and the assessment of environmental damage and which is the enforcing authority for the preventive and remedial measures
Questions 2-5: identification and description of the event

Questions 6-8: description of the conduction of the screening, the determination of clues and the determination of evidence
Question 9: significance thresholds considered
Question 10 and 11: legal (procedural and technical) requirements, as well as tools/equipment and methods used
Question 12: key findings and lessons learned about the determination process
Question 13: suggestions about the criteria for the determination referable to other similar cases with the same type of damage
Question 14 and 15: training needs for the determination of the environmental damage and imminent threats of damage, as well as additional information, remarks, concerns, requests, suggestions

The questionnaire was disseminated among the IMPEL Network members and other stakeholders, with the objective to involve competent authorities and practitioners for the environmental damage assessment: ministries of environment, environmental protection agencies, nature protection bodies, judges, environmental inspectorates, environmental guard departments, environmental monitoring and research institutions, environmental associations, NGOs, insurance companies and associations, environmental consultants, industrial operators.

1.9 Terminology

Term (alphabetical order)	Definition
Ascertainment	The determination of clues and evidence of environmental damage and imminent threat of damage through information and data collection, analysis and assessment of the event, the effects on natural resources, the environmental quality status ex-ante and ex-post. The ascertainment can be done also by other investigative methods, such as modelling, risk assessment, expert judgement, etc.
Biodiversity	This report frequently refers to the term 'biodiversity' with the meaning of 'natural habitats and protected species'. Moreover, this report concerns both the natural habitats/species protected by the Habitat and Birds Directive and those protected by the national legislation on natural areas.
Determination of clues of environmental damage	The process of evaluation of cases of potential environmental damage that passed the screening phase. This process is preliminary to the determination of the evidence. The purpose of the determination of clues is to identify candidate cases of significant environmental damage and imminent threat of damage and to dismiss non-candidate ones. It involves the collection and evaluation of data,

	circumstances and other elements of fact or law indicating the possible existence of significant damage or imminent threat of damage in the light of the requirements of the ELD or other legislation on environmental damage. It concerns evaluations on the characteristic of the source of the impact and on the effects on natural resources. For example, clues of environmental damage may concern the exceeding of the screening concentration values for soil suspected to be contaminated.
Determination of evidence of environmental damage	The process of evaluation of candidate significant environmental damage cases that confirms them as significant environmental damage cases. This process is preliminary to the phase of designing of quantification of damage and definition and designing of remedial, complementary and compensatory measures. The purpose of the determination of evidence is, thus, to confirm the occurrence of significant environmental damage or imminent threat of damage cases in light of the requirements of the ELD or other legislation.
ELD case and non-ELD case	ELD case is a case where the environmental damage or imminent threat is found significant in light of the requirements of the ELD. Non-ELD case is a case where the environmental damage or imminent threat is found in light of the requirements of other legislation on environmental damage.
Event	Any kind of event which may cause environmental damage, whether it is an accident, on-going pollution, over-abstraction, killing of animals, etc.
Screening	A preliminary evaluation of cases to identify potential environmental damage and imminent threat of damage cases and to dismiss non-potential environmental damage and imminent threat of damage cases (from the beginning). The screening phase is the very early stage of the evaluation (before the determination of clues). It is conducted without taking any action of ascertainment/investigation, but it is conducted only in light of the first information/data available about the event and its consequences (no effects/impacts evaluated). For instance, screening is conducted on information and data communicated by the operator or by an

	authority through a notice reporting about the event. For example, the screening can be useful for environmental inspectors to recognise potential/non-potential environmental damages or imminent threat of damages as a result of non-compliances discovered during routine/non-routine inspections of regulated/unregulated sites. **Please note:** the screening does not only refer to select potential ELD cases but also other environmental damage cases under other legislation.

1.10 Acronyms

ARPA Regional Environmental Protection Agency
CEFIC European Chemical Industry Council
EA Environment Agency
ECD Environmental Crime Directive
EDR Environmental Damage Regulations
EPA Environmental Protection Agency
ELD Environmental Liability Directive
ELY Centre for Economic Development, Transport and the Environment
EU European Union
FCS Favourable Conservation Status
IED Industrial Emission Directive
IPPC Integrated Pollution Prevention and Control
ISPRA National Italian Institute for the Environmental Protection and Research
MARWP Multi Annual Rolling Work Programme
MEA Multi-lateral Environmental Agreement
MoE Ministry of the Environment
MS Member State
NGO Non-Governmental Organisation
SAC Special Area of Conservation
SCI Site of Community Importance
SEPA Scottish Environment Protection Agency
SPA Special Protection Area
SSSI Site of Special Scientific Interest
TFEU Treaty on the Functioning of the European Union
UNEP United Nations Environment Programme
WFD Water Framework Directive
WSR Waste Shipment Regulation

2 QUESTIONNAIRE-BASED SURVEY RESULTS

2.1 Overview

The respondents to the questionnaire-based survey[16] are IMPEL Network members and other stakeholders from all over Europe (no. 22 Member States) with different institutional and non-institutional roles. Various information and no. 32 case studies were gathered (see Annex II) with various practices in different EU Countries in handling and engaging with the procedural and technical aspects for the determination of the environmental damage in the framework of the administrative procedure and, in some cases, judicial proceeding. Other case studies found in literature are provided in Annex III but they are not subject to the following analysis and evaluation.

In the following Table 1 it is possible to find the list of case studies with the related contributors:

Case Study	Name	Country	Contributor
Case study no. 1	Groundwater contamination by pesticides impacting public drinking water supplies	Austria	Environmental Agency
Case study no. 2	Leakage of a hazardous waste stored in a tank as a result of rupture in the tank wall	Bulgaria	Ministry of the Environment and Water
Case study no. 3	Contamination of ground water, soil and building constructions by pharmaceutics production plant	Czech Republic	Ministry of the Environment
Case study no. 4	Cultivation of protected grassland habitat within designated Natura 2000 area	Denmark	Municipality of Aarhus
Case study no. 5	Waste of fertilizer in marine waters and to soil and groundwater	Denmark	Municipality of Fredericia
Case study no. 6	Pollution of waterways due to spill of fluid fertilizer	Denmark	Municipality of Holbæk
Case study no. 7	Discharge of sewage from sewage pumping station to surface water	England (UK)	Environment Agency
Case study no. 8	Solvent leak on railway	Estonia	Ministry of the Environment
Case study no. 9	Surface water	Finland	Centre for Economic

[16] See Annex IV to see the questionnaire and the questions in detail.

	contamination by the release of hydraulic oil through cooling water canalisation		Development, Transport and the Environment (ELY Centre)
Case study no. 10	Destructive fire in a waste treatment recycling facility	Greece	Ministry of the Environment and Energy
Case study no. 11	Destruction of dry and wet heath protected habitats within a protected area	Ireland	Environmental Protection Agency
Case study no. 12	Water over-abstraction from a lake operated by an occupational activity	Italy	ISPRA (Italian National Institute for the Environmental Protection and Research)
Case study no. 13	Surface water contamination by wastewater treatment plant spill	Italy - Region of Calabria	ARPA Calabria (Italian Regional Environmental Agency)
Case study no. 14	Groundwater contamination by halogenated hydrocarbons	Italy – Region of Friuli Venezia Giulia	ARPA Friuli Venezia Giulia (Italian Regional Environmental Agency)
Case study no. 15	Permanence in the soil of buried waste in disused industrial site, near a water body	Italy - Region of Lazio	ARPA Lazio (Italian Regional Environmental Agency)
Case study no. 16	Spill of crude oil in a stream and into the sea	Italy – Region of Liguria	ARPA Liguria (Italian Regional Environmental Agency)
Case study no. 17	Groundwater and soil contamination of a wide urban area	Italy – Region of Lombardy	ARPA Lombardy (Italian Regional Environmental Agency)
Case study no. 18	Hexavalent chromium contamination of groundwater	Italy - Region of Lombardy	Pool Ambiente Italia - Consortium for Insurance and Reinsurance of Liability for Environmental Damage
Case study no. 19	Illegal scattering of depuration sludge	Italy - Puglia	ARPA Puglia (Italian Regional Environmental Agency)
Case study no. 20	Landfill of non-hazardous waste, illegal disposal of waste and contamination of soil and groundwater by	Italy- Umbria	ARPA Umbria (Italian Regional Environmental Agency)

	the leachate of the waste		
Case study no. 21	Chemical warehouse fire, chemical spills during fire extinction	Latvia	State Environmental Service
Case study no. 22	Laying of alien material in a Special Area of Conservation (SAC)	Malta	Environment and Resources Authority
Case study no. 23	Gasoline leak at a filling station	Portugal	Portuguese Environment Agency (APA)
Case study no. 24	Land contamination by illegal dumping of waste by occupational activity on unregulated site	Republic of Croatia	State Inspectorate
Case study no. 25	Major fish kill from release of chemical into waterbody	Scotland	Scottish Environment Protection Agency (SEPA)
Case study no. 26	Operation of water works small hydroelectric power plant	Slovakia	Slovak Environmental Agency
Case study no. 27	Protected nature, land and water pollution due to a massive fire of mostly hazardous waste	Slovenia	Inspectorate of environment and spatial planning
Case study no. 28	Slope detachment from a mine waste dump	Spain	County Inspectorate of Galicia
Case study no. 29	Soil and groundwater pollution by a fuel station in an urban environment	Spain	Pool Espanol de Riesgos Medioambientales (Spain)
Case study no. 30	Groundwater contamination of drinking water supply by fire-fighting foam	Sweden	County administrative board contaminated areas coordination
Case study no. 31	Cargo train accident with run-off of hazardous chemicals	Switzerland	Swiss Federal Office for the Environment (BAFU)
Case study no. 32	Fire in chemical storage and packaging facility	The Netherlands	Ministry of Infrastructure and Water Management

Table 1 - List of case studies with the related contributors

Other respondents are the Ministry of the Environment of Romania, the Presidency of the EUFJE Network, the Supreme Administrative Court of the Czech Republic, the European Chemical Industry Council (CEFIC),

Bayer AG (Germany), ARPA Emilia Romagna (Italian Regional Environmental Agency) and ARPA Campania (Italian Regional Environmental Agency) but they did not fill the questionnaire[17].

Looking at Table 1 it is possible to find cases that concern contamination by pesticides or fertilisers, contamination by contaminated fire extinguishing waters, contamination due to leakage of fuel from underground tanks of fuel stations, surface water pollution or physical changes in the riverbed that caused massive fish kill, fire in waste storages, landfill leachate or illegal dumping of waste, groundwater contamination due to release of hazardous and persistent substances into the soil, contamination of land generated by incidents during transportation of hazardous substances. Lastly, some cases concerned adverse effects to biodiversity in Natura 2000 sites due to the direct or indirect (lowering of the groundwater level) destruction of habitat.

The no. 32 cases that were put forward for this project are a good number but they are only a small (and possibly not representative) sub-set of the total number of ELD investigations and determinations across Europe. Nevertheless, it is still possible to make some statistical analysis.

Firstly, it is possible to find that not every case was addressed under the ELD regime, in some cases, the case was addressed under non-ELD national legislation[18].

Secondly, not in every case study the outcomes of the determination confirmed the environmental damage under ELD regime or under non-ELD national legislation.

The following Table 2 summarises the number of cases divided in water, land and biodiversity damage. Moreover, the table gives the number of cases addressed under ELD transposed legislation (ELD cases) and cases addressed under non-ELD national legislation (non ELD cases). The table finally reports the number of cases where the damage was found or not found and the cases where an imminent threat of damage was found.

	Overall	Water Damage	Land Damage	Biodiversity Damage
n. of cases collected	32	24	15	7
ELD cases	23	18	9	6
Non ELD cases	9	6	6	1
Damage found	15	11	5	4
Damage not found	17	13	10	3
Imminent threat found	5	5	2	1

Table 2 - Number of cases divided in water, land and biodiversity damage

[17] With the exception of Bayer AG (Germany) that provided a confidential case study with the purpose of contributing to the project.

[18] In this regard, it is to be clarified that some contributors classified their case as non-ELD by meaning that it was assessed under ELD but ELD significance thresholds were not exceeded or were no longer valid *(e.g. see case study no. 30).* In other words, the case started under the scope of ELD and it followed under other legislation.

The following Table 3 reports the abovementioned results in detail. As one can see, the cases that were identified as having more than one type of damage investigated are various and also the cases where the imminent threat of damage was found for more than one natural resource.

The number of cases provided by Italy is higher than the other jurisdictions only because a number of the Regional Environmental Agencies of the SNPA (Italian National System for the Protection of the Environment) responded providing case studies, and not because the number of cases in Italy is greater than in the other jurisdictions. As for details about the total number of cases for each Member State please refer to Country Fiches provided by the EU Commission[19].

No.	Member State	Legislation	Type of case	Damage	Imminent threat
1	Austria	Non ELD	WD	found	-
2	Bulgaria	ELD	WD+LD+BD	not found	imminent threat WD,LD,BD found
3	Czech Republic	Non ELD	WD+LD	found	-
4	Denmark - AA	Non ELD	BD	found	-
5	Denmark - FR	Non ELD	WD+LD	found	-
6	Denmark - HO	ELD	WD	found	-
7	England	ELD	WD	found	-
8	Estonia	ELD	WD+LD	not found	imminent threat WD, LD found
9	Finland	ELD	WD	not found	-
10	Greece	ELD	LD	not found	-
11	Ireland	ELD	BD	found	-
12	Italy	ELD	BD	found	-
13	Italy - Calabria	Non ELD	WD	not found	-
14	Italy - FVG	ELD	WD	found	imminent threat WD found
15	Italy - Lazio	ELD	LD	not found	-
16	Italy - Liguria	ELD	WD	not found	imminent threat WD found
17	Italy - Lombardy - AL	ELD	WD+LD	not found	-
18	Italy - Lombardy - PA	ELD	WD+LD	not found	-
19	Italy - Puglia	ELD	WD+LD	not found	-
20	Italy - Umbria	ELD	WD	not found	imminent threat WD found
21	Latvia	ELD	WD	found	-
22	Malta	ELD	BD	not found	-
23	Portugal	ELD	WD+LD	found	-
24	Rep of Croatia	Non ELD	LD	found	-
25	Scotland	ELD	WD	found	-
26	Slovakia	ELD	WD+BD	found	-
27	Slovenia	ELD	WD+LD+BD	not found	-
28	Spain - IN	ELD	WD	not found	-
29	Spain - PA	Non ELD	WD+LD	not found	-
30	Sweden	ELD	WD	not found	-
31	Switzerland	Non ELD	LD	not found	-
32	The Netherlands	Non ELD	WD+LD	found	-

Table 3 - Results of case studies in details (BD=Biodiversity damage; WD=Water Damage; LD: Land Damage)

Table 3 shows that no. 32 case studies were gathered and 21 jurisdictions contributed to the collection of the case studies and many institutions. The list of contributors is provided in Table 1 in par. 2.1.

[19] https://circabc.europa.eu/ui/group/cafdbfbb-a3b9-42d8-b3c9-05e8f2c6a6fe/library/82e90a00-fa70-4af6-bc4b-ab54207b1694?p=1&n=10&sort=modified_DESC

Considering the case study results divided per type of regime (ELD or Non-ELD) and type of damage (Biodiversity, Water, Land), it is possible to observe in the following histogram (Figure 2) various interesting results:

1. biodiversity damage cases are few compared to other types of damage and, moreover, the biodiversity damage for non-ELD regime is only one compared to the 6 cases under ELD regime;
2. water damage cases are the highest number followed by land damage cases that are half the number of water damage cases referring to ELD cases; water and land damage cases are equal for non-ELD cases; land damage is slightly less than in ELD cases;
3. In ELD cases damage not found is almost equal to damage found in water damage and biodiversity damage cases. Damage not found is higher in land damage; for non-ELD cases damage found and not found are almost equal for water damage and land damage.

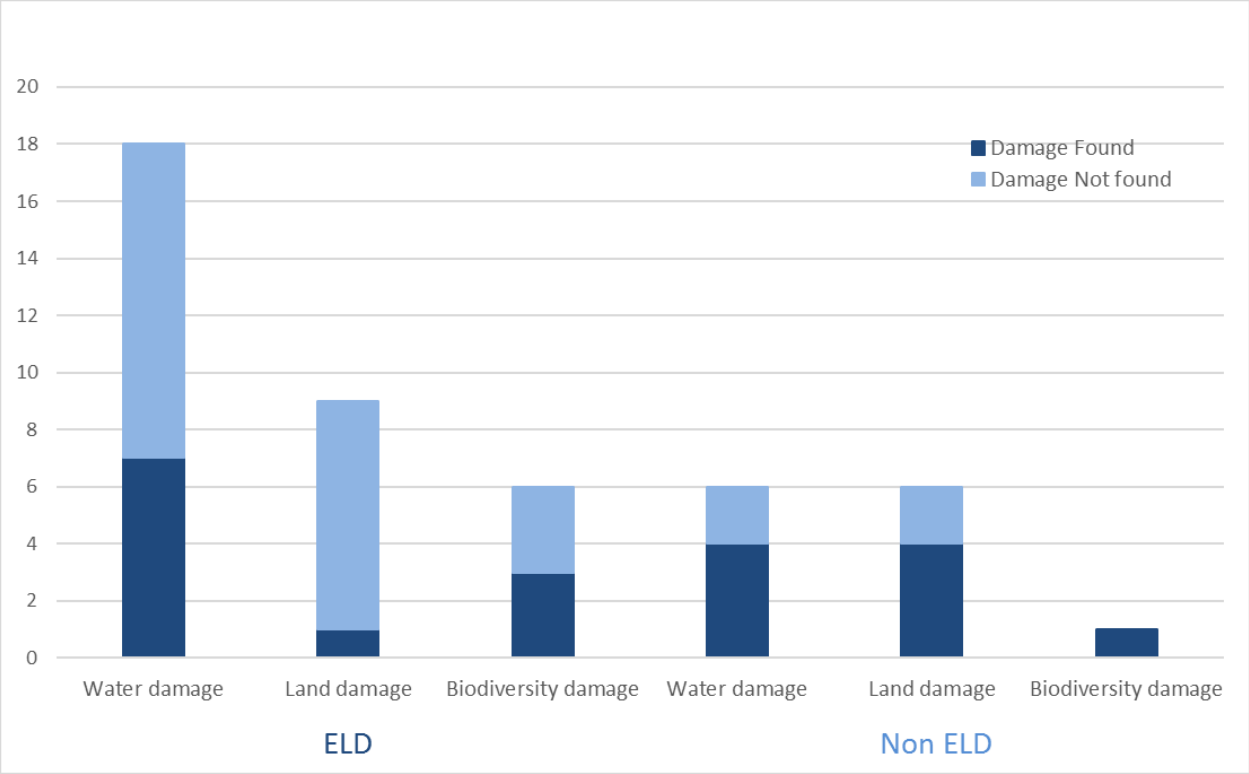

Figure 2 – Case study results divided per type of regime and type of damage

Besides the abovementioned results, it is possible to find other interesting aspects when considering the combinations of types of damage, since more than one type of damage can be reported in a case. The following pie chart (Figure 3) explodes the ELD cases into the different combinations of types of damage.

In the pie chart it is possible to see that under ELD regime 'pure' water damage is the most common type of damage (10 cases and mostly surface waters), followed by the cases of combined land damage and water damage (5); afterward 'pure' biodiversity damage follows (3) and lastly 'pure' land damage (2).

No cases of combined land and biodiversity damage were found (0), while only one case of combined water damage and biodiversity damage (1) and, moreover, two cases of combined water, land and

biodiversity damage were found (2). The cases of biodiversity damage in combination with water damage is low (1).

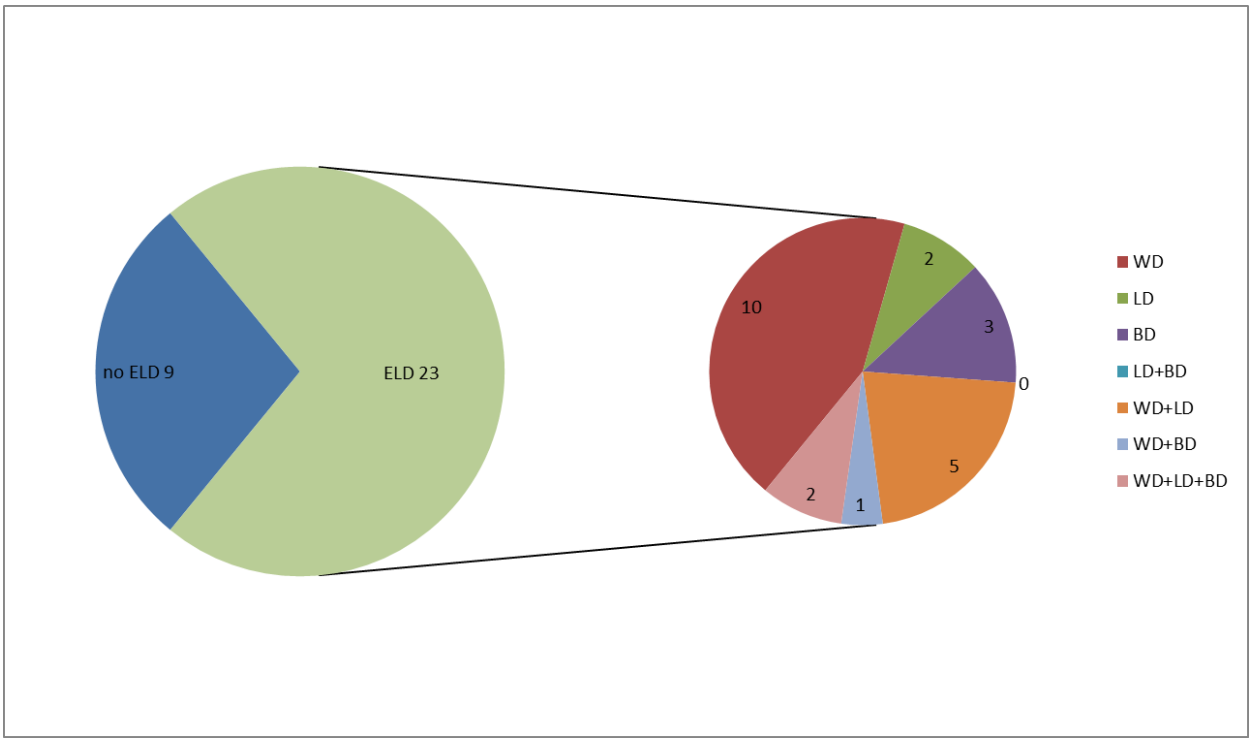

Figure 3 – ELD cases exploded per types of damage

As regard to the following pie chart (Figure 4), it explodes the Non-ELD cases into the different combination of types of damage.

This confirms what was shown in Figure 3: the water damage cases (2) and the combination of water damage and land damage (4) are the highest, then 'pure' land damage (2) and biodiversity damage (1) follow.

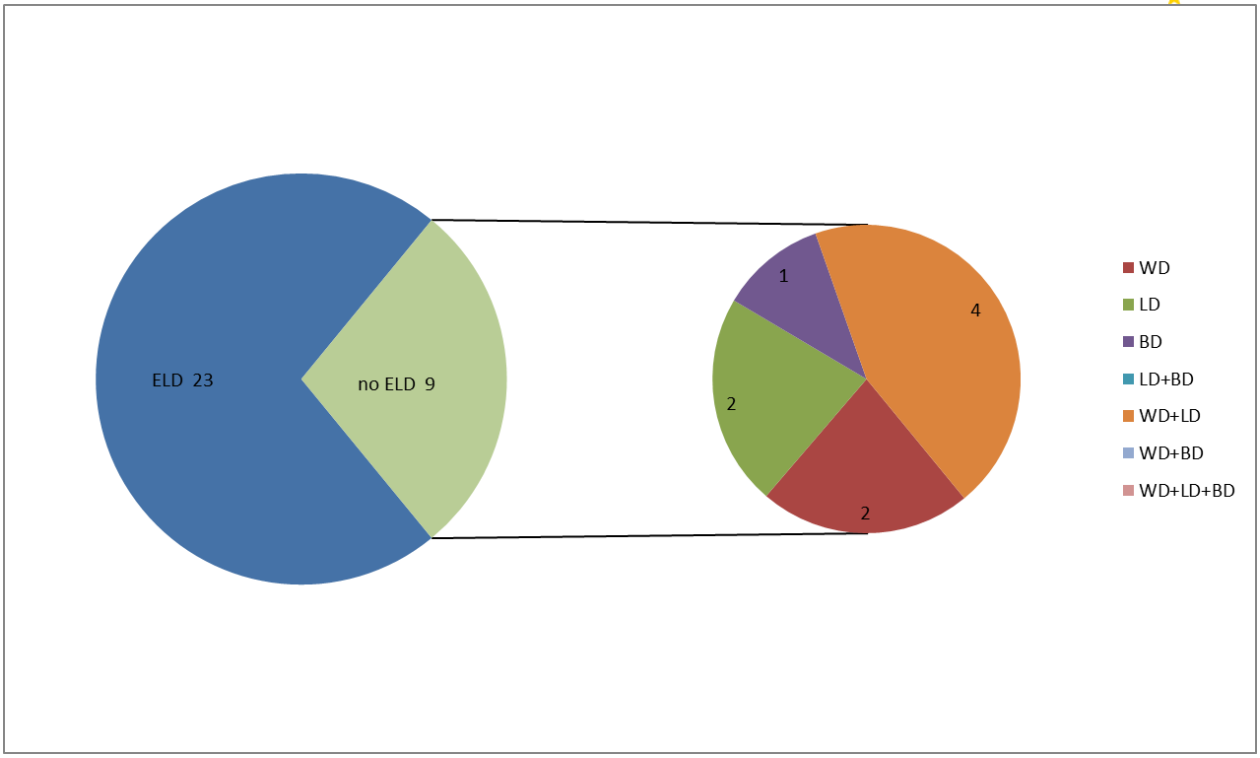

Figure 4 – Non-ELD cases exploded per types of damage

Finally, in the last two charts below (Figure 5, Figure 6) the cases of damage found (15) and damage not found (17) with ELD and Non-ELD cases grouped together shows interesting results in relation to the fight against environmental damage.

The highest number of cases is related to water damage (6 for both damages found and not found). The second ranking is related to the combined cases of land damage and water damage (mostly groundwater) where the cases of damage found (4) is almost equal to the cases of damage not found (5).

There is only one case of 'pure' land damage found (1) and a few more cases (3) of 'pure' land damage not found.

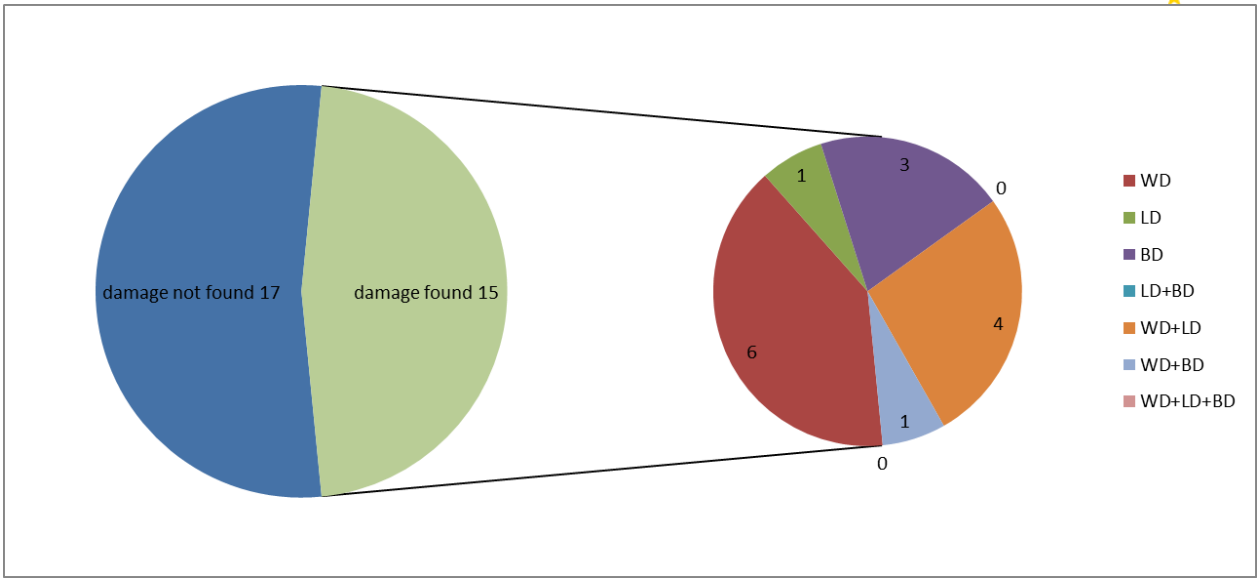

Figure 5 – Cases of damage found exploded per types of damage

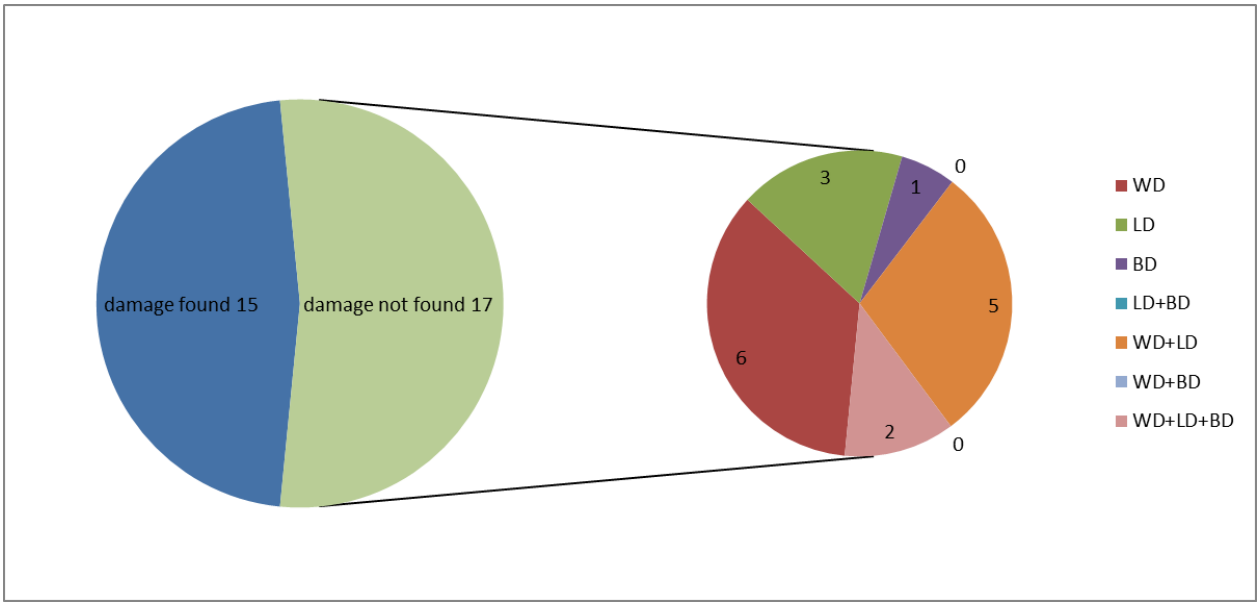

Figure 6 – Cases of damage not found exploded per types of damage

2.2 Authorities that conduct the ascertainment, the assessment and the enforcement

The table in Annex I contains the responses provided by the contributors to the question 1 of the Questionnaire as regard to the roles and duties of the authorities that conduct the ascertainment, the assessment and the enforcement under ELD regime or other legislation on environmental damage.

Focusing in the ELD regime, the information collected show a heterogeneous situation. In particular, at least three ways of managing the ascertainment and the assessment phases can be identified and, also, a combination of them:

- There are national or local agencies that cover all aspects of the environmental protection and give their support whenever collection of data and technical evaluation are necessary (Czech Republic, Denmark, Ireland, Italy, Latvia, Malta, Portugal, Slovenia, Spain)
- Investigation and evaluation are carried out by different agencies/institutes/authorities depending on the natural resource to be investigated (Bulgaria, England, Scotland, Slovakia, Spain)
- Investigation and evaluation are carried out by different authorities following the administrative competences (territorial jurisdiction, responsibilty for granting activity permission, etc.) (Austria, England, Scotland, Sweden, The Netherlands)

As for the enforcing authorities, the responsibility is to one statal authority (Czech Republic, Denmark, Estonia, Greece, Ireland, Italy, Latvia, Republic of Croatia, Slovenia) or to multiple authorities depending on the territorial jurisdiction (Austria, Sweden, The Netherlands) or depending on the natural resource (Bulgaria, England, Malta, Portugal, Scotland, Slovakia, Spain).

In some jurisdictions the enforcing power belong to the same authorities that conduct the ascertainment and the assessment phases (England, Scotland, Latvia, Austria, Sweden, Denmark, Spain, Bulgaria, Czech Republic, The Netherlands, Slovenia, Estonia, Greece, Republic of Croatia, Ireland), while in other jurisdictions the ascertainment and assessment is delegated (Italy) or can be delegated (Slovakia, Malta).

In a jurisdiction (Switzerland) there is no competent authorities under ELD regime, but territorial authorities under national legislation on environmental liability.

2.3 The Determination of the Environmental Damage

In the following sub-paragraphs, some descriptions provided by the contributors of the case studies about the conduction of the screening, the determination of clues and the determination of evidence are reported. See the case studies in Annex II for details.

2.3.1 The screening process

Some worth mentioning methods mentioned by the contributors to collect information useful for the conduction of the screening (question no. 15 of the case study factsheets) are the following:

- an incident Reporting System (with a free phone emergency number) which collects information about environmental incidents reported, e.g. the information collected include the location of the incident, time and date of the report, and information on the potential impact on natural resources;
- a bilingual platform for communication to the competent authority of the environmental damages or the imminent threats of damages *(case study no. 23)*;
- a form for the notification of the imminent threat of damage to be filled and notified by the operators to the ELD competent authority in case of environmental incidents[20] *(case study no. 21)*.

[20] An example can be the form for the imminent threat of damage notification included in in Annex 5, Cabinet Regulation No. 281, 24 April 2007 of the Republic of Latvia.

As regards the identification of possible best practice for the screening, derived from the case studies, see par. 3.2.1.

2.3.2 The determination of clues

Some worth mentioning methods for the determination of clues (question no. 18 of the case study factsheets) conducted by the contributors are the following:

- method of fisheries stock assessment (e.g electro fishing survey): the procedure outlines how one can determine baseline/discount natural variations and how to determine the severity of the impact (number, weight and type of fish killed) *(case studies no. 7, 25)*;
- planned monitoring of the quality status of the natural resources before and after the event according to an ascertainment/investigation plan and actions *(case study no. 7)*;
- Searching GIS systems to determine the status of the habitats and referencing biodiversity data and any available literature on the site and habitats affected (the conservation plan for the site, the Natura 2000 – Standard Data Form for the site and Interpretation Manual of European Habitats) *(case study no. 11)*;
- in order to make an investigation plan, it is worthy to start conducting site visits to the source of the impact and to the surroundings, observing which natural resources could potentially have been affected, confirmation of the estimation of the affected area and initiatory causes, and clarifying doubts; if an operator is involved, it is worth conducting regular meetings with the operator to discuss the assessment of the occurrence; the preventive measures implemented; the remedial measures to be implemented/already implemented; the monitoring programme to be carried out for the assessment of the ongoing situation *(case study no. 23)*.

As regards the identification of possible best practices for the determination of clues see par. 3.1.2.

2.3.3 The determination of evidence

Some worth mentioning methods for the determination of evidence (question no. 21 of the case study factsheets) conducted by the contributors are the following:

- use of electro fishing survey associated to biological impact assessment methods *(case study no. 7)*;
- use of risk analysis under art. 4 of WFD regarding the chemical status *(case study no. 1)*;
- use of soil characterisation and human health risk assessments conducted according to existing national law and/or European guidelines on soil protection/contamination *(case studies no. 3, 23)*.

As regards the identification of possible best practices for the determination of evidence see par. 3.1.3.

2.4 Legal and technical requirements

Respondants approached this question in two ways – some responding with detail on the specific legal and technical requirements of the case studies presented, and others providing overarching information on the legal and technical requirements in their country.

In general, respondants referred to compliance with administrative procedures, ELD transposing legislation and national/international quality standards of analysis/technical requirements of sampling.

Of note is the reference of two respondants to the right of defense of the operator *(case studies no. 1, 10)*, which was satisfied in one case by documenting the liability in environmental inspection findings.

One respondant referred to compliance with published national guidance *(case study no. 11).*

One case revealed that according to the legal framework of the member state, sampling and analysis were conducted by an official laboratory accredited to the national standards *(case study no. 24)*.

Another stated that the environment agency has its own detailed internal procedures ensuring that legal and technical requirements are complied with, in this manner, reliable sound evidence is obtained that enables informed decisions to be made regardless of the legislative regime applied *(case study no. 7)*.

2.5 Tools/equipment and methods used

As expected, the responses to the questionnaire revealed that the tools and equipments for the determination of environmental damage are the same as used for the assessment of impacts of pollution on land, water and biodiversity.

These include chemical and biological sampling and analysis equipment *(case studies no. 1, 3, 7, 8, 9, 12, 14, 15, 16, 18, 22, 24, 26, 27, 30, 32)*, mobile/permanent laboratories *(case studies no. 1, 10, 14, 18, 27)*, electro fishing survey *(case studies no. 7, 25)*, tracer experiments *(case studies no. 1)*, cameras and videocameras *(case studies no. 4, 10)*, air and underwater drones *(case studies no. 5, 16)*, GPS, geo satellites and GIS imagery *(case studies no. 4, 10, 11)*, interoperable platforms of spatial and environmental data and services *(case studies no. 4, 5, 24)*, environmental monitoring databases *(case studies no. 4, 5, 8, 27)*, environmental damage databases *(case study no. 23)*.

Methods for the determination of environmental damage are site inspections/visits *(case studies no. 8, 10, 14, 16, 22, 23, 24)*, interviews of operators/workers/witnesses *(case studies no. 8, 9, 10, 14, 24, 25)*, internet and literature research *(case studies no. 10, 24, 26)*, consultation of environmental monitoring database *(case studies no. 4, 5, 8)* and damage database *(case studies no. 23)*, consultation of public bodies and local authorities about the existing information on the source of the impact, on the site and on the territory *(case studies no. 25, 26)*.

2.6 Key findings and lessons learned

Most respondents reported key findings and lessons learned on similar themes (see box 'Key Findings and Lessons Learned' in the case studies factsheets in Annex II). These are summarised below. The first 4 are of particular relevance to this project on the Criteria for Assessment of Environmental Damage.

Speed of initial investigation (see case studies no. 9, 12, 16, 25, 32)

The prompt collection of evidence relevant to the ELD, particularly on intensity and extent, as well as duration of the source of damage and of its impact to natural resources concerned, is key to decision making and ultimately a successful determination. Particular attention needs to be paid to this when evidence is also being collected for a different regulatory regime which may have different evidence requirements. Delays in the collection of evidence and the evaluation can also arise from other factors such as regulatory and procurement constraints.

Sound Evidence Base (see case studies no. 1, 7, 9, 10, 11, 12, 16, 25, 27, 32)

A sound evidence base is needed to make ELD determinations. In some cases, e.g. major fish kills the evidence is unequivocal. However, in other cases there is a need for up to date databases, for example of baseline condition, along with prompt collection of evidence at the time of an event. Problems are encountered in cases where the initial reference data e.g. safety data sheets are incomplete or not directly relevant to the substances of concern. In these cases, it can be difficult to determine what analysis should be undertaken. Solutions have included compilation of databases and use of reference substances, for substances with similar properties and which behave in a similar way. The collection of sound evidence can be an expensive and time-consuming process.

Availability of procedures/guidelines (see case studies no. 5, 10, 18, 21, 24, 27)

Competent authorities can experience difficulties in applying the ELD significance tests. The European Commission Guidance due to be published in 2020 will prove useful in this respect. Procedures, standards and reference values are important to allow competent authorities to assess and determine ELD cases on a consistent basis.

Lack of precedent (see case study no. 24)

ELD is still relatively new and, because it applies to serious cases which happen rarely, there is a lack of expertise, competence and practical knowledge amongst stakeholders, including the courts.

Importance of routine inspections (see case studies no. 2, 4, 23, 24)

Routine inspections play an important role in identifying potential ELD cases and near misses (as for the screening phase). These can be used to perform pollution prevention actions that can ensure ELD incidents are prevented. Inspections can also develop good working relationships with the operator which should help secure prompt notice from an operator of potential environmental damage.

Collaboration of public bodies (see case studies no. 2, 4, 8, 10, 11, 12, 15, 16, 21, 24)

The expertise to determine an ELD case can be spread across several organisations. Achieving a high degree of collaboration through coordination of multi-disciplinary experts is essential. However, resource pressures within organisations can be a barrier.

At an early stage in a potential ELD case it is important to have good interaction with emergency services, to avoid the risk of exacerbating the problem or introducing a delay in the investigation.

Communications with operator (see case studies no. 11, 14, 23)

ELD cases proceed most successfully when there is a good level of co-operation with the operator and where the operator notified the ELD case. One jurisdiction provided an IT platform to make it easy for operators to notify. A recommended process is for regular meetings with the operator(s) during an ELD case to discuss:

- the assessment of the environmental impact
- the preventive measures implemented
- the remedial measures to be implemented/already implemented
- the monitoring program to be carried out to assess the environmental impact; to assess the environment at the end of the remedial measures; and to determine whether the environment has been restored within the timetable foreseen.

It can be difficult to identify the operator 'owner' of the ELD case i.e. who is it within the organisation, is it the loss adjuster, is it the insurance company?
Particular problems in terms of burden on the public purse arise where the operator is unknown or has entered into insolvency proceedings.

2.7 Training needs

Through the questionnaire-based survey, the contributors expressed a number of topics, methods and possible recipients of training.

As regards the topics, most of contributors expressed the need of exchanging practical experience and knowledge using practical cases as training material for the practical application of ELD rules *(case studies no. 2, 5, 6, 8, 10, 24, 27)*. Practical training in the field about detection, determination and assessment of impacts and damages and training on getting well into relationship with the operators was suggested *(case study no. 32)*.
In general, technical training was the most requested, followed by procedural and organizational aspects (e.g. between organizations involved).

As regards the methods, workshops are the most requested (e.g. because they facilitate proactive approach of participants) *(6 cases)*, followed by e-learning (*5 cases)*, webinars (e.g. on specific issues) (*4 cases)* and training on-the job *(3 cases)*.

Finally, as regards the recipients, civil servants, public authorities, police officers, environmental inspectors, judges, but also operators and NGOs were suggested as possible targets of training (*in particular case studies 10, 24)*.

However, worth mentioning are also the suggestions of organising training to mixed groups of different authorities (*case study no. 24)* and, besides, webinars for 'continuous' training of employees, i.e. as introduction to the new ones and as a refresh to the existing ones (*case study no. 7)*.

Worth mentioning is also the importance, expressed in some cases, of training of operators to increase their awareness about ELD and to make them more sensitive about a more effective prevention of event of environmental damage *(case studies no. 11, 18, 24)*.

Finally, in relation to specific topics of the CAED project, it is to be noted the remark included in *case study 11*: all inspectors involved in site visits for the Regulatory Authorities in the EPA should be trained on screening for potential or suspect ELD cases to ensure that any such cases are identified quickly and investigated adequately upon discovery.

2.8 Collected Guidance documents

While COMs guidance on ELD interpretation is expected at the end of 2020, nine Member States have adopted technical and/or legal guidance documents including electronic tools[21]. Also, the Commission has developed a training package and is supporting ELD training measures[22].

Some Member States, for their part, have published guidance to accompany national transposing legislation. These include Belgium (Walloon Region), Denmark, Finland, France, Ireland, the Netherlands, Portugal, Spain, and the United Kingdom.
Such guidance typically elaborates on provisions of the national legislation and, in addition, provides case studies and guidelines for determining whether the threshold for environmental damage has been exceeded and methods for quantifying such damage. Some of the available national guidance documents are available from the European Commission's Environmental Liability website[21].

Also, the EU-funded REMEDE project was designed to support Annex II of the Directive, which lists different methodologies that can be used for this common framework.[23].

Finally, different stakeholders in the insurance businesses have taken initiatives to develop guidelines and methodologies to assist in determining and calculating the level of compensatory remediation required and to financial security issues. In this regard, it is worth mentioning the reports and guides produced by the IMPEL Network project named *'Financial Provision – what works when?'* [24]

[21] http://ec.europa.eu/environment/legal/liability/eld_guidance.htm
[22] http://ec.europa.eu/environment/legal/liability/eld_training.htm
[23] www.envliability.eu
[24] https://www.impel.eu/projects/financial-provision-what-works-when/

As regards the guidances collected by the project team, only the English versions and the parts related to the ascertainment/investigation and assessment of environmental damage, as well as related to the significance of environmental damage were evaluated.
Some of them are mentioned and linked in the case studies in Annex II, some others are dedicated for internal use of the contributors, so are not public.

From the reading of the collected guides comes out the exigence of Member States to provide guidelines for the interpretation of the ELD transposed into national legislation and, in particular, to provide information and directions for the operators and competent authorities for its implementation.

Some guidance provides procedural and organisational directions for the coordination of different competent authorities, for the management of incidents, for the evaluation of potential environmental damage cases under ELD. These last guidelines also give some criteria and parameters to consider for the determination of damage to concerned natural resources.

What emerges from the guidelines is, also, the exigence of providing the competent authorities of all the links to other related legislation, to all possible useful technical references and existing databases for the investigations and assessment of environmental damage.

The focus of all the guides is on the administrative proceedings, but in some cases the requirements of the civil and criminal proceeding are also taken into account.

Not all the guides have the same interpretation of the ELD, but this depends on the transposed legislation and on the organisational aspects of the whole national system in each jurisdiction. In fact, MSs have their own legislation which transposes the requirements of the ELD and some differences in the transposition exist[25].

Hereafter, it is possible to find some brief description of the collected guidelines.

Denmark
Denmark is equipped with the guideline 'ELD Guidelines', edited by the Danish EPA and ASEP (Agency for Spatial and Environmental Planning) in 2012. This guide clarifies the concept of environmental damage and assists making decisions about whether environmental damage or imminent threat of damage are present, and who is liable for the damage or threat.
Moreover, the guide provides directions on determining whether damage is environmental damage. In particular, it says that environmental damage is characterised by when it took place, what activities caused it and how, what resources it affects, and how and by how much it affects these resources. It, also, says that the competent authorities sort the environmental damage to deal with under ELD or other legislation. In addition, the guide provides a flowchart for making decisions on absolute liability and on liability in the event of errors or negligence.
Finally, the guideline provides in-depth analysis about environmental damage to nature, water, and land, with some examples of events of damage. In particular, the interpretation of environmental damage to nature is discussed with respect to the requirements of the extent and character of the adverse effect and

[25] BIO Intelligence Service, Valerie Fogleman, 2014, 'ELD Effectiveness: Scope and Exceptions' (https://ec.europa.eu/environment/legal/liability/pdf/BIO%20ELD%20Effectiveness_report.pdf)

how this affects the favourable conservation status for protected species and international nature conservation areas. The interpretation of environmental damage to water is discussed with respect to the requirements of the extent and character of the adverse effect and how this affects the quantitative, chemical or ecological status or the ecological potential for bodies of water. The interpretation of environmental damage to land is discussed as far as the requirements of the extent and character of land pollution are concerned, including what risks these entail for human health. The guidelines provide also a in-depth analysis about the imminent threat of environmental damage.

England
England has different procedures for the ascertainment, the assessment of the environmental damage and the enforcement of remedial measures.

The quick guide of the Environmental Agency named *'What is 'environmental damage'?'* (Quick guide 266_09, 2015) defines and describes the definitions of 'environmental damage'[26].

This guide also matches with the idea of the concept of the screening when saying that if a serious incident has happened, or is threatened, it is required to form a quick initial view on whether there are reasonable grounds to believe that the damage is or may be environmental damage. Moreover, it matches with the the concept of the determination of clues when saying that it may not be clear that the environmental damage threshold has been reached until it has carried out an investigation, but if it is believed it may be environmental damage, one should consider the case for action.

Moreover, this guide makes clear who are the enforcing authorities for each type of damage, how one can make the decision on whether the damage occurs and provides details on how to assess significant adverse effect for each type of damage. The guide also provides some useful examples of damage for each type of damage.

A related guide is the one called '*59_09 Identifying and investigating environmental damage cases'*. This guide looks at the first two stages of handling environmental damage - the identification and investigation of 'candidate' cases. This guide defines damage under Environmental Damage Regulations (EDR) as a serious damage, in particular as damage at the top end of the environmental impacts.
The guide also says that the EDR apply as soon there are reasonable grounds for believing that there is or may be environmental damage. And also, it lists the sources that bring to EDR cases the attention: incidents, compliance work, notifications from operators, notifications from third parties, etc.
The guide also contains procedures for dealing with suspected incidents and with incidents due to non compliance, as well as with notification by an operator and parties with sufficient interest. These procedures are related to various competent officers with different roles, duties (and responsibilities) to perform in coordination with other subjects.
What is also important to highlight, is that the guide says that in case of a major investigation evidence should be retained, as far as possible, and a record of staff time should be kept for potential cost recovery.
This guide also contains procedures for establishing who is the enforcing authority, establishing whether the case is within scope of the EDR, deciding whether to instigate a major investigation, preventing damage, and investigating to establish whether it is environmental damage.

[26] They define four types: 'biodiversity' damage – EU protected species and habitats, or damage to a Site of Special Scientific Interest (SSSI); water damage; marine damage; land damage.

This guide also gives directions on data collection, recording and monitoring. In particular, since it may take some time before one knows whether the threshold for environmental damage has been exceeded. During that period, and from the moment one has 'reasonable grounds' to believe there may be environmental damage, it is needed to ensure that all necessary monitoring measures are in place and continuous checking will be needed to establish at what point the environmental damage threshold has been exceeded.

Worth mentioning in the scope of this report are also the guides *'04_01 Incidents and their classification: The Common Incident Classification Scheme (*CICS)' and *'Investigations Manual Operational instruction 353_03, 2019'.*

Further guides are: '*807_11 Dealing with confirmed environmental damage cases (prevention and remediation)', '265_09 Overview of how the Environmental Damage Regulations (EDR) interface with our current powers and duties (quick guide)59_09_SD01 – EDR report form',* etc.

The EDR and comprehensive guidance[27] are available on the Gov.uk website[28]. The guidance contains also various useful diagrams, flow-charts, decision trees, examples, exemptions and case studies related different types of actual damage.

All the abovementioned guidances are focused on the procedures and practical information supporting all the steps of the whole process of the ascertainment and assessment of the environmental damage. This broad volume of guidance documents is well interconnected and linked to all possible national and European useful reference. Other guidance is focused on technical information and procedures to follow when investigating effects on the environment and assessing the significance pursuant the EDR.

Finland

Finland is equipped with the guideline 'Remediation of Significant Environmental Damage - Manual on Procedures (2012)', edited by the Ministry of the Environment. This guide is designed as a manual on procedures for the remediation of significant environmental damage. It provides guidance for assessing the significance of such damage, the selection of remedial actions and official procedures related to remediation.

The primary aim of the manual is to clarify and harmonise actions taken by the authorities for the remediation of environmental damage. For other operators, it also provides information on legislative obligations and practices related to the remediation of environmental damage.

As regard to the ascertainment phase, the guideline contains directions for the assessment of the significance of damage caused to ELD natural resources. The guide, also, considers separately the damage caused by Genetically Modified Organisms (GMOs).

[27] The Environmental Damage (Prevention and Remediation) Regulations 2009, Guidance for England and Wales, 2nd Update, DEFRA, November 2009

[28] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/221095/pb13895-indepth-guide-regs09.pdf

This guide highlights the differences between the requirements of the Finnish Environmental Liability Legislation and the Environmental Liability Directive.
The guide also highlights that there are several restrictions on the scope of application of the Environmental Liability Act. These concern the time of damage and the type of action causing it.

Some decision-making trees and flowcharts (e.g. types of damage and applicable legislation, types of environmental damage and applicable procedures) are included in the guide.

Finally, the guide gives directions for the application of the administrative enforcement.

France

France is equipped with a two-part methodological guide named 'The Environmental Liability Law (ELL) and the equivalency methods Methodological Guide (2012)' edited by the Ministry of Ecology, Sustainable Development and Energy where the first part covers the presentation of the legal and regulatory framework from the law and the second part describes the methods for evaluating environmental damage recommended by the law and by the European Commission's REMEDE working group, as well as the process to follow to determine the remedial measures that should be implemented.
The guideline provides clarifications about the legal and regulatory framework from the Environmental Liability Law and and directions for the implementation of the mechanism and it is focused on the determination of remedial measures and use of equivalency methods.

However, the guidelines give directions on the process for determining remedial measures that is divided into two phases: 1) Identification of the event causing the damage and (description of the event causing the damage, pre-identification of resources, ecological services and related damaged functions, determination of the causal link between the event that occurred and the environmental impacts identified, 2) Determination of the site's baseline condition (data collection, choice of proxy and determination of its baseline condition level, assessment of the nature and gravity of the damage with regard to the baseline condition).

In the first phase, the guide gives some directions on the identification of the event causing the damage with the help of a case study related to a severe accident. In the second phase of determination of the site's baseline condition, the guide gives directions on the availability of databases such as those concerning aquatic environments, the habitat and biodiversity and other databases. The guide, finally, gives guidance on the assessment criteria for the conservation status of a species and habitats, and criteria for estimating impairments for each damaged habitat or species.

Ireland

Ireland is equipped with the guidelines *Environmental Liability Regulations Guidance Document (2011)* produced by the Environmental Protection Agency.
The guide is intended to provide guidance for operators, regulatory authorities and the public in relation to the Environmental Liability Directive and the European Communities Regulations.

As regard to the ascertainment phase, the guide provides directions related to responding to an imminent threat, immediate action, determination of environmental damage and immediate action, screening (that includes a decision tree for the screening assessment for damage under the regulations), damage to habitats and species, water, land. The guide provides clarifications on the natural resources covered by the Regulations and on the criteria for establishing the significance.

This guide, as for the assessment of damage to habitats and species, says that any damage to protected species and natural habitats that has a proven effect on human health must be classified as significant damage under the Regulations, regardless of the criteria which may be used for establishing favourable conservation status (source: EU Commission, 2006).

This guide, as for the assessment of water damage, says that effects will be regarded as significant enough to qualify as damage under the Regulations if they result in: change in status to a lower status; or
change to a lower status of any quality element for the classification of bodies of surface water or any parameter (conductivity, level or concentration) for the classification of bodies of groundwater; or change to a lower status for any parameter (conductivity, level or concentration of pollutants) for the classification of bodies of groundwater.
Moreover, it says that monitoring of the chemical, ecological or quantitative parameters of a water body may be carried out after an incident to establish the relevant status of a water body. Data analysis will follow the criteria outlined above under WFD reporting standards to establish the status of a water body. Finally, it states that if an incident of water damage causes water pollution to an extent that it adversely affects human health, then the damage is considered significant under the Regulations. This is regardless of the water quality status before or after the incident.

This guide, as for the assessment of land damage, gives information on risk assessment principles, components of screening level risk assessment, site specific quantitative risk assessment and its components.

Worth mentioning it is also that in Annex of this guide, it is possible to find case studies for damage to natural habitats, damage to protected species, damage to water and damage to land, that are described with the following sections.

Latvia

Latvia has a Cabinet Regulation No. 281 (adopted 24 April 2007) regarding *Preventative and Rehabilitation Measures and the Procedures for Evaluation of Environmental Damage and Calculation of Costs of Preventative, Emergency and Rehabilitation Measures*[29] which contains also a method for determining the significance of the environmental damage

The guidance in order to evaluate the significance environmental damage gives relevance to only two parameters such as the level of 'Importance' of the environmental damage and the 'Suspension Options', namely the possibilities to stop the environmental damage. In fact, for each aspect of the named activity

[29] https://likumi.lv/ta/en/en/id/157197-regulations-regarding-preventative-and-rehabilitation-measures-and-the-procedures-for-evaluation-of-environmental-damage-and-calculation-of-costs-of-preventative-emergency-and-rehabilitation-measures

that causes direct environmental damage, the significance of that damage is evaluated on a points system: the more important the direct environmental damage is in terms of environmental quality, the higher the score.
So, the 'Importance' is divided into the following cathegories: Detailed importance (1), Low importance at local level (2), Significant local relevance (3), Importance of national importance (4), International relevance (5). The scores given increase from the detail level to the international level of importance.

The 'Suspension Options' are divided into the following categories: The chances of halting this damage are very low (1), The possibilities to stop this damage are insignificant (2), The chances of halting this damage are medium (3), There is great potential to stop this damage (4), Directly controls this injury (5). The scores given increase from the level in which is not almost impossible to halt the damage to the level in which is the effects of the event are under control.

At the end, the significance of the environmental damage is evaluated with a multiplication of scores and the damage is classified into 4 'significance' categories with different score intervals: The damage caused by the named activity is very significant (15-25), The damage caused by the named activity is extremely significant (9-14), The damage caused by the named activity is significant (4-8), The damage caused by the named activity is negligible (1-3).

This method intends to simplify the assessment of the environmental damage[30], giving relevance to the level of protection of natural resources (international protection is better than national and local) and gives importance to the preventive and remediation measures that are or may be implemented to halt the damage.

Portugal

Portugal is equipped with the document *'Guide for the Assessment of Imminent Threats and Environmental Damages, The Environmental Protection Agency of Portugal and the Ministry of Agriculture, the Sea, the Environment and Territorial Planning (2011)'*, This guide is a document providing assistance to operators for them to check their compliance with the obligations arising from the application of the EL statute and, simultaneously, it is a decision-making support tool for the authority in charge of the application of the EL statute.

The guideline contains directions related to the assessment of the environmental damage and imminent threat of damage. In particular, it provides directions for assessing the baselines situation and the effects of an incident, as well as directions to identify interventions in the event of an incident, situations of imminent threat, preventive measures, and situations of environmental damage. The guide also provides definition of the concept of 'extent of damage' and the directions for the assessment of the extent of the effects and for the assessment of risks to human health.

As for water damage the guide says adverse, transient and short-term effects on water bodies, from which they can recover without the adoption of remediation measures, are not considered significant enough to cause a deterioration of the status of such water bodies, as indicated in the European Commission's 'Guidance document on exemptions to the environmental objectives' (2009).

[30] This method implies an expert judgement anyway.

The guideline also says that the occurrence of incidents sometimes results in short-term damages of reduced impact, for example due to the dilution effect of the medium, so not all adverse effects on a water body are environmental damages as defined under the EL statute. Moreover, the extent of such damage has to be assessed in order to decide for the applicability of the EL statute and also, based on the developments after the adoption of appropriate containment measures, and provided that there are persistent effects justifying the status alteration of the affected water body, the situation shall be duly included within the framework of the EL statute.

The guide also says that any effect on species or habitats that pose a significant risk to human health, regardless of the eventual deterioration of the status of such species or habitats, is to be also considered as environmental damage and any effect on a water body resulting in a significant risk to human health shall be also considered as 'environmental damage', regardless of any deterioration of such water body.

Various decision making trees and flowcharts as well as boxes with examples and suggestions are included in the guide (e.g. decision-making support flowchart for the applicability of the EL statute, decision-making flowchart for the applicability of the EL statute upon the occurrence of an incident, course of action flowchart in the event of an affected water body, flowchart of general procedures in the framework of the EL statute, operator´s intervention flowchart in the event surface or ground water bodies are affected, decision-making flowchart in the event of damage to a water resource; flowchart for the assessment of damages to the soil).

Finally, worth mentioning is that Portugal is equipped with a database of environmental damage events provided and managed by the Environmental Protection Agency.

Scotland

As regard to the ascertainment phase, a guide named *'Environmental Liability (Scotland) Regulations 2009, Draft Guidance, August 2009'* produced by the Scottish Government provide assistance to those seeking to have a better understanding of the requirements and practical application of the Environmental Liability (Scotland Regulations 2009 available in the Scottish Government's website [31]). It is aimed at those carrying out activities that may cause imminent threats of 'damage' or actual 'damage', the authorities responsible for overseeing the Regulations and those who are interested more widely in the application of the Regulations.

The guidance describes the main provisions of the Regulations and in particular when the Regulations apply and what is required by whom when they do. It also encourages the use of flexible communication between operators and competent authorities.

As regard to the scope of this project, the content of this guide includes guidance about the meaning of 'damage' under the Regulations, who is liable, exemptions, deciding whether the Regulations apply, damage to protected species and natural habitats, to water, to land, roles and responsibilities, duties of operators, duties of competent authorities, preventive measures, determination of damage, possible examples relevant to Scotland that might meet the threshold of damage to European habitats or species under the Environmental Liability (Scotland), case studies of damage to marine habitats and species, etc.

[31] http://www.scotland.gov.uk/Topics/Environment/waste-and-pollution/Pollution-1/ELD

Worth mentioning are the paragraphs *'What do we mean by 'adverse effects significant enough to cause deterioration of status'?'* and *'What sort of pollution incidents might result in water damage?'* for water damage, *'Causes of risks of adverse effects on human health'* and *'Assessment of the significance of a risk'* for land damage.

The guide includes a decision tree for deciding whether the Regulations apply and flowcharts for the determination of immediate action, the determination of damage and remedial measures.

Competent Authorities may also have internal or external procedural or technical guidance.
All the abovementioned guidances, like in England, is focused on the procedures and practical information supporting all the steps of the whole process of the ascertainment and assessment of the environmental damage.

The Netherlands

The Netherlands is equipped with the document *'Guidelines for Part 17.2 of the Dutch Environmental Management Act (Wm): measures in the event of environmental damage or its imminent threat (English translation of original version dated 8 January 2008)'*, issued by the Dutch Government.

This guide provides directions to the competent authority to order action or take action to prevent impending environmental damage, and to limit and remedy such damage that has already occurred.

The guide highlights the differences between the requirements of the Dutch Legislation and the transposed Environmental Liability Directive.

Worth mentioning is that this guide says that if you discover damage, or the threat of damage, to soil, water or nature areas, an action plan can be of assistance. The plan sets out the steps that a competent authority can and must do in such cases.
So, the guide provides directions to set out and implement an action plan that is divided in the following parts: detection of environmental damage (or its threat), measures to prevent and limit environmental damage, remedial measures, costs recovery, notification and registration.

The guide provides, also, directions about the collection of information following the notification of the perpetrator or in other cases, the verification of measures already taken.
The guide contains an interactive decision tree that allows to determine whether a particular type of environmental damage (or its threat) falls under under Part 17.2[32]. Each box of the decision tree has a dedicated paragraph that explains its content and gives directions.

[32] Damage falls within the scope of Part 17.2 if it is to protected species, natural habitats, water or soil; exceeds the damage threshold; results from an activity performed in a professional or operational capacity; falls within the scope of: Annex III to the Environmental Liability Directive; or, if not, it can be classified as damage to protected species or natural habitats, and the entity carrying out the activity that caused the environmental damage (or the imminent threat of such damage) (the "perpetrator") can be deemed at fault or negligent; and the damage is not an exception as described in Section 17.8 of the Wm.

One should take into account that in The Netherlands three damage thresholds exist that are relevant for determining whether an occurrence of environmental damage falls under Part 17.2. The threshold for damage to protected species and natural habitats, threshold for damage to water and the threshold for damage to soil.

As for the damage to soil, the guide says that, in contrast to the ELD, the duty of care and the regulation for unusual occurrences are not limited to professional or operational activities. In the case of damage to soil, the Directive applies only if and insofar as the pollution or harm poses a significant risk of adverse effects on human health. Less serious and other effects fall under the Environmental Management Act (inside an installation) or the Soil Protection Act (outside an installation).

The duty of care under the Soil Protection Act extends further than that under the Directive. With the former, all pollution and harmful effects must be reversed as much as possible, i.e., not only if and insofar as there is a significant risk in relation to human health, while in the case of environmental damage from soil pollution due to the direct or indirect addition of materials, preparations, organisms or microorganisms onto, into or under the soil, the Directive states that environmental liability arises if the addition entails a significant risk of adverse effects on human health. To decide whether there is a 'significant risk', the definition used is based on existing standards and concepts in the government's soil policy. The intervention value in the soil policy is a generally used risk limit. In relation to the Environmental Liability Directive, the proposal is to adopt this intervention value. It is relevant here to base it on an intervention for human risks, in other words the risks for human health.

As for the damage to water, the guide says that underlying the Dutch legislation for implementing the objectives of the WFD is the assumption that they apply only to surface waters, which are designated as bodies of water by WFD. Relatively small waters, such as polder canals, are often not designated as bodies of water. The ELD refers to 'damage … of the waters concerned …' and not to damage to bodies of water. Moreover, the associated definition is not limited to waters designated as bodies of water, but it does embody the idea of 'status' from the WFD. When applying the ELD, it is therefore recommended to ascertain the status before the damage occurred, based on the monitoring or experience data available from the water board concerned. As for water damage, the guide gives directions for answering the following questions: what was the ecological, chemical and/or quantitative status of the water (before the damage occurred)? is there an adverse affect on this status? If so, is it significant?

As for the damage to species and habitats, the guide gives information and directions on which are the protected species and natural habitats, on how to find locations of the species and habitats, what information is already available for determining the baseline condition, what information is becoming available, damage to other than Natura 2000 areas, how to determine the area boundaries, etc.
Worth mentioning, regarding damage to species and habitats, is that the guide says that damage with a proven effect on human health is deemed significant damage and that the following need not be classified as significant damage: adverse variations that are smaller than the normal average variations for the species or habitat in question; adverse variations due to natural causes or resulting from the normal management of areas (as recorded in habitat files or documents setting out the objectives, carried out previously by owners or operators), damage to species or habitats from which it is known they will recover within a short time and without intervention (to the baseline condition, or a status which leads, solely by virtue of the dynamics of the species or habitat concerned, to a condition deemed equivalent or superior to the baseline condition).

2.9 Suggestions from the contributors of the case studies

At the end of each case study factsheet, it is possible to find a box called 'Additional information and suggestions' in which the contributors were invited in through the questionnaire at providing any possible suggestions or remarks about the project and/or the implementation of ELD.[33].

The suggestions and remarks from the contributors can be summarised as follows.

General suggestions at EU level

The common difficulty in assessing the significance of the environmental damage results in a request to define (e.g. at European level) table reference values for all the natural resources in order to simplify the assessments and facilitate the chance for a rapid assessment and a quick response to environmental damage or threat of damage events.

A proposal for addressing the problem of the imminent threat of damage for events not yet occurred is, for instance, to improve (e.g. at European level) obligations in the authorisation related to the maintenance of environmentally critical parts of facilities. The obligations related to maintenance and correct management could be particularly identified in the parts of the plants, such as tanks, storages and pipelines, that present the major risks of environmental damage. This major risk could be identified, for instance, on the basis of the experience and by the use of databases of cases. For this objective, also a specific Standard for certification could be of help.

Another contributor remarked a key issue is to address the problem of the environmental damage, the specific actions and procedures to be adopted, in the event of bankruptcy of the liable operator.

Moreover, the development of an environmental damage database at EU level, other than at national level, or the development of IT tools for evaluation of damages is considered very important for the purpose of accelerating and increasing the effectiveness of the process of ascertainment and assessment.

Suggestions related to the CAED project

Moreover, it is remarked by the project team that it is of particular importance to establish clear criteria for determining whether an environmental damage exists. It is also suggested as practical to consider intensity, extent and duration of contamination/impacts, as well as natural resource sensitivity in the assessment process.

Another contributor suggests that the screening process and determination of clues and evidence often might be handled in the same way and/or the same time for simple cases (not applicable in complex cases), so the suggestion is to provide also a guide to perform all of them at the same time.

[33] It is possible to find them all in the respective case study factsheets (Annex II).

Finally, the project team received a request to highlight that in some jurisdictions old environmental burdens and loads coming from the period before the privatisation of former state-owned sites must be distinguished by current type of damage which is under ELD. In addition, one can find a high interest on exploring procedures and methods for cases regarding accidentally discovered contaminated sites and cases when polluter does not exist or is unknown.

3 EVALUATION OF THE QUESTIONNAIRE-BASED SURVEY RESULTS

3.1 The Determination of the Environmental Damage

The collection of the case studies has been very productive with regard to the number of cases collected as well as to the quality of description of the cases studies. Most of the contributors paid attention to the details and to the correct position of the information.
Moreover, almost all of them where consistent in placing the information in the questions related to the proposed concept of screening, clues and evidence of environmental damage.
At this regard, it is to be noted that in different jurisdictions an evidence of damage can be interpreted as clue of damage and viceversa. This is due to the reasons of different interpretation of the significance of damage - hence, on what is an evidence - among jurisdictions and, also, among practitioners where the significance threshold is not standardised (by the law, or guidelines) but depend on expert judgement.

In paragraph 2.3 some best practices for the conduction of the screening (subpar. 2.3.1), the determination of clues (subpar. 2.3.2) and the determination of evidence (subpar. 2.3.3) were mentioned referring to case studies factsheets (Annex II). But, also, other practices can be considered as best practices, as follows.

It must be clarified that the identification of best practice is relative and cannot be objective, in fact, it can depend on various factors, for instance: the existence of a monitoring system to recover baseline data, the existence of supporting national primary or secondary legislation/guidelines that provide methods for the ascertainment and the assessment (according to ELD requirements), the availability of state-of-the-art technology, etc.
Moreover, for the abovementioned reasons, it is important to say that best practice cannot be considered as an example applicable or reachable in every jurisdiction, because of possible and actual constraints or, merely, differences in national systems.

3.1.1 The screening process

As for the screening methods, the use of general and/or specific check-lists to evaluate the potential damage or threat of damage of an event[34] may be considered as a best practice, useful for notifications of operators to competent authorities or during site visits of inspectors.
Moreover, the potential damage of events can be evaluated according to a defined classification of events and their possible consequences on natural resources, e.g. classification of events that can involve activities included in Annex 3 of ELD with the same procedures of SEVESO Directives but focused on the

[34] E.g. built on the information collected by existing national damage databases or on existing damage risk assessments methods.

protection of the environment[35]. For instance, if the occurred event affects a natural resource that is protected by ELD and the event can be considered as severe (Annex 3 activity + some more information about the type of the event and magnitude in relation to the sensitivity of the natural resource) it is always evaluated as potential damage and it should trigger for further investigation.

Even if the screening of the potential damage can be done in absence of a site visit, it would be important to consider that the potential damage of events is better evaluated by field observation.

For this reason, the interview of eyewitnesses (citizens, associations, public officers, inspectors, environmental specialists, fire brigades, etc.) and the use of videos and photos *(see e.g. case study no. 5)* and the implementation of pre-defined agreements and pre-organised procedures for cooperation among different competent bodies (Police, Prosecutors, local authorities, environmental associations, NGOs, environmental agencies, nature protections agencies, Competent Authorities, etc.) for the screening of cases *(see e.g. case study no. 26)* may be considered as a best practice.

Other possible best practice for the screening of potential damage can be that the discovery of a contamination or a deterioration, which indicates a sustained adverse impact or significant deterioration, during the routine quality monitoring conducted according to a ELD related Directives (WFD, Habitat, Birds, Marine Strategy) is evaluated as potential damage and triggers further investigation *(see e.g. case study no. 4)*.

Finally, the screening of potential damage of events can be evaluated by setting the potential impact on public health (as indirect target) as a priority and as a trigger to take immediate action and investigation *(see e.g. case study no. 1)*, before evaluating every other aspect.

3.1.2 The determination of clues

Usually, the determination of clues is referred to the ascertainment actions conducted in the field on the impacted natural resources. Magnitude (or intensity) of the event with reference to the impact on natural resources and (if possible) to the source of the impact, the spatial extent of the impact on natural resources, the sensitivity of the natural resources in relation to the type of the impact and the duration of the impact are considered and evaluated as clues of damage and their determination (where possible) and, finally, the evaluation (in combination) of the potential or actual sustained adverse effects may be considered as best practice.

Some clues and their determination described by the contributors (questions no. 17 and 18 of the case studies factsheets) are in some way consistent with the concept of clues that are proposed in this report (see subpar. 1.5.2), for instance, the case studies no. 1, 3, 5, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 24, 25, 26, 27, 31, 32.

An example of determination of clues is related to the information and data collection of the event, data collection of the environmental quality status before and after the event, sampling and analysis and

[35] Some competent authorities use simple flowcharts for the screening of ELD case and not-ELD cases on the basis of information related to ELD scope.

comparison of results with EQSs. In any case, the clues of damage (that trigger futher investigations) should be evaluated in relation to the abovementioned information and, moreover, in relation to the possibility of finding a long-term adverse effect on the natural resource with further monitoring/investigations.

As an example, a common practice when looking for clues of damage to surface water is to conduct an on-site inspection for sampling and analysis of the wastewater at a discharging point and of the water body (upstream and downstream); the sampling is done to determine both the concentrations (with the comparison of results with EQSs) but also to identify the causal link and to characterise the type of product *(see e.g. case study no. 13)*.
Even if needed for other reasons, most of the time this practice of ascertainment may be not sufficient to be considered as a clue of damage under ELD, if no evaluation of possible or actual long-term effects is conducted. In fact, if one or more wastewater discharges produce only short-term chemical adverse effects on the surface water body, then the case should not be considered under ELD regime, provided that ecological damage does not exist.
On the contrary, any suspicion of long-term contamination/pollution of a natural resource should be considered as a clue of damage (see e.g. *case study no. 3)*.

One interesting case of clues of damage is the death of fish in a water body: a massive fish kills may be considered as a clue of damage because it can represent a long-term adverse effect to the surface water body. But it does not directly represent an evidence of water damage (or biodiversity damage if protected species are involved) under ELD if an assessment on the long-term adverse effects and, hence, on the deterioration of the ecological status is not conducted (e.g. through the use of a national guideline like 'Assessing fish kills' guideline in UK).

Some MSs also provided, in their laws or guidelines, some pre-defined thresholds of significance of potential damage. In fact, a clue of environmental damage may be represented by the exceeding of pre-defined national thresholds (e.g. concentration thresholds for potentially contaminated soil[36] or thresholds of spatial extent of the potentially polluted surface waters[37]) in combination with other relevant indicators.

Generally, the use of national or international pre-defined thresholds and guidelines for the determination of clues of damage may be considered as a best practice.

3.1.3 The determination of evidence

As already mentioned, the evidence of damage represents a significant (and measurable) adverse effect to the natural resource.

[36] These thresholds are included in the legislation of various MSs. For instance, in the Italian legislation exist pre-defined thresholds for soil contamination named CSC (ref. Law D.Lgs. 152/2006, part. IV, Annex 5) *(see case studies no. 10, 15, 17, 28)*.
[37] For instance, in Scotland there are national standards for the evaluation of the status of water bodies which include spatial extent (ref. 'The Scotland River Basin District (Standards) Directions 2014' and 'The Scotland River Basin District (Status) Directions 2014').

As emerged in the project team members discussions (see par. 1.7) there is not always a common interpretation of evidence of damage among MSs. However, even when the interpretation of evidence is the same between MSs, the difference stands also in how the evidence is determined (e.g. independence or dependence of ELD assessment of deterioration of the quality status from periods, frequencies of WFD monitoring) that can generate some differences in the determination and, thus, in the conclusion of the assessments.

In jurisdictions where pre-defined 'thresholds' of significance do not exist in the laws or in national guidelines (if not expressed or clarified at EU level), the determination of the evidence of damage may rely completely on expert judgement (which may generate also inconsistencies in the assessment at national level).
The use of expert judgement, however, is not viewed as negative, but the definition of procedures and methods for the ascertainment and assessment at national or international level may be of help for the solidity of experts judgement conclusion
In this regard, as already mentioned, some MSs provided ELD guidelines (or secondary regulations) that clarified some national interpretation of significance in order to homogenise the interpretation at national level. However, even when guidelines (or secondary regulations) provide some pre-defined thresholds of significance (e.g. in the case the spatial/volumetric thresholds of Italy for the assessment of the deterioration of groundwater bodies[38]), the assessment of damage is still a matter of expert judgement approach and it is not reduced only to an exceeding of significance thresholds. Like it happens in the approach of the DPSIR (Drivers, Pressures, States, Impacts, Responses) method for assessment of environmental impacts, some evaluations, for instance, are still present also in simplified criteria of assessment *(e.g. see the case study no. 21)*.

In the objective of achieving a common interpretation of the evidence of damage under ELD among MSs, high expectations are placed on the 'Guidelines on environmental damage' of European Commission due to be issued at the end of 2020.
It is worth mentioning that the Weser ruling (C-461/13), of the Court of Justice of the European Union (CJEU) concerning the interpretation of 'Deterioration of the status of a body of surface water' of Article 4(1)(a)(i) to (iii) of Directive 2000/60/EC represented a key clarification for the assessment of water damage.

Generally, the use of national or international pre-defined thresholds of significance and guidelines for the determination of evidence of damage may be considered as a best practice.
With reference to some determination of evidence described by the contributors (questions no. 20 and 21 of the case studies factsheets) it might be possible to consider as a best practice the following approaches:

For damage to natural habitats:

- To conduct an assessment at local level by field visit and evaluation of existing data and by aerial photos/maps and to compare the area adversely affected to the size and the conservation status of the whole area of the same habitat on the site. Moreover, to conduct an assessment on whether the adverse effects are significant against reaching or maintaining the favourable conservations

[38] For instance, in Italy, the deterioration of the chemical quality status of groundwater bodies is defined when the WFD monitoring stations with low quality status represent more than 20% of the total area or volume of the groundwater body (ref. Law D.Lgs. 30/09, art. 4, par. 2).

status of habitats, taking into consideration the overall conservation status and trend of the habitat and the rarity of the habitat and species at regional or national level. Moreover, to conduct an assessment on the timeframe of recovering without intervention.

For damage to surface waters:

- To conduct, after a severe pollution event negatively affecting a water body, the assessment of the ecological condition of the water body with respect to the related biological quality elements: forecasting and monitoring whether the condition of classes, stock density, and age composition, that existed before the event, will be re-established after one-two years.
- To conduct the assessment of the severity of a fish kill through a fisheries stock assessment based on electro-fishing survey on the water body.

For damage to marine waters:

- To conduct an assessment of the adverse effects on marine waters through a model of marine dispersion using data from ongoing monitoring of the state of the marine environment and, if needed, assess of possible sediment contamination through photographs/videos and sampling of sediment and benthos; if the source of contamination is onshore, conduct a survey on the pollution of soil and groundwater based on samples of soil and groundwater and conduct a contaminated groundwater dispersion forecasting.

For groundwater damage:

- To conduct a groundwater investigation to determine the severity (magnitude and extent) of the groundwater body contamination: groundwater sampling, monitoring stations installing, connected surface water sampling, tracer experiments to forecasting the behavior of the contamination. Successively, conduct a risk analysis under art. 4 of WFD regarding the chemical status of the groundwater body.
- To conduct a risk assessment for human health in case of groundwater used for drinking.

For imminent threat of land and water damage

- To identify whether there is the possibility that the source of potential damage (for instance, the spillage of a hazardous chemical) can reach the soil and/or the groundwater or is confined by an intact containment system, i.e. identify a pathway and thus, of exposure of the natural resources.

For damage to land:

- To conduct a risk assessment for human health.
- To compare the contamination values with national pre-defined thresholds for intervention (i.e. pre-defined as determining the significant risk for human health), if they exist

Finally, as regards the significance 'thresholds' considered (question no. 22 of the case studies factsheets) due to the wide variety of circumstances, it was found not possible to make an evaluation on the extent of common interpretations. In fact, this evaluation may be further conducted among the project team members by involving other MSs to participate to the discussion.
In this regard, it is to be noted that the questionnaire-based survey collected also non-ELD cases. Thus, the comparison of significance 'thresholds' between different regulatory regimes made the abovementioned evaluation even more difficult.

3.2 Authorities that conduct the ascertainment, assessment and the enforcement

The transposition of the Directive is different among the MSs. In particular, the MSs decided differently how the provisions of ELD were incorporated in the national administrative systems.
An important aspect related to the efficiency of conduction of the ascertainment, assessment and enforcement of the environmental damage is the designation of competent authorities. Depending on jurisdictions, multiple authorities or single/limited authorities were designated to conduct the ascertainment and the assessment of environmental damage (see par. 2.2 for a summary and Annex I for details).
A key element for the efficiency of the process of determination of environmental damage, in particular when multiple authorities are designated, is to support the process by a system of common procedures of coordination and, moreover, by an adequate exchange of knowledge and training among all the competent authorities about the requirements under the ELD regime related to their duties and to other's duties.
In fact, in a few case studies the matter of coordination of all involved authorities for the assessment procedures is mentioned as a strength *(see case study no. 26)* or weakness/training need *(see case studies no. 5, 16, 28)*, affecting the time of the intervention and of the ascertainment.

In this regard, for instance, the existing Memorandum of Understanding of England (UK) (see Annex I), describing how enforcing authorities should consult each other and how lead arrangements work if there is more than one authority responsible under the Regulations (enforcing authorities may agree between themselves that a different authority should be appointed in place of the one that has been allocated responsibility under the Regulations) may be considered as a best practice.

3.3 Legal and technical requirements

The responses to the questionnaire with respect to the legal and technical requirements, though limited in their scope, provided some points which warrant further consideration.

The legislative regimes of MSs with respect to ELD implementation has been well documented[39]. Though it may not be possible in all states where the Directive has been implemented in a devolved manner, standard procedures for the collection and processing of evidence which meet the requirements of the general legislative regimes in each MS would be invaluable, if not already in place, to ensure that sound, reliable evidence is collected irrespective of the legislative regime being used.

When an administrative procedure is conducted, the competent authorities should take into consideration that it may be followed by a civil action against the possible operator, or that those responsible for the damage may challenge the provision before the Administrative Court. To that end, the administrative and the technical procedures for the ascertainment of the environmental damage need to ensure compliance with the legal requirements (e.g. the rights of defense), taking into account the interpretations and guidance established by the Commission and the Court of Justice of the European Union (CJEU).

[39] https://circabc.europa.eu/ui/group/cafdbfbb-a3b9-42d8-b3c9-05e8f2c6a6fe/library/f9e972ab-7260-49d8-8801-28d23dd96bd7/details

In general, in cases where the responsible parties of the damage are identified or suspect, it is important that they are legally aware of all the ascertainment actions for the damage assessment, in order not to undermine their right of defense.

Technical requirements, such as compliance with national/international quality standards for laboratory analysis and laboratory management, and the competence of the laboratory used, may be important to make the claim for environmental damage successful. If the technical requirements such as international quality standards are not met, typically national ones substitute them. Multiple lines of argument and evidence can assist to allow the final decision.

Finally, it may be considered as a possible best practice where internal procedures of the ascertainment body/ies ensure that legal and technical requirements are complied with, regardless of the legislative regime applied *(see case study no. 7)*. Hence, these procedures might be applied no matter what the legislative differences are as the evidence would be rigorously collected and issues with enforcement reduced.

3.4 Tools/equipment and methods used

As expected, the responses to the questionnaire revealed that the methods used for the determination of the environmental damage strictly depend on the extent of the event and the natural resource involved. However, some common approaches can be identified in the assessment process. In particular, in a site visit it is often necessary to verify the magnitude/extension of the event/accident and to make rapid decisions about any measures to contain the environmental impacts. Technologically advanced instruments, such as aerial or aquatic drones, can facilitate this phase of the investigation.

As regards the determination of the baseline conditions after an event of potential damage, data collected to implement / monitor other EU Directives (IPPC-IED, EIA, SEA, SEVESO Directives) could help produce indicators of baseline.

Furthermore, the site inspection is an opportunity to deepen the knowledge of the source of impact or the type of pollutants, also through interviews with the responsible operator, with the aim of defining the techniques and tools necessary for the collection of the analytical data.

For biodiversity damage, it can be observed that the essential step in the ascertainment process is the identification of species or habitat involved in the environmental incident. Using hand-held GPS during the site inspection allows to correctly georeference the area; then the consultation of national databases confirms whether the site is within the boundary of a protected area. The main information in the databases are the GIS or satellite images of the protected area (Natura 2000 sites or other natural area protected by national laws) and the indication of habitat and species listed in the annex of 92/43/CEE and 79/409/CEE directives.

Nevertheless, the information available in the national databases of habitat and species is not always sufficient. In fact, the national habitat mapping is characterized by a resolution (usually 10x10 km) too high to allow the identification of the habitat present in a particular site. In these cases, a visual examination of

the site conducted by experts becomes important to evaluate the environmental impact and the possible damage.

The determination of water damage requires the adoption of different techniques depending on the type of data to be searched.

To obtain information about the concentration of substances in water, manual or automatic sampling tools are used and thermostatic containers are required to store the samples and avoid their deterioration during transportation to the laboratories for the analysis. Some physico-chemical parameters, such as temperature, pH, conductivity can be measured in-situ by handled instruments.

Data regarding the ecological status can be obtained by examination of the structure and functioning of water ecosystem. This kind of study requires the manual sampling of aquatic organism or vegetation and analytical observation conducted by specialists. Fish survey methods, such as electro fishing, can be adopted when the impact on water results in fish kill.

As for land, some countries refer to the ascertainment procedures adopted for the management and remediation of contaminated sites. The existence of legal thresholds for chemicals in soils and the experience in the human health risk assessment become useful for the assessment of the damage to land.

Overall, for the detection of the land quality, the methodology adopted for monitoring and sampling are in line with those previously described for the determination of damage in other natural resources. In particular, indirect observation through satellite images or GIS mapping and collection of data available in literature about the geological structure of the site, the purpose of land etc. represent the preliminary phase of the ascertainment. Analytical data are collected according to the standardised procedures for sampling and analysis of soil. Waste characterisations methodologies have been applied in some juridsictions where legislation on contaminated soil does not exist to determine the significance of soil contamination (and remedial actions required as a result).

Finally, the coordination among the different teams involved in the determination of environmental damage and imminent threat of damage is a key element for the efficiency of the ascertainment that should be defined in specific procedures and organisational plans.

3.5 Key findings and lessons learned

Some of weaknesses and strengths reported by the contributors of the survey in the 'Key findings and lessons learned' box (see case study factsheets in Annex II) concerning the specific case studies or the ascertainment of the damage in general, are already highlighted in the reports of the EU Commission on the ELD implementation effectiveness and in the report 'Towards a Common Understanding Document - ELD key terms and concepts'[3] abovementioned, for instance: the difficulties in determining the baseline condition and the difficulties in coordination of the ELD competent authorities and other competent authorities related to other directives (e.g. ECD, IPPC–IED, SEVESO, WFD, Birds and Habitats directives, Waste Framework Directive).

Other issues highlighted by the contributors are reported in summary in par. 2.6.

Given the number of case studies collected and the willingness for sharing knowledge, it could be concluded that the training methodology that concerns sharing key findings and lesson learned from practical case studies (successful and unsuccessful experiences of determination of environmental damage and imminent threat of damage under ELD regime) should be developed at EU level for a better implementation of the ELD directive[40].

3.6 Training needs

The project questionnaire-based survey collected a wide demand of training needs based on practical cases and practical experience sharing (for results see par. 2.7, for details see Annex II).
The preferred methods of training are consistent with the ranking set by the DG Environment during the MAWP 2017 - 2020 with government experts and stakeholders: training workshops are the most preferred, followed by the webinars. Both of them allow interactions between trainers and recipients.

Further options to satisfy the abovementioned requests may be peer to peer projects and internet platforms/dashboards that allows networking and practical confrontation among competent authorities and practitioners (from public bodies) of different MSs. Networking of ELD practitioners from public bodies can be the best way of sharing knowledge and experience.
In this regard, the need for training on practical cases is an expression of the need of identifying technical and procedural similarities of approaches and solutions to problems, even if adapted to different jurisditions.

A concurrent involvement of different national and local authorities to the training was also suggested. This, in fact, is consistent with the actual situation of some MSs in which different authorities are involved in the ascertainment and assessment of environmental damage under the administrative procedure (see par. 2.2).
All the authorities which may be notified of, or have roles in the assessment of, environmental damage cases should be trained of the requirement of, and their obligations under, the ELD and transposing Regulations. E.g. all inspectors involved in site visits should be trained on screening for potential or suspect ELD cases to ensure that any such cases are investigated adequately upon discovery.
So, the training to all authorities involved should be addressed to the process of identification and determination of environmental damage and threat of damage, because this the phase where, usually, more stakeholders are involved.

Some respondents indicated that also operator's awareness is needed to be increased, to enhance their involvement in identifying and notifying environmental damages and imminent threat of damage but also to determine the damage on the request of the competent authority.

[40] Seminar series on 'Lessons learnt from industrial accidents' organised in collaboration with IMPEL Network and the database of case studies may represent a very good example of training by sharing of practical experiences (https://www.impel.eu/projects/seminar-series-lessons-learnt-from-industrial-accidents/).

A better cooperation between authorities at international level is one of the objectives of the CAED project. Practical knowledge and experience sharing at international level through networking and on 'case by case' problems and solutions, but also on shared criteria of damage and threat of damage assessment, could be of great value to increase the capacity of the systems related to ELD.

For the abovementioned purposes, IMPEL is in a good position to put in place an adequate system of training, which may envisage: organisation of peer to peer projects and practical workshops, or realisation of webinars and web-based tools useful for the process of ascertainment.

4 CONCLUSIONS

This report is the first of the IMPEL Network products concerning the ELD implementation and the environmental damage assessment in general, moreover, it is the first European report entirely devoted to the ascertainment/investigation phase of the whole process of the environmental damage assessment.

The challenges of the first year of the project were exploring investigation methods and recording different approaches and gaps that emerge in the administrative procedure of the process of determination of environmental damage in the Member States.

Moreover, the objective of the first year of the project was to identify best practice, both from a regulatory, practical and technological point of view, for the detection, determination and evaluation of the clues and the evidence of environmental damage and threats of damage.

The project collected technical and procedural guidance from 21 jurisdictions and more than 30 case studies under ELD and non-ELD regimes. Whilst there are some differences in the administrative set-up across jurisdictions, the project found some common approaches in the assessment process.

The project also identified some common key factors for a successful outcome. These include:

1. Prompt initial investigation
2. Sound evidence base
3. Availability of guidelines and procedures
4. Enhancement of the administrative process to provide a framework for technical support activities
5. Good communication both between competent authorities and technical experts, and between competent authorities and operators
6. Improvements in environmental management at regulated sites[41]

Moreover, a three-stage administrative procedure for the process of environmental damage assessment was established as follows:

1) The **screening** of cases of potential environmental damage and imminent threats of damage (to identify whether there are potential or actual adverse effects on natural resources)
2) The **determination of clues** of environmental damage and imminent threats of damage for the identification of candidate significant environmental damage and imminent threat of damage cases (to establish whether there are potential or actual sustained adverse effects on natural resources)
3) The **determination of evidence** of environmental damage and threats of damage for the confirmation of cases of significant environmental damage and imminent threat of damage (to confirm whether there are actual significant adverse effects on natural resources i.e. confirmed ELD cases for ELD resources)

[41] At this regard, useful links exist with the IMPEL DTRT project (https://www.impel-dtrt.eu/) and IMPEL Incident Reponse project (https://www.impel.eu/projects/environmental-incident-and-emergency-response/) of the IMPEL Network.

The project identified some best practices for each of the three stages. These can inform the production of future guidance[42].

A common challenge is interpreting and assessing significance (i.e. evidence) of damage. The anticipated publication by the European Commission, this year of guidance on Environmental Damage is welcomed in its contribution to providing a pan-European benchmark against which damage can be assessed. In particular, there is seen to be value in incorporating consideration of scale/intensity, extent and duration of damage along with sensitivity of ELD receptors. There is also interest in the development of an IT tool to facilitate the prompt assessment of cases.

Other challenges include how to deal with historically contaminated land[43] (which is out of the scope of the ELD) and how to ensure prevention and remediation of ELD cases in the case of operator insolvency.

It would be useful to consider a check-list of preliminary information to collect or to require of the operator in order to make screening considerations. There is the possibility to prevent the damage caused by incidental events by using dedicated check-lists during routine inspections on industrial sites. Moreover, it would be useful to consider a check-list, or an investigation plan template, for inspectors and/or public officers that will be charged with conducting immediate/thorough investigations of the adverse effects originating from an event.

Finally, this first step of the project recognised it is not easy to make rapid progress towards a consistent approach and overcoming problems but to ensure exchange of experiences remain useful and important, comparing similar situations and learning from other experiences abroad, with an interaction of mutual benefit from both sides and also for training purposes. For these reasons, the project team wants to encourage more MSs to participate in this project that has raised attention on the gaps in the process of ascertainment.

5 FOLLOW UP

The first year of the CAED project, with the collection and analysis of case studies, reflected the need for trainings of practitioners by practical examples of ascertainment, proposing a scheme of environmental damage determination that follows three-stage administrative procedure for the process of environmental damage assessment that envisages the phases of the screening, determination of clues and determination of evidence.

The work of the first year of the project 2019/2020 has been a preliminary work of the project final goal: develop a practical guide for practitioners on the criteria for the assessment of the environmental damage, focused on the aspects of the ascertainment.

[42] However, is to be noted that there is no single method and approach that can be applied to any given situation in terms of the determination of the environmental damage. Mechanisms which work in one jurisdiction may pose unexpected problems in another depending on, for example, the liability system used, availability of information and data, experience of regulators.

[43] It is needed to take into account that different definitions of historical contaminated land exist among jurisdictions.

In particular, the practical guide will contain a definition of criteria for the determination of the environmental damage and imminent threat of environmental damage. The criteria will refer to each natural resource protected by in the ELD[44] and will refer to the level of significance envisaged by the ELD.

The guide is also expected to contain the definition of practical tools for practitioners, such as:

- Definition of minimum content of check-lists for inspectors and other public officials for the preliminary evaluation of cases and the identification of potential environmental damage and imminent threat of damage cases
- Flowcharts to support and direct the decision-making process of the user to the determination of the environmental damage
- Definition of the structure and minimum content of planning tools for the ascertainment of the imminent threat of damage and of the extent of environmental damage, adapting it also to selected case studies

This guide will be intended as a reference document for competent authorities and practitioners. It will aim to provide information to assist competent authorities and practitioners in making better decisions about the determination of the environmental damage and the imminent threats of damage. In this way, it should contribute to improve protection of the environment, promote compliance with the polluter pays principle and encourage operators and competent authorities in pollution prevention.

The guide will identify issues to consider in the decision-making process when assessing the environmental damage and the imminent threats of damage, and will assist competent authorities and practitioners in finding successful solutions.

6 REFERENCES

Documents are quoted in alphabetical order as: [Author/s, Year, Title, #]

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[44] The natural resources protected by the ELD are surface inland and transitional waters, marine and coastal waters, groundwater, habitat and protected species (or national protected areas), land.

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Annexes

ANNEX I. Authorities that conduct the ascertainment, the assessment and the enforcement

Phases and Responsible Authorities		
Ascertainment *Determination of clues and evidence of environmental damage and imminent threat through information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysys, ascertainment/investigation plan and actions*	**Assessment** *Environmental damage quantification and monetisation, preventive and remedial measures identification*	**Enforcing** *Ordinances and actions for prevention and remediation of environmental damage*
Italy		
Under ELD regime: In Italy, the SNPA (Italian National System for the Protection of the Environment), that is composed by the ISPRA and the ARPAs, performs the technical support to the Ministry of the Environment for the ascertainment on site of environmental impacts and damages to waters and land. As regards biodiversity damage, the SNPA has to collaborate with the Regions and other local authorities (e.g. forest rangers). Under other legislation: Regional and Local authorities.	Under ELD regime: In Italy, the Italian National Istitute for the Environmental Protection and Research (ISPRA) before and now the SNPA (Italian National System for the Protection of the Environment) performs the technical support to the Ministry of the Environment for the assessment of environmental damage (evaluation of damage and threats of damage, environmental damage quantification and monetisation, preventive and remedial measures identification) for the Ministry of the Environment. However, they have not been delegated by the law, so they have not the monopoly for this activity. Under other legislation: Regional and Local authorities.	Under ELD regime: In Italy, the Ministry of the Environment is the competent authority responsible for the enforcement of the ELD provisions on prevention and remediation of environmental damage. Under other legislation: Regional and Local authorities.
Scotland (UK)		

Under ELD regime: SNH (terrestrial biodiversity) and Marine Scotland (marine biodiversity and marine waters), SEPA (water and land). Under other legislation: As above, plus local authorities for damage to land.	Under ELD regime: Same as ascertainment. Under other legislation: Same as ascertainment.	Under ELD regime: Same as ascertainment. Under other legislation: Same as ascertainment.
England (UK)		
Under ELD regime: Biodiversity (EU protected species and habitats, or damage to a Site of Special Scientific Interest (SSSI)) – Natural England, **Environment Agency and the Secretary of State** Water (groundwater and surface water – **Environment Agency (but not marine waters)** Marine – **Marine Maritime Organisation** Land – **Local authority** **Damage caused by an activity requiring an EPR permit or registration under the Environmental Permitting (England and Wales) Regulations 2016 (EPR)** will be regulated by the Environment Agency, if they are the body responsible for granting such a permit or registration, or by the local authority if it would fall within Part 2 of EPR. If it falls within Part 3 of EPR, then the Environment Agency is the enforcing authority for damage to land, and surface and groundwater, the Marine Maritme Organisation for damage to marine waters or habitats etc. within those waters, the Secreatary of State for damage to marine waters or habitats etc. within beyond 12 nautical miles from the baselines in England, and Natural England is the damage is to a	Responsibilities as provided for the ascertainment.	Under ELD regime: Responsibilities as provided for the ascertainment. There is a Memorandum of Understanding describing how enforcing authorities should consult each other and how lead arrangements will work if there is more than one authority responsible under the Regulations. Enforcing authorities may agree between themselves that a different authority should be appointed in place of the one that has been allocated responsibility under the Regulations. Under other legislation: See above.

natural habitat etc on land or in surface water or groundwater. ***6.1.1.1.1.1 Damage caused by any other activity (not permitted under Enviroment Agency or Local Authority)*** *6.1.1.1.1.2 Land damage:* ***Local authorities*** *6.1.1.1.1.3 Water damage:* ***Environment Agency*** 6.1.1.1.2 Marine damage: **Marine Management Organisation (MMO) or Secretary of State** *6.1.1.1.2.1 Biodiversity damage* - in inland waters (defined as any waters out to the point where the tide flows at mean high water spring tide): **Environment Agency** - in the sea if caused by an activity authorised by Environment Agency: **Environment Agency** - other biodiversity damage in the sea: **Secretary of State** - biodiversity damage on land - **Natural England** <u>Under other legislation:</u> In England the Environment Agency also has responsiblities for water damage under the Water Resources Act 1991 and under EPR.		
Latvia		
<u>Under ELD regime:</u> In Latvia, the State Environmental Service (hereinafter - SES) determine the causes and the place of origin of imminent threat of damage, evaluate the site subjected to the imminent threat of damage and the types of natural resources and, if	<u>Under ELD regime:</u> In Latvia, SES shall organise preventive measures in case of imminent threat of damage, due to which the environmental quality standards specified in the environmental laws and regulations could be exceed or they might have an adverse impact on human	<u>Under ELD regime:</u> In Latvia, SES shall organise the evaluation of such measures and assess the environmental damage. <u>Under other legislation:</u>

protection of all protected natural resources is not possible upon implementation of the imminent threat of damage, determine the natural resources to be protected in priority. <u>Under other legislation:</u> No.	health. As regards the environmental damage the SES shall assess: 1. the damage to specially protected nature territories, micro-reserves, the damage to specially protected species or natural habitats; 2. the damage to water (surface water or groundwater): 2.1. the damage to fish resources in accordance with the fisheries expert-examination; 2.2. the damage to the ecological or chemical quality of a surface water body, the potential or chemical quality of a heavily modified or artificial water body, the chemical quality or quantitative status of a groundwater body. The damage shall be evaluated by comparing the present condition with the baseline condition of a water body, performing the necessary analyses and evaluating the results of monitoring, as well as observing the environmental quality standards specified in laws and regulations; 3. the damage to soil or subterranean depths. The damage shall be evaluated by comparing the polluted soil or subterranean depths with the baseline condition, performing the necessary analyses and evaluating the results of monitoring, as well as observing the environmental quality standards specified in laws and regulations. <u>Under other legislation:</u> No.	No.
Slovakia		

Under ELD regime: In the Slovak Republic (SR), at the request of the Ministry of the Environment of the Slovak Republic (MoE SR), information on events is carried out by: - monitoring data on species and habitats of EU importance: Slovak Environmental Agency (SAŽP), State Nature Protection of the Slovak Republic (ŠOP SR); - water data: Slovak Environmental Inspectorate (SIŽP), Slovak Hydrometeorological Institute (SHMI) and Water Research Institute (WRI); - soil data: Public Health Office of the Slovak Republic (ÚVZ SR) and Regional Public Health Office (RÚVZ), soil service; professionally qualified persons (OSO) - for health risks; The executive bodies (CA) are: District Office, Department of Environmental Care (OŽ OSŽP); SEI - for operations of Integrated Pollution Prevention and Control (IPPC); MoE SR - for cross-border damage; OÚ OSŽP sometimes cooperate with the Police Force of the Slovak Republic (PZ SR Under other legislation: District Office, Department of Environmental Care (OŽ OSŽP); Slovak Environmental Inspection (SIŽP); Police Corps of the Slovak Republic.	Under ELD regime: Quantification of environmental damage (hereinafter referred to as 'ES') is carried out by: professional organizations (OOs) for competent authorities (CAs) at their request; OOs are e.g. ŠOP SR - for habitats and species of EU importance; Slovak Hydrometeorological Institute (SHMI), Research Institute of Water Management (WRI), State Geological Institute of Dionýz Štúr (ŠGÚDŠ), accredited laboratories - for waters; Public Health Offices (ÚVZ SR), soil service, professionally qualified persons - for health risks; Nákladov cost quantification is carried out by: ŠOP SR - for habitats and species of EU importance according to Decree No. 24/2003 Coll. Annex no. 1 - List and social value of habitats nation. importance, biotope eu. importance and priority habitats Annex no. 5 - List of protected plants and eu species (in bold) and their social value Annex no. 6 - List of protected animals and eu species and their social value Land decontamination firms. Manual - Remediation Methods Atlas https://envirozataze.enviroportal.sk/Atlas-sanacnych-metod the identification of preventive and corrective actions is carried out by: competent authorities (CA) in cooperation with professional organizations (OO) with regard to the type of ES.	Under ELD regime: The supervisory and enforcement body is the Ministry of the Environment of the Slovak Republic (MoE SR), the District Office, the Department of Environmental Care and the Slovak Inspection. Under other legislation: MoE SR, District Offices, SIŽP. The Presidium of the Police Force of the Slovak Republic, the Department of Environmental Crime, is also an investigative and enforcement body for serious environmental damage.

	Under other legislation: As already mentioned.	
Austria		
Under ELD regime: District administration. Under other legislation: – Water Act (WRG; 1959): District administration. – Historically Contaminated Sites (ALSAG; 1989): Provincial government. – Waste Management Act (AWG; 2002): Provincial government.	Under ELD regime: Same as ascertainment. Under other legislation: Same as ascertainment.	Under ELD regime: Same as ascertainment. Under other legislation: Same as ascertainment.
Sweden		
Under ELD regime: Depends on responsible authority for enforcement of the site that is laiable for the damage. Responsible authorities are County adminstrative boards or municipalities. ELD is incorporated in the Environmental Code. Under other legislation: The same as above.	Under ELD regime: Depends on responsible authority for enforcement of the site that is laiable for the damage. Responsible authorities are County adminstrative boards or municipalities. ELD is incorporated in the Environmental Code. Under other legislation: The same as above.	Under ELD regime: Depends on responsible authority for enforcement of the site that is laiable for the damage. Responsible authorities are County adminstrative boards or municipalities. ELD is incorporated in the Environmental Code. Under other legislation: The same as above.
Denmark		
Under ELD regime: In Denmark, governance with regard to envionmental protection is shared between different authorities depending on the aspect of environmental protection in question. In most areas where environmental damage may occur, the municipialities will be responsible for the ascertainment whether or not the	Under ELD regime: Initially, the competent authority (usually the municipiality – see above) is responsible for assessing whether the damage falls within the ELD. This usually includes assessment of the environmental damage quantification. If an environmental damage is deemed to fall within the	Under ELD regime: In Denmark, the EPA is the enforcing authority with regard to cases that fall within the ELD. Under other legislation: The same as the ascertainment.

damage falls within the ELD. With regard to certain kinds of soil polution, the regions or the state may be responsible, and with regard to the marine environment the state which is responsible. <u>Under other legislation:</u> With regard to instances that do not fall within the ELD, the responsibility for further measures, e.g. administrative injunctions, remains with the responsible authority.	scope of ELD, the state – ie. the Environmental Protection Agency – takes over the responsibility for the management of the case under the ELD regime. This includes monetisation and identification of preventive and remedial measures. <u>Under other legislation:</u> The same as the ascertainment.	
Spain		
<u>Under ELD regime:</u> Autonomic (Regional) Environmental Agencies. In the region of Galicia the competence to supervise corresponds to the regional organism of environment (General Directorate of Environmental Quality and Climate Change - Xunta de Galicia) in cases of affection to more than one area. In cases with a single area of affection corresponds to the organism that holds each faculty. <u>Under other legislation:</u> The application of sectoral regulations corresponds to each of the agencies with their competencies.	<u>Under ELD regime:</u> Autonomic (Regional) Environmental Agencies. In the region of Galicia the competence to supervise corresponds to the regional organism of environment (General Directorate of Environmental Quality and Climate Change - Xunta de Galicia) in cases of affection to more than one area. In cases with a single area of affection corresponds to the organism that holds each faculty. <u>Under other legislation:</u> The application of sectoral regulations corresponds to each of the agencies with their competencies.	<u>Under ELD regime:</u> Autonomic (regional) environmental agencies or the ministry of environment, depending on who is the authority holding the damaged resources. In the region of Galicia the competence to supervise corresponds to the regional organism of environment (General Directorate of Environmental Quality and Climate Change - Xunta de Galicia) in cases of affection to more than one area. In cases with a single area of affection corresponds to the organism that holds each faculty. <u>Under other legislation:</u> The application of sectoral regulations corresponds to each of the agencies with their competencies.
Bulgaria		

Under ELD regime: Directive 2004/35/EC on environmental liability (ELD) has been transposed into national law by the Liability for the Prevention and Removal of Environmental Damage Act (LPREDA). According to the LPREDA the competent authorities (CAs) are: 1. the Minister of Environment and Water, 2. the directors of regional inspectorates of environment and water, 3. the directors of the basin directorates for water management and 4. the directors of national parks. In case of occurring of an imminent threat or caused ecological damages the CAs referred to in items 2-4 shall carry out inspections to identify the liable operator and ascertain the imminent threat of environmental damage or environmental damage. According to the LPREDA, the Executive Director of the Executive Environmental Agency (EEA) - establish and maintain databases at national level for: (a) the status of the protected species and natural habitats; (b) the ecological, chemical and / or quantitative status and / or ecological potential of the water bodies; (c) the state of the soil; - Provides information to the Ministry of Environment and Water, RIEW, the basin directorates, except for the information under letter 'b', and the directorates of national parks for the performance of their functions under the law. The necessary information on the state of soil resources is provided officially to the Executive	Under ELD regime: According to the LPREDA and the Ordinance No1/2008 (on the type of preventive and the remedial measures in the cases provided for by the Law on liability for the prevention and remediation of environmental damage and on the minimum cost of their implementation): 1. The operators are obliged to carry out their own assessment of the possible cases of imminent threat of environmental damage and environmental damage. The own assessment shall be carried out prior to the commencement of the activity and / or before commissioning of new facilities and installations. The assessment shall be updated in the case of changes in the activities under Annex 1 of the LPREDA or in the result of cases of imminent threat of environmental damage or cases of environmental damage. The operator shall plan preventive/remedial measures to remove the causes and imminent threat/environmental damage in compliance with identified possible occurrences based on the assessment. 2. The operator shall be obliged to provide information, including own assessment, related to each imminent threat for ecological damages and for caused ecological damages upon request of a competent body. 3. In cases of imminent threat /when despite the immediate preventive measures taken the treat	Under ELD regime: On the basis of the information provided by the operator, the CA carries out an inspection on the site and a check the facts and circumstances related to the case. If needed, CA shall request from the operator additional information and shall draw up a written statement. If the information is complete and sufficient, CA: - In case of imminent treat - issues a prescription and / or order for applying the preventive measures, - In case of environmental damage - issues order for applying the remedial measures. (No environmental damage has been reported by CAs so far.) The procedures on preventive and remedial measures are set by Chapter II of LPREDA. On the other hand, in case when any natural or legal person (who has been affected or is possible to be affected by ecological damages, or has sufficient interest at taking decision for removing ecological damages or claims, that his right has been violated) requests from a CA (competent body under Art. 6, p. 2 – 4 LPREDA) to initiate a procedure for determining and applying remedial measures: 1. Where the information in the application is

Director of the EEA by the Ministry of Agriculture, Food and Forestry. Information on the ecological, chemical and / or quantitative status and / or ecological potential of water bodies shall be provided to the Director of the EEA by the directors of the Basin Directorates. <u>Under other legislation:</u> The LPREDA establishes the legislative framework for the prevention and remedying of environmental damage, incl. ascertainment of an imminent threat of environmental damage or environmental damage.	continues/ or environmental damage, the operator shall immediately inform the competent authority by providing detailed information. On the basis of the information provided, the CA carries out an inspection on the site and a check the facts and circumstances related to the case. If needed, CA shall request from the operator additional information and shall draw up a written statement. If the information is complete and sufficient, CA issues: - In case of imminent treat - a prescription and / or order for applying the preventive measures, - In case of environmental damage - order for applying the remedial measures. (No environmental damage has been reported by CAs so far.) The procedures on preventive and remedial measures are set in Chapter II of LPREDA. In case of environmental damage the CA determines remedial measures on the basis of the measures proposed by the operator, an assessment of the specific situation that has arisen since the occurrence of damage, recommendations and opinions received from the public and / or those involved in the indicative list of remedial measures under Annex 2 of Ordinance No1/2008. In cases of factual complexity and / or further analysis if necessary, the determination of the measures is also based on the report, prepared by the operator. In case the operator is unknown, the minister on environment and water shall open a	sufficient or added CA within 14-day term from its receiving shall perform a check up on site. Where as a result of the check up it is proved that an ecological damage has occurred, and where the operator is known, CA shall submit the request to the operator to submit an opinion upon the request within 14 – day term from its receiving. After the check up in p.1 above, where the operator is unknown, or after the expiry of the 14- day term for submitting the operators opinion, CA shall: 1. open a procedure on determining remedial measures under Chapter Two, Section II, or 2. issue an order for refusal of applying remedial measures, in which he shall indicate the grounds for that and shall publish it on his the internet site. The procedure on request for undertaking actions under LPREDA is set by Chapter IV LPREDA <u>Under other legislation:</u> The same as in the ascertainment.

	procedure on assigning a preparation of a report for remedial measures under the Public Procurement Act. The report shall be assigned to experts with competence in the area of protection of habitats and protected species, and of the waters and water bodies, soils. Any natural or legal person, who has been affected or is possible to be affected by ecological damages, or has sufficient interest at taking decision for removing ecological damages or claims, that his right has been violated, may request from a CA (competent body under Art. 6, p. 2 – 4 LPREDA) to initiate a procedure for determining and applying remedial measures. For non-governmental nature-protecting organizations proof of the circumstances shall not be required. The person shall submit an application, which contain the data on the case. <u>Under other legislation:</u> The same as in the ascertainment.	
Portugal		
<u>Under ELD regime:</u> The operator is responsible for determining on-site clues and evidences of environmental damages and imminent threats of such damages, and The Portuguese Environment Agency (APA) is responsible for validating the data and studies presented by the operator supporting the assessment of the environmental damages or the imminent threats of such damages and may at any time require him to provide supplementary information. <u>Under other legislation:</u>	<u>Under ELD regime:</u> The operator is responsible for the assessment of an environmental damage or an imminent threat of such damage, and adopting preventive and remedial measures, the latter after approval by the competent authority, and APA is responsible for validating the assessment of the environmental damage or imminent threat of such damage and fixing the remedial measures to be applied by the operator, and may at any time require the operator to take further preventive or remedial	<u>Under ELD regime:</u> In Portugal, the enforcement of the preventive and remedial measures for environmental damage and imminent threat of such damage is carried out by the General Inspectorate for Agriculture, Sea, Environment and Spatial Planning (IGAMAOT), the competent authority (APA) and the Nature and Environment Protection Service of the Republican National Guard (SEPNA).

-	measures deemed necessary. Under other legislation: -	Under other legislation: -
Czech Republic		
Under ELD regime: The Czech Environmental Inspectorate (CEI). CEI is an independent organization subordinate to the Ministry of the Environment adn funded from the state budget. Under other legislation: The Czech Environmental Inspectorate (CEI).	Under ELD regime: The Czech Environmental Inspectorate (CEI). There have not been identificated a case under ELD in the Czech Republic yet. Under other legislation: In more difficult cases they can ask for a special 'Risk assesment' made by an expert company (special authorization from Ministry of Environment) acording the special methodology. https://www.mzp.cz/cz/metodiky_ekologicke_zateze	Under ELD regime: The Czech Environmental Inspectorate (CEI). Under other legislation: The Czech Environmental Inspectorate (CEI).
The Netherlands		
Under ELD regime: The water and soil compartments in the Netherlands fall under the competency of various competent authorities. Rijkswaterstaat is the competent authority for the main water system. The water boards (21) are responsible for the local water systems. The provinces (12) and municipalities are primarily the competent authority for soil (contamination). However, the central government, municipalities (355) and water boards also have powers. Under other legislation: The same as above.	Under ELD regime: The same as in the ascertainment. Under other legislation: The same as in the ascertainment.	Under ELD regime: The same as in the ascertainment. Under other legislation: The same as in the ascertainment.
Slovenia		

Under ELD regime: In Slovenia the Ministry of environment and spatial planing is by law responsible for the ascertainment on site of environmental impact and damage. Slovenian Envionmental Agency is a part of Ministry that actualy collects data of the environment. Under other legislation: -	Under ELD regime: In Slovenia the Ministry of environment and spatial planing is by law responsible for the assessment of environmental damage. Slovenian Envionmental Agency is a part of Ministry that actualy does evaluation of damage and threats of damage, environmental damage quantification and monetisation, preventive and remedial measures identification. Under other legislation: -	Under ELD regime: In Slovenia The Ministry of the environment is enforcing authority. Slovenian Envionmental Agency is a part of Ministry that measures and determines the size of damage. Under other legislation: The same as in the ascertainment.
Estonia		
Under ELD regime: Environmental damage and a imminent threat of damage is identified by the Environmental Board. The person who caused damage is identified by the Environmental Board (hereinafter allso Board). Under other legislation: The Environmental Inspectorate exercises supervision in all areas of environmental protection. It coordinates and executes supervision regarding the use of natural resources and the protection of the environment by applying the state´s coercive measures on the basis and to the extent specified by law (except ELD). The Environmental Inspectorate is an institution dealing with environmental violations and since September 1st, 2011 also carries out investigations in criminal cases.	Under ELD regime: The Environmental Board is responsible for the assessment of environmental damage and imminent threat of damage according to environemtal liability act (evaluation of damage and threats of damage, environmental damage quantification and monetisation, preventive and remedial measures identification), all other environemtal protection areas is responsible The Environmental Inspectorate. Under other legislation: -	Under ELD regime: According to Environemtal Liability Act: § 32. Communication of information and giving explanations (1) The Board informs the Ministry of the Environment about events of environmental damage and threats of damage and about the preventive and remedial measures taken. Information on environmental damage and a imminent threat of damage is published on the websites of the Ministry of the Environment and the Board. (2) The Ministry of the Environment has the right to give explanations for assessment of interim damage and for drawing up and implementing a remedial action plan. (3) The minister responsible for the field may establish the procedure for informing the public about environmental damage events,

		threats of damage, and about preventive and remedial measures taken. § 33. Settlement of disputes (1) Disputes arising from the prevention of environmental damage or a imminent threat of damage or from remedying of environmental damage are resolved by the Ministry of the Environment. (2) Before filing of an appeal with an administrative court in the event of a dispute arising from the implementation of this Act, intra-authority appeal proceedings must be undergone on the conditions and in accordance with the procedure for in the Administrative Procedure Act. (3) The Ministry of the Environment will resolve an intra-authority appeal within 30 working days as of the filing of the appeal. (4) The Ministry of the Environment and the appellant have the right to involve experts in resolving an intra-authority appeal. (5) The costs of involving the expert are borne by the appellant, unless the appeal is granted. <u>Under other legislation:</u> -
Switzerland		
<u>Under ELD regime:</u> - <u>Under other legislation:</u> Switzerland is not an EU member state and therefore	<u>Under ELD regime:</u> - <u>Under other legislation:</u> Same responsibilities as for the ascertainment.	<u>Under ELD regime:</u> - <u>Under other legislation:</u> Same responsibilities as for the

the European Environmental Liability Directive (ELD) is not applicable in our country. In Switzerland environmental liability is regulated in Title 4 of the Federal Act on the Protection of the Environment EPA . The responsibility in relation to the ascertainment of environmental damage is in general the same as for all other tasks regarding the protection of the environment in Switzerland, which means that the enforcement of the EPA is in the responsibility of the cantons, if not stated otherwise by the EPA.		ascertainment.
Greece		
Under ELD regime: In Greece, the Ministry for Environment and Energy (MEE) is the competent authority for ELD (specifically COEIL at national level) as well as Decentralized Administrations (specifically PEAPZ at regional level). Regarding the on-site ascertainment of environmental damage caused to waters, land and biodiversity, under the Presidential Decree 148/2009 which transposed ELD into national legislation, the process may be held by Environmental Inspectors of the MEE, environmental inspectors of the Regional authorities (namely KEPPE) as well as by competent authorities for ELD (COIEL and PEAPZ). Under other legislation: -	Under ELD regime: In Greece, the MEE (COIEL) and the Decentralised Authorities (PEAPZ) are responsible for the assessment of environmental damage (evaluation of damage and threats, environmental damage quantification and monetization), determination of preventive and remedial measures for environmental damage or imminent threat of it. Under other legislation: -	Under ELD regime: In Greece, the MEE is the enforcing authority for the preventive and remedial measures (determination of remedial actions, restoration, penalties for non-compliance to P.D. 148/2009) of environmental damage and imminent threat of it. Additionally, at a regional level, the competent authorities for enforcing actions causing environmental damage are held by the Decentralized Administrations (PEAPZ). It is worth mentioning that for ELD cases of high importance or emergency, the MEE may coordinate the competent central and regional authorities. Under other legislation: -
Republic of Croatia		

Under ELD regime: Environmental Protection Inspection is responsible for the ascertainment on site of environmental impact and damage under ELD regime Under other legislation: Other responsible inspection bodies (Water Protection inspection, Nature Protection inspection, Agriculture Inspection etc…) are also responsible for the ascertainment on site of environmental impact and damage.	Under ELD regime: In Croatian legislation (article 190 of Environmental Protection Act) it is prescribed that central state body, which in accordance with its competences performs an investigation at the site of damage in the environment or imminent threat of damage, in case it is possible given the undertaken investigation, shall identify the operator who caused the damage in the environment and/or imminent threat of damage, and shall via authorised assessor assess the significance of damage in the environment and/or imminent threat of damage. According to the 'List of Authorised Persons for Expert Jobs in the Environment Protection', there are 30 authorised assessors for the assessment of environmental damage and/or imminent threat of environmental damage in Croatia, but still there is very little experience in this field. Under other legislation: -	Under ELD regime: In Croatia, State inspectorate - Environmental Protection Inspection is the enforcing authority for the preventive and remedial measures of environmental damage and imminent threat of damage. Under other legislation: Other responsible inspection bodies (Water Protection inspection, Nature Protection inspection, Agriculture Inspection etc…) are also responsible for the ascertainment on site of environmental impact and damage. If the operator fails to take corrective measures, the inspector can issue an administrative fine up to 10 times the average annual salary in Republic of Croatia in previous year. According to Environmental Protection Act (EPA), environmental protection inspectors shall also start misdemeanour procedure, if operators failed to implement measures from art. 182, 183 and 186 of EPA.
Ireland		
Under ELD regime: The EPA is the competent authority for under the Environmental Liability Regulations (which transpose the ELD in Ireland). In practice, the EPA generally complete the ascertainment phase with assistance from other state organisations such as Inland	Under ELD regime: As per the answer for the ascertainment phase for damage quantification and monetisation. The operator and the EPA are designated for identifying the preventative and remedial measures required under the Environmental Liability Regulations.	Under ELD regime: The operator, where identified, is responsible for the ordinances and actions for prevention and remediation under the Environmental Liability Regulations. If the operator cannot be identified, the EPA may undertake

Fisheries Ireland, the National Parks and Wildlife Service, Local Authorities etc. <u>Under other legislation:</u> There are a significant number of other authorities which deal with non-ELD environmental damage such as mentione previously Inland Fisheries Ireland, the National Parks and Wildlife Service, Local Authorities.	<u>Under other legislation:</u> As per the answer for the ascertainment phase.	necessary preventativie and remedial measures but is not required to do so. <u>Under other legislation:</u> As per the answer for the ascertainment phase
Malta		
<u>Under ELD regime:</u> The Environment Liability Directive is transposed through Subsidiary Legislation 549.97 on Prevention and Remedying of Environmental Damage Regulations In Malta the Environment and Resources Authority (ERA) is responsible for the ascertainment on site of the extent of environmental damage. However, ERA may require other entities to be able to carry out its functions. The collection of environmental quality data of the event is the responsibility of ERA and / or the perpertrator of environmental damage, depending on whether the perpertrator is known. However, baseline environmental data is a shared responsibility between different entities depending on the environmental receptor that has been impacted. For instance, groundwater monitoring is the responsibility of the Energy and Water Agency (EWA), whilst inland, coastal and marine waters would be monitored by ERA. Some soil parameters are monitored by the Deprtment of Agriculture; whilst	<u>Under ELD regime:</u> As stated in the reply above, environmental damage quantification and monetisation, preventive and remedial measures identification is carried out by ERA. However, ERA may also call upon other entities to carry out these functions depending on the environmental receptor that has been damaged or is at risk. Should other entities be involved, ERA together with such entities identifies the remedial measures necessary.	<u>Under other legislation:</u> A number of agencies are responsible for environmental enforcement in Malta, including the Environment and Resources Authority; the Planning Authority, the Police; the Armed Forces, Transport Malta; the Malta Resources Authority and the Environmental Health Directorate.

data on other parameters are compiled by ERA. In accordance with Regulation 7(3) of S.L. 549.97, ERA may take the measures itself if the operator (i) fails to comply with the following obligations: where the environmental damage has occurred, the operator shall inform ERA of all the aspects of the situation and take all the necessary remedial measures; (ii) ERA shall give the operator instructions to control, contain, remove or other manage the contaminants; (iii) ERA shall require the operator to take the necessary remedial measures; (iv) ERA shall give instructions to the operator on the necessary remedial measures. ERA is also entitled to take the measures itself if it is the case that the operator cannot be identified and to bear the costs.		

ANNEX II. Case studies

The case studies have been arranged in factsheets and listed in alphabetical order according to the country of the contributors.

Case study no. 1 - Groundwater contamination by pesticides impacting public drinking water supplies

Case study name	Groundwater contamination by pesticides impacting public drinking water supplies
Country	Austria
Contributor	Environmental Agency
Type of damage	Water damage
Legislation	Non ELD case Waste Management Act (AWG 2002) + Water Act (WRG 1959)
Site	Data available but against the fact that it was not qualified as a case under ELD particular data on the location and the polluter are to be kept anonymous as well as further information is generalised where necessary
Source of impact	The source of groundwater contamination was identified in the release of pesticides (among a broad variety of substances were 5 substances as a typical “finger-print”)
Natural Resources	Groundwater along the river Traun had been seriously contaminated by several pesticides. Several public drinking water plants were involved either being shut down, impacted by elevated pesticide concentration or threatened by the fast expanding contaminant plume
Effects of the impact	The groundwater contamination impacted 6 small public drinking water plants. Assuming a possible further input and expansion of the contamination plume up to 30 further drinking water plants (ready to cover the daily water demand of 200.000 citizens) could have been affected

EVENT DESCRIPTION

1. *Location of the event*

Data available but against the fact that it was not qualified as a case under ELD particular data on the location and the polluter are to be kept anonymous as well as further information is generalised where necessary.

2. *Cause of the event and offense committed*

Illegal dumping of liquid pesticide residues at a construction waste landfill.

3. *Date and duration of the event*

The first indication on groundwater contamination was reported by November 2013. It took until May 2014 to identify the specific substance causing the bad smell of groundwater samples, which was a structural isomer to a pesticide substance banned in Austria. By October 2014 a construction waste landfill operating since more than 15 years was evidenced causing pesticide inputs to groundwater by its leachate. However due to a complex hydrogeological setting and

misleading generic assumptions regarding groundwater flow full evidence proving the landfill as origin of groundwater contamination and excluding other possible sources took until end of 2015. Nevertheless, immediately by the evidence of high pesticide concentration for the landfill leachate the input was stopped. Since collected leachate was treated off-site as well as the surface of the landfill was covered by an impermeable barrier to minimise leachate.

4. Natural resources and services involved and adversely affected

Groundwater along the river Traun had been seriously contaminated by several pesticides. Several public drinking water plants were involved either being shut down, impacted by elevated pesticide concentration or threatened by the fast expanding contaminant plume.

ASCERTAINMENT

5. How was the event known?

As several private households reported bad smelling tap water the water authorities started investigation to identify (i) involved substances and (ii) the origin of the pollution.

6. Who conducted the ascertainment / investigation?

The ascertainment and investigation was led by the provincial government.

7. Timeline of the event and of the determination of clues and evidence

See answer to question 3.

8. Identification of the source of impact

The source of groundwater contamination was identified in the release of pesticides (among a broad variety of substances were 5 substances as a typical “finger-print”)

9. Magnitude of the event

The magnitude of the event was characterised by:

• status assessment (chemical status of groundwater) and risk analysis (risks regarding environmental objectives referring to Art. 4 of the Water Framework Directive)

• identification of relevant pesticide substances and delineation of groundwater contamination referring the environmental quality standard for pesticides (0,1 µg/l)

• (maximum) concentrations of relevant substances close to the source of contamination (governing pesticide contaminant > 50 µg/l)

• (maximum) width of groundwater contamination at a control plane close to the source of contamination (520 m),

• (maximum) groundwater flow rate impacted by pesticides (max. 490 l/s)

• (maximum) contaminant mass flow rate (governing pesticide contaminant: max. 175 g/day)

• (maximum) length of the groundwater plume in flow direction (max. 10 km)

• trends of contaminant concentration over time

• duration groundwater contamination and impacts for public drinking water supplies (forecasted and monitored: +/- 3 years)

10. *Spatial extent*

The input of contaminants was a point source. The hydro-geological setting involves a comparably fast flowing groundwater. The main contaminants were hardly retarded by the aquifer sediments. Accordingly, the expansion of contaminants was dominated by longitudinal convective transport in flow direction, whereas transversal dispersion was limited. The spatial extent of the groundwater contamination can be characterised by a maximum width of ~ 500 m and a maximum length of 10 km.

11. Consequences to the natural resources and description of the causal link

The groundwater contamination impacted 6 small public drinking water plants. Assuming a possible further input and expansion of the contamination plume up to 30 further drinking water plants (ready to cover the daily water demand of 200.000 citizens) could have been affected.

12. Legal requirements

Rights of defense of the penal code & national/international quality standards of sampling and lab analysis.

13. Tools/equipment and methods used

See answers under question 21.

14. Other Legislation Applied

Waste Management Act (AWG 2002) + Water Act (WRG 1959)

Screening

15. Conduction of the screening

As several private households reported bad smelling tap water the water authorities started investigation to identify (i) involved substances and (ii) the origin of the pollution.

As the event reported to the competent authority was an impact for a public drinking water supply the damage was evident and the need to take action obvious.

16. Guidelines used

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Determination of clues

17. Clues found

One of the less relevant substances caused a bad smell of drinking water supplied to private households.

Some of the pesticides (among a broad variety of substances were 5 substances as a typical "finger-print") were exceeding the EQSs for groundwater (national EQS: pesticides 0,1 µg/l; sum of pesticides 0,5 µg/l)

Environmental thresholds considered:

Intensity of groundwater contamination: contaminant concentration [µg/l] > guideline values (environmental quality standards): pesticides 0,1 µg/l

18. Conduction of the determination of clues

The substances causing the bad smell of drinking water and contamination of groundwater were unknown in the beginning. The clues of environmental damage were to (i) identify the relevant substances by generic chemical investigation, (ii) to identify possible sources within the area upstream the impacted well and (iii) control possible sources and (iv) taking water samples to track towards possible sources of contamination.

19. Guidelines used

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Determination of evidence

20. Evidence found

Evidence of damage under ELD was determined in accordance of evidence approach:

(i) a risk analysis under art. 4 of WFD regarding the chemical status of the relevant regional water management (= groundwater body as reported under the WFD)

(ii) significance of the groundwater contamination

(iii) Forecast in the behavior of the groundwater contamination

The risk analysis under the WFD did not confirm a risk for the chemical status. Groundwater contamination was generally qualified "serious", but not classified as water damage as in response to emergency measures the intensity and extent of the groundwater contamination were already quickly attenuating.

21. Conduction of the determination of evidence

The determination of evidence of environmental damage was conducted by groundwater investigation (groundwater sampling; installing groundwater monitoring stations; surface water sampling; tracer experiments).

22. Significance thresholds considered

INTENSITY of groundwater contamination: contaminant concentration [µg/l] > guideline values (environmental quality standards): pesticides 0,1 µg/l

EXTENT of groundwater contamination:

- contaminant mass flow rate [g/day] > EQS * 500.00
- plume length: > 500 m

DURATION of groundwater contamination:

• > 6 months 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED A key lesson learned in the process was that investigation measures in establishing evidence for groundwater contamination (linking source-identification to pathway interactions) in general are time-consuming and limitations in financial resources of competent authority cause serious problems, overall hampering legal procedures. As well particular unknown substances out of the usual spectrum of analytics are a challenge difficult to overcome. Without that it would have been impossible to identify groundwater contamination and it would still be lasting.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE No specific inputs.
TRAINING NEEDS No particular feedback.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS It would be of particular importance to establish clear criteria which need to be evaluated to determine whether am environmental damage is given. To characterise environmental impacts in a general manner it is advocate as practical to consider: • Intensity, extent and duration (of contamination/impacts) • Impacted sensitive

Case study no. 2 - Leakage of a hazardous waste stored in a tank as a result of rupture in the tank wall

Case study name	Leakage of a hazardous waste stored in a tank as a result of rupture in the tank wall
Country	Bulgaria
Contributor	Ministry of Environment and Water
Type of damage	Imminent threat of environmental damage to Land, Water, Natural habitats and protected species
Legislation	ELD case
Site	Devnya Municipality, Varna District
Source of impact	The possible source of impact on natural resources / resource services would be a leakage from the tank shell after the leakage of a hazardous waste stored in a tank as a result of rupture in the tank wall In fact, there are no natural resources / resource services involved because of this case is an "imminent threat of environmental damage"
Natural Resources	There are no natural resources / resource services involved/ affected as the case is an "imminent threat of environmental damage"
Effects of the impact	In fact, there are no natural resources / resource services affected because of this case is an "imminent threat of environmental damage"
EVENT DESCRIPTION	

1. *Location of the event*
Devnya Municipality, Varna District.
2. *Cause of the event and offense committed*
Leakage of a hazardous waste (stored in a tank) as a result of rupture in the tank wall was collected in the tank shell.
3. *Date and duration of the event*
The event occurred/was discovered on 05/05/2012.
4. *Natural resources and services involved and adversely affected*
There are no natural resources / resource services involved as the case is an "imminent threat of environmental damage".

ASCERTAINMENT

5. *How was the event known?*
Submitted information by the operator to the competent authority in accordance with the procedure of the Chapter II, Section I. Preventive measures of Liability for prevention and remediation of environmental damages Act (LPREDA).
6. *Who conducted the ascertainment / investigation?*
Regarding the investigation on site, especially data collection of the environmental quality status ex-ante and ex-post, sampling and analysis was not needed because the operator took immediate measures and as a result natural resources / resource services were not affected and the operator took control upon the accident, resp. the case of the imminent threat of environmental damage.
7. *Timeline of the event and of the determination of clues and evidence*
We do not have the exact time period of leakage. In fact, the leakage was initially discovered by the operator. In this regard, the operator has submitted immediately the information to the competent authority that there was an imminent threat of environmental damage.
8. *Identification of the source of impact*
The possible source of impact on natural resources / resource services would be a leakage from the tank shell after the leakage of a hazardous waste (European Waste Code 070107* halogenated still bottoms and reaction residues) stored in a tank as a result of rupture in the tank wall.
9. *Magnitude of the event*
The magnitude of the event is characterised by quantity of the hazardous waste stored in the tank. There is no indication of the exact amount of hazardous waste leaked. The quantity was collected in the tank shell, then immediate measures were taken to remove the spilled amount. Then a quantity of 150t of waste from compromised tank was poured to the second tank located in the same tank shell so as to lower the level of waste below the rupture of the first tank.
10. *Spatial extent*
No area was affected by the leakage, because the whole quantity of the spilled waste was collected in the tank shell.
11. *Consequences to the natural resources and description of the causal link*
In fact, there are no natural resources / resource services involved because of this case is an "imminent threat of environmental damage". No area was affected by the leakage, because the whole quantity of the spilled waste was collected in the tank shell. In general, it would be possible to affect area just in case of the tank shell rupture. But it did not happen.
12. *Legal requirements*
In the present case, the provisions of Chapter Two, Section One of LPREDA were applied:
(1) Operators, as a result of whose activity an immediate threat of environmental damage has arisen, shall be obliged to immediately take preventive measures. (2) Where the imminent threat of environmental damage persists despite the measures taken under para. 1, the operator shall be obliged to immediately inform the relevant competent authority […]. (3) The information under para. 2 contains:
1. data about the operator; 2. the location, territorial scope and type of environmental damage for which there is an imminent threat of occurrence; 3. data from protocols of performed analyses and

measurements, proving a violation of the applicable emission standards and restrictions; 4. the reasons for the imminent threat of environmental damage; 5. the preventive measures taken by the operator so far under para. 1; 6. proposals for other preventive measures; 7. financial statement of the expenses for their implementation. (4) Within three days of receiving the information under para. 3 the respective competent authority […], or by an official authorized by him, performs on-the-spot verification of the facts and circumstances related to the imminent threat of environmental damage. If necessary, require additional information from the operator and draw up a statement of findings. (5) The competent authority […] or an officer authorized by him may issue a prescription and / or an order for the implementation of preventive measures other than those under para. 3, items 5 and 6. (6) The order under para. 5 contains: 1. the name of the issuing authority; 2. information about the operator; 3. the legal and factual grounds for its issuance; 4. the preventive measures to be taken; 5. the reasons for the implementation of the preventive measures; 6. the time limit for the implementation of the measures under item 4; 7. financial statement of the expenses for their implementation; 8. before which body and within what time limit can be appealed; 9. the date of issue and signature of the official who issued the order. (7) The competent authority […] shall notify the order to the operator within three days of its issuance. (8) The order under para. 5 shall be subject to appeal by the order of the Administrative Procedure Code. (9) Appeal against the order shall not suspend its execution.

13. Tools/equipment and methods used

According to the information provided by the operator to the Competent Authority (CA), a level gauge was used.

14. Applied Legislation

Provisions of Chapter Two, Section One of LPREDA were applied.

Screening

15. Conduction of the screening

The screening phase was carried out by the CA on the basis of the information provided by the operator, the inspection on the site and a check-up of the facts and circumstances related to the case. CA has taken into account the results of the controls carried out on the fulfilment of the conditions in the IPPC issued to the operator. CA requested from the operator additional information.

16. Guidelines used

In general, there are various orders/instructions/methodologies, including for control over the fulfilment of the conditions in the IPPC permit, over the fulfilment of the requirements of the LPREDA, etc.

The followed procedure was the mentioned by the Chapter II, Section I. Preventive measures of LPREDA.

The mentioned LPREDA, Ordinance No1/2008 and Methodology for the classification of cases under the Liability for prevention and remediation of environmental damages act (LPREDA), determination and valuation of preventive / remediation measures under the law and by-laws to it. (The Methodology was elaborated following the recommendation of the European Commission to the Member States for proactive activities mentioned in the Commission Report to the Council and the European Parliament under Article 18 (2) of Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage. On 19th December 2019 the College of the Ministry of Environment and Water of Republic of Bulgaria has approved the Methodology).

All of them are available on the web site of the Ministry of Environment and Water: https://www.moew.government.bg/bg/prevantivna-dejnost/ekologichna-otgovornost/zakonodatelstvo/

Determination of clues

17. Clues found

The clues of the imminent threat of environmental damage were a leakage of a hazardous waste stored in a tank because of rupture in the tank wall.

18. Conduction of the determination of clues
The clues of an imminent threat of environmental damage were founded by the operator.
19. Guidelines used
The requirements followed were the Art. 18 and Art. 20 of the LPREDA, respectively Ordinance No. 1/2008 (see the explanation in answers to point 16).
Determination of evidence
20. Evidence found
The evidence of the imminent threat of environmental damage were a leakage of a hazardous waste stored in a tank because of rupture in the tank wall. No area was affected by the leakage, because the whole quantity of the spilled waste was collected in the tank shell. In general, it would be possible to affect area just in case of the tank shell rupture. But it did not happen. Natural resources have not been exposed to environmental damage. Therefore, the case is classified as an imminent threat of environmental damage.
21. Conduction of the determination of evidence
The evidence of an imminent threat of environmental damage were founded by the operator.
22. Significance thresholds considered
The case is classified as an imminent threat of environmental damage.
23. *Guidelines used*
--

KEY FINDINGS AND LESSONS LEARNED

In the present case, despite the active provision of information by the operator to the competent authority, the operator did not subsequently proceed with any real action to prevent an imminent threat within the meaning of the LPREDA, due to the subsequent insolvency procedure of the operator.
In this regard, and on the basis of LPREDA, the Minister of Environment and Water determine by the order Regional Governor responsible for the implementation of the preventive measures prescribed by the CA.
This caused difficulties in securing in the budget the necessary funds for the implementation of the measures, the carrying out of procedures under the Public Procurement Act for the preparation of the terms of reference, with the subsequent implementation of the measures.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

At present, the applicable methodological instrument is the one adopted at the end of 2018 Methodology for the classification of cases under the Liability for prevention and remediation of environmental damages Act (LPREDA), determination and valuation of preventive / remediation measures under the law and by-laws to it. (available on the web site of the Ministry of Environment and Water: https://www.moew.government.bg/bg/prevantivna-dejnost/ekologichna-otgovornost/zakonodatelstvo/

TRAINING NEEDS

We consider it particularly important to exchange experience on the implementation of the Directive in the Member States, given the diverse experience of implementing the ELD by Member States.

ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

We are interested in the opportunity offered under the EU exchange programs to exchange experience on the procedures adopted in national law for the implementation of the ELD, on a case by case basis. In addition, for us would be of particular interest the information on what specific actions are taken / procedures adopted in the event of bankruptcy of the liable operator.

Case study no. 3 - Contamination of ground water, soil and building constructions by pharmaceutics production plant

Case study name	Contamination of ground water, soil and building constructions by pharmaceutics production plant
Country	Czech Republic
Contributor	Ministry of the Environment
Type of damage	Water Damage and Land damage
Legislation	Non-ELD case Water act
Site	Czech Republic, Central Bohemian Region, Roztoky u Prahy
Source of impact	The identified contamination presents a risk to groundwater, which serves to supply the population with drinking water
Natural Resources	Contamination of ground water, soil and building constructions
Effects of the impact	Consequences to the natural resources consisted in the existence of contamination directly in groundwater, which could be further expanded

EVENT DESCRIPTION

1. *Location of the event*

Czech Republic, Central Bohemian Region, Roztoky u Prahy

2. *Cause of the event and offense committed*

Historical production method. Production of antibiotics.

3. *Date and duration of the event*

The remediation measures from Czech Environmental Inspectorate CEI were determined in 2005 (contamination from 1938)

4. *Natural resources and services involved and adversely affected*

Contamination of groundwater, soil and building constructions.

ASCERTAINMENT

5. *How was the event known?*

It is an old environmental burden; it was known historically.

6. *Who conducted the ascertainment / investigation?*

From the environmental side, CEI and the Environmental Damage Department as a technical remediation supervisor (Ministry of Environment).

7. *Timeline of the event and of the determination of clues and evidence*

1998 environmental audit 1998, 2002 risk assessment - CEI parameters of remediation 2005 - complementary survey before remediation 2006 – remediation project (and then remediation of soil, building constructions and ground water) 2013 - updating risk assessment 2015 - completion of remediation 2017 - completion of post-remedial monitoring 2019

Please note that this type of case is funded by the Ministry of Finance in public procurement.

8. *Identification of the source of impact*

The identified contamination presents a risk to groundwater, which serves to supply the population with drinking water.

9. *Magnitude of the event*

Groundwater: 1940 mg/l butyl acetate, 200 mg/l non-polar extractable

Soil: max. 27,8 g/kg butyl acetate, 6,400 mg/kg non-polar extractables in dry matter

Building construction: max. 77 g/kg non-polar extractables
10. Spatial extent
2000 m^2.
11. Consequences to the natural resources and description of the causal link
Consequences to the natural resources consisted in the existence of contamination directly in groundwater, which could be further expanded.
12. Legal requirements
All possible. This kind of remediation was given by a special contract of the Czech Republic and the New Owner of the contaminated area (after privatization).
13. Tools/equipment and methods used
The specialized company took samples.
14. Other Applied Legislation
Water act.
Screening
15. Conduction of the screening
The case is an old case.
Visual contamination in buildings.
16. Guidelines used
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Determination of clues
17. Clues found
The relevant results of the sampling were:
Groundwater: 1940 mg/l butyl acetate, 200 mg/l non-polar extractable
Soil: max. 27,8 g/kg butyl acetate, 6,400 mg/kg non-polar extractables in dry matter
Building construction: max. 77 g/kg non-polar extractables
Spatial extent of 2000 m^2.
18. Conduction of the determination of clues
The specialized company took samples.
19. Guidelines used
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Determination of evidence
20. Evidence found
I only have the conclusions of the update of the risk assessment from 2015. The document evaluates the situation after the first stage of remediation. Contaminated soils have already been removed. Groundwater flows towards the river. The contamination cloud is delimited in all sub-localities after the first stage of remediation. The possibility of spreading contamination may be the surrounding house wells. The risk assessment calculated the health risks for the surrounding population in the event of failure to eliminate groundwater contamination (house wells may be used occasionally). HQ from 0.33 to 16.81 (according to US EPA methodology). Real ecological risks for the Vltava River have also been demonstrated. In the end, the risk assessment recommended continuing the remediation at the site with biodegradation methods.
21. Conduction of the determination of evidence
Depends on concrete case. The CEI orders risk assessment (according a special methodology of Ministry of Environment). In remediation of old environmental burdens, the risk assessment is crucial. There was a risk assessment, which included analysis of groundwater, soil and building constructions.
The Risk analysis must be done by a specialized company.
22. Significance thresholds considered
There is always useful information from the Risk assessment, real risk for human health and environment and of course comparison with legislation. The remediation parameters (concentrations) must be realistic (technically feasible). The thresholds are based on real risks

(real risks are based on US EPA calculations). *23. Guidelines used* All documents are according to the special methodology of Ministry of Environment. The risk assessment methodology concern human and environmental targets. Risk assessment: https://www.mzp.cz/C1257458002F0DC7/cz/metodiky_ekologicke_zateze/$FILE/OES-c1_vestnik_mzp-3_2011_20140318.pdf Contaminated sites: https://www.mzp.cz/C1257458002F0DC7/cz/metodiky_ekologicke_zateze/$FILE/Met%20pokyn%2013.pdf Survey of contaminated site
KEY FINDINGS AND LESSONS LEARNED --
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE According our experience there are no similar cases (natural sources, geology, concentration of contaminants, risks etc.). All cases are individual.
TRAINING NEEDS Webinars.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS There were not occurred any case under ELD in the Czech Republic yet. For this Questionnaire I would divide the Cases of Environmental Damage info several groups: 1) There are old environmental burdens and loads before the privatization, former Soviet Army military bases; 2) in the Czech Republic and (for the Operational Programme Environment - OPE) accidentally discovered contaminated sites; 3), where the polluter does not exist or is unknown. On the other side, there is a current type of damage which is under ELD or other legislation. For both of them (old environmental burdens and current damage) determines the parameters of remediation CEI; 4) CEI, where needed, imposes corrective measures and controls their compliance. Including remediation, fines etc. according to legislation. 1) The Environmental Damage Department as a technical remediation supervisor of the contaminated sites. 2) https://www.mzp.cz/en/competency_enviro_damage 3) https://www.mzp.cz/en/operational_programme_environment 4) http://www.cizp.cz/Departments-of-CEI Except for cases in Operational Programme Environment OPE. In OPE the remediation measures usually determine the Department of Environmental Damage of Ministry of Environment.

Case study no. 4 - Cultivation of protected grassland habitat within designated Natura 2000 area

Case study name	Cultivation of protected grassland habitat within designated Natura 2000 area
Country	Denmark
Contributor	Municipality of Aarhus
Type of damage	Damage to natural habitats and protected species
Legislation	Non-ELD case The case was ultimately assed by the Danish Environmental Protection Agency (EPA) who found it not to be severe enough to fall within the ELD and it was thus handled by the municipality (Aarhus) enforcing national nature protection law § 3 (that protects specific

	nature types (including Natura 2000 habitat types))
Site	Denmark, Samsø (the island), near the city Nordby
Source of impact	(not relevant)
Natural Resources	The natural resources involved/impacted (damage was not found) were 2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker"
Effects of the impact	The cultivation of the 2 ha acidic grassland (habitat code 6230) effectively removed all (or nearly all) plant species growing there and their associated fungi, likens, insects etc. leading to a local destruction of the habitat

EVENT DESCRIPTION

1. *Location of the event*

Denmark, Samsø (the island), near the city Nordby

2. Cause of the event and offense committed

2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker" had been ploughed, fertilized and sowed with rape (Brassica napus).

3. Date and duration of the event

The event occurred was discovered on the 7th July 2014. The cultivation had occurred 6 to 12 months before.

4. Natural resources and services involved and adversely affected

The natural resources involved/impacted (damage was not found) were 2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker".

ASCERTAINMENT

5. How was the event known?

The event was reported to the Municipality of Aarhus (MAA) by the EPA in late June/early July 2014 as a result of NAEAs routinely monitoring (through field observation) of the habitat types within the Natura 2000 area in Samsø. The EPA reported to MAA the extent and the location of the area that had been cultivated.

6. Who conducted the ascertainment / investigation?

The ascertainment/investigation on site was conducted by MAA on the 7th of July 2014.

7. Timeline of the event and of the determination of clues and evidence

See answers no. 3 and no. 6.

8. Identification of the source of impact

(not relevant)

9. Magnitude of the event

(not relevant)

10. *Spatial extent*

Cultivation of 2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker", see the map below where the yellow shaded areas mark the habitat types and the red line shows the location of the cultivated 2 ha.

11. Consequences to the natural resources and description of the causal link

The cultivation of the 2 ha acidic grassland (habitat code 6230) effectively removed all (or nearly all) plant species growing there and their associated fungi, likens, insects etc. leading to a local destruction of the habitat.

12. Legal requirements

The legal procedural and technical requirements to comply with is found in the national law for

protection of nature, "Naturbeskyttelsesloven" in Danish (link to law text in Danish: https://www.retsinformation.dk/Forms/R0710.aspx?id=207969) and in the law for administration of justice ("Retsplejeloven" in Danish, https://www.retsinformation.dk/Forms/R0710.aspx?id=202196))

13. Tools/equipment and methods used

The tool/equipment/method used for the determination of clues were cameras, aerial photos/maps, hand-held GPS and database consultation.

14. Other Applied Legislation

The case was ultimately assed by the Danish Environmental Protection Agency (EPA) who found it not to be severe enough to fall within the ELD and it was thus handled by the municipality (Aarhus) enforcing national nature protection law § 3 (that protects specific nature types (including Natura 2000 habitat types).

Screening

15. Conduction of the screening

The event was discovered as a result of NAEAs routinely monitoring (through field observation) of the habitat types within the Natura 2000 area in Samsø.

16. Guidelines used

See the file "MEA procedure" for the guideline for handling cases where protection of nature has been (or suspected to be) violated (procedure in Danish).

Determination of clues

17. Clues found

Cultivation of 2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker".

The cultivation of the 2 ha acidic grassland (habitat code 6230) effectively removed all (or nearly all) plant species growing there and their associated fungi, licens, insects etc. leading to a local destruction of the habitat.

18. Conduction of the determination of clues

There was an initial search using aerial photos and maps, locating the area in focus. The focus is to determine whether the area is registered as a § 3 (national law) protected area (in this case species rich grasslands), and if so, if it is within Natura 2000 area and if it is also registered as a Natura 2000 habitat. The initial investigation also included a search in records and journals existing data from the same area or possible earlier cases with the same landowner.

19. Guidelines used

See answer no. 16.

Determination of evidence

20. Evidence found

2 ha of acidic grassland (habitat code 6230) within the Natura 2000 area nr. 58 "Nordby Bakker" had been ploughed, fertilized and sowed with rape (Brassica napus).

21. Conduction of the determination of evidence

By field visit and evaluation of existing data (plant species recorded, earlier nature status recorded etc.) and aerial photos/maps.

22. Significance thresholds considered

The significance threshold for destruction of habitat types within a Natura 2000 area is not known to MAA. Upon request from the MAA the case was assessed by the EPA, who found the area affected by the cultivation to be too small in size to have a "significant adverse effect on reaching or maintaining the favourable conservation status" for the type 6230 in the area, cf. law on environmental damage section 7. Because of that assessment by the EPA the MAA handled the case by enforcing national nature protection law section 3 (which protects specific nature types, including Nature 2000 habitat types).

23. *Guidelines used*

See answer no. 16

KEY FINDINGS AND LESSONS LEARNED
As is often the case, the better knowledge (previous visits, data etc.) of an area, the better chances there are of successfully handling a case of destruction of nature.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE
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TRAINING NEEDS
--
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS
--

Case study no. 5 - Waste of fertilizer in marine waters and to soil and groundwater

Case study name	Waste of fertilizer in marine waters and to soil and groundwater
Country	Denmark
Contributor	Municipality of Fredericia
Type of damage	Water damage and Land damage
Legislation	Non-ELD case Danish environmental protection act
Site	Denmark, Jutland, Fredericia, Møllebugtvej, 7000 Fredericia
Source of impact	The accident caused release of 14.400 m^3 fertilized water containing up to 32 percent nitrogen
Natural Resources	The marine waters "Lillebælt", surrounding fjords, "Kattegat" and "Sydfynske Øhav" were affected with fertilizer, but not in such concentrations that caused an ELD-case. The accident happened in February, before the algae growth, which reduced the environmental damage. The accident caused a soil and groundwater pollution on more properties, but not in concentrations that caused an ELD case. There is an ongoing remediation in the area to protect the marine waters against further nitrogen discharge.
Effects of the impact	A model spread of marine dispersion showed no significant deterioration in the environmental state in the marine areas. A survey based on samples showed increased content of nitrogen in soil and groundwater. The content will eventually be washed out in the marine waters.
EVENT DESCRIPTION 1. *Location of the event* The event happened in Denmark, Jutland, County of Fredericia, Møllebugtvej. *2. Cause of the event and offense committed* A tank collapse caused several damaged tanks. Some of the tanks contained palm oil that burned on fire. *3. Date and duration of the event* The accident happened 3 february 2016.	

4. Natural resources and services involved and adversely affected

The marine waters "Lillebælt", surrounding fjords, "Kattegat" and "Sydfynske Øhav" were affected with fertilizer, but not in such concentrations that caused an ELD-case. The waste happened in February, before the algae growth, which reduced the environmental damage.

The waste caused a soil and groundwater pollution on more properties, but not in concentrations that caused an ELD case. There is an ongoing remediation in the area to protect the marine waters against further nitrogen discharge.

ASCERTAINMENT

5. How was the event known?

The accident, and the following fire, were fought by the fire department and the environmental authorities.

6. Who conducted the ascertainment / investigation?

The local environmental authorities in Municipality of Fredericia conducted the process. The Danish Environmental authorities assisted.

The company, that owned the fertilizer, performed voluntarily investigation in the marine water.

The company, that owned the fertilizer, got an order to investigate the effect on soil and groundwater.

7. Timeline of the event and of the determination of clues and evidence

Spillage of fertilizer in the marine waters: 3 February 2016 until 29 August 2018

Soil and groundwater pollution: 3 February 2016 until 20 April 2016.

8. Identification of the source of impact

The accident caused release of 14.400 m^3 fertilized water containing up to 32% of nitrogen.

9. Magnitude of the event

The accident caused a release of 2.755 tonnes of N to the marine waters, and 1.750 tonnes of N to the soil and groundwater.

10. *Spatial extent*

Impossible to estimate.

11. Consequences to the natural resources and description of the causal link

A model spread of marine dispersion showed no significant deterioration in the environmental state in the marine areas.

A survey based on samples showed increased content of nitrogen in soil and groundwater. The content will eventually be washed out in the marine waters.

12. Legal requirements

The model spread was done by an independent analysis lab, which is bound by relevant procedural and technical requirements.

13. Tools/equipment and methods used

The tool/equipment/method used for determination of clues were cameras, drones, maps with contour lines, maps with sewers, geological information, information from the owner of the fertilizer, data from ongoing monitoring of the state of the marine environment.

14. Other Applied Legislation

Danish environmental protection act.

Screening

15. Conduction of the screening

Eyewitnesses saw fertilizer spread on the harbour area and in the harbour basin. In addition, parts of the harbour area were video-monitored.

The operator communicated the incident of a tank collapse caused several damaged tanks.

The owner of the fertilizer informed about the contents of the tank facility.

Some of the tanks contained palm oil that burned on fire.

The screening was conducted as an assessment of the hazard from the amount of fertilizer discharged. Contact was made with the relevant authorities.

16. Guidelines used

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Determination of clues

17. Clues found

The tank facility and tank yard were destroyed. The accident caused release of 14.400 m^3 fertilizer water containing up to 32% nitrogen.

The accident caused a release of 2.755 tonnes N to the marine waters, and 1.750 tonnes N to the soil and groundwater.

A survey based on samples showed increased content of nitrogen in soil and groundwater. The content will eventually be washed out in the marine waters. There is an ongoing remediation in the area to protect the marine waters against further nitrogen discharge.

18. Conduction of the determination of clues

The clues of environmental damage were found by the authority for the marine environment, and acquired help from Aarhus University.

19. Guidelines used

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Determination of evidence

20. Evidence found

The marine waters "Lillebælt", surrounding fjords, "Kattegat" and "Sydfynske Øhav" were affected with fertilizer, but not in such concentrations that caused an ELD-case. The spillage happened in February, before the algae growth, which reduced the environmental damage.

A model spread of marine dispersion and data from ongoing monitoring of the state of the marine environment showed no significant deterioration in the environmental state in the marine areas.

21. Conduction of the determination of evidence

The evidence of environmental damage was done by the owner of the fertilizer. The determination of evidence was carried out as a model spread of marine dispersion, data from ongoing monitoring of the state of the marine environment and a survey on the pollution of soil and groundwater based on samples of soil and groundwater.

22. Significance thresholds considered

There are no thresholds for nitrogen in the marine environment, the damage is assessed on the basis of side effects.

There are not thresholds for nitrogen in soil and groundwater, the damage is assessed on the basis of background level.

23. *Guidelines used*

The Danish Environmental authorities have made a guideline nr. 4, 2008, from the Environmental Protection Agency on the concept of damage under the environmental damage act. Particularly chapter 9.

https://www2.mst.dk/udgiv/publikationer/2008/978-87-7052-794-1/pdf/978-87-7052-795-8.pdf

KEY FINDINGS AND LESSONS LEARNED

The weaknesses in the process of determination environmental damage were:

The accident involved several authorities, the police investigations meant that information could not be provided early in the process.

The Municipality of Fredericia is only authority on land and not in the marine waters, which meant that professional knowledge had to be acquired in relation to the impact on the marine environmental.

Lack of experience with the application of the set of rules made the case processing challenging.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

Impossible to answer, as the Municipality of Fredericia is not an authority in the marine environment.

TRAINING NEEDS

Guides in the practical application of the set of the rules, and help to translate the environmental

damage criteria into thresholds.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 5 - Pollution of waterways due to spill of fluid fertilizer

Case study name	Pollution of waterways due to spill of fluid fertilizer
Country	Denmark
Contributor	Municipality of Holbæk
Type of damage	Water damage
Legislation	ELD case
Site	Denmark, Region Zealand, Holbæk municipiality
Source of impact	The damage was caused by a large quantity of a fertilizer
Natural Resources	Natural resources affected were a system of natural waterways totalling a length of app. 15 km.
Effects of the impact	The spill adversely affected the ecological condition of the waterways. It was assessed that for the biological quality element fish it would take at least 1½ years from the discharge has occurred before the condition classes, stock density, and age composition that existed before the event would be re-established. For small water animals, it was assessed that it would take more than a year to restore the state from before the release.
EVENT DESCRIPTION 1. *Location of the event* Denmark, Region Zealand, Holbæk municipality *2. Cause of the event and offense committed* The contamination happened because of a leakage of a tube used for transferring fluid fertilizer. *3. Date and duration of the event* The event occurred on the night between 5th and 6th of September 2018. There is no information of the exact duration. *4. Natural resources and services involved and adversely affected* Natural resources affected were a system of natural waterways totalling a length of app. 15 km.	
ASCERTAINMENT *5. How was the event known?* A citizen notified the municipality about the polluted water. *6. Who conducted the ascertainment / investigation?* The municipality conducted the ascertainment assisted by private environmental consultants. *7. Timeline of the event and of the determination of clues and evidence* The event was discovered on 6 September 2018. On 26 October 2018, the municipality forwarded to the EPA a draft decision for deciding that the event was an environmental damage within the	

meaning of the ELD. According to the present Danish rules on environmental liability, the EPA has to give a binding opinion before such a draft decision becomes final. On 21 December 2018 the EPA acceded to the draft decision.

8. Identification of the source of impact

The damage was caused by a large quantity of a fertilizer.

9. Magnitude of the event

It was estimated that app. 100 tonnes of the fertilizer was spilled. App. half of the spill was soaked up and the rest remained around the site of the spill among some woods or ran into the waterways. The fertilizer contained a high concentration of nutrients as well as the following environmentally hazardous substances: LAS, DEPH, PAH, NPE, and Sulfur.

10. *Spatial extent*

The fertilizer spill had affected waterways (a small stream leading into a bigger stream) with a total length of app. 15 km.

11. Consequences to the natural resources and description of the causal link

The spill adversely affected the ecological condition of the waterways. It was assessed that for the biological quality element fish it would take at least 1½ years from the discharge has occurred before the condition classes, stock density, and age composition that existed before the event would be re-stablished. For small water animals, it was assessed that it would take more than a year to restore the state from before the release.

12. Legal requirements

Not applicable.

13. Tools/equipment and methods used

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14. Other Applied Legislation

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Screening

15. Conduction of the screening

A citizen notified the Municipality about the polluted water due to a leakage of a tube used for transferring fluid fertilizer.

By contacting the operator of the tube from where the leakage had occurred, it was verified that there had indeed been a leakage which had led to the spill into the waterways.

On-site inspection by the municipality. Very visible death of fish was reported.

16. Guidelines used

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Determination of clues

17. Clues found

It was estimated that app. 100 tonnes of the fertilizer was spilled. App. half of the spill was soaked up and the rest remained around the site of the spill among some woods or ran into the waterways. The fertilizer contained a high concentration of nutrients as well as the following environmentally hazardous substances: LAS, DEPH, PAH, NPE, and Sulfur.

The fertilizer spill had affected waterways (a small stream leading into a bigger stream) with a total length of app. 15 km.

18. Conduction of the determination of clues

On-site inspection and testing of the water by the municipality.

19. Guidelines used

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Determination of evidence

20. Evidence found

The spill adversely affected the ecological condition of the waterways. It was assessed that for the biological quality element fish it would take at least 1½ years from the discharge has occurred before the condition classes, stock density, and age composition that existed before the event

would be re-established. For small water animals, it was assessed that it would take more than a year to restore the state from before the release.

21. Conduction of the determination of evidence

The number of remaining fish and insects after the incident was compared to similar earlier research of the same parts of those streams.

See also answer no. 18.

22. Significance thresholds considered

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23. *Guidelines used*

The Danish Environmental authorities have made a guideline nr. 4, 2008, from the Environmental Protection Agency on the concept of damage under the environmental damage act. Particulary chapter 9.

https://www2.mst.dk/udgiv/publikationer/2008/978-87-7052-794-1/pdf/978-87-7052-795-8.pdf

KEY FINDINGS AND LESSONS LEARNED

The key finding for the environmental damage was the very visible death of fish. It is a stream that has several minor occurrences of discoloration due to a lake and rainwater drainage from a town upstream. But arriving at the same point of the stream as in these other cases, it was not hard to distinguish from other events.

What proved to be difficult, was to determine the amount of documentation that was needed, to decide whether this was an environmental damage. This based on that there wasn't established a precedent in Denmark to support the evaluation. We sought outside counselling to secure adequate documentation.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

If we have a case in a different area, one of the first things in the assessment would be an overview of knowledge of the polluted recipient to determine if there is a parameter, where it's possible to assess the damage.

TRAINING NEEDS

We need more cases and to spread the knowledge of those that have been.

ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

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Case study no. 7 - Discharge of sewage from sewage pumping station to surface water

Case study name	Discharge of sewage from sewage pumping station to surface water
Country	England, UK
Contributor	Environment Agency
Type of damage	Water damage
Legislation	ELD case
Site	Discharge of sewage from pumping station

Source of impact	The source of the impact was the release of screened sewage from a pumping station to a WFD waterbody. The sewage discharge affected approximately 5 kilometre stretch of water.
Natural Resources	Natural resources affected (damage was found) were fish. Two thousand kilos of dead fish were removed from the waterbody. Due to the slow flowing nature and existing presence of low levels of organic enrichment in the water body there was no evidence of invertebrate impact.
Effects of the impact	Fish mortality caused by water pollution. Pre-incident fish information confirms classification of 'good' ecological potential for the biological quality element. Post-incident fish information confirms classification of 'at least poor' for the biological quality element. 'Poor' means that there is a major deviation in the numbers and composition of fish from that expected in normal circumstances. The Water Framework Directive classification of the biological element was lowered as a result of the impact.

EVENT DESCRIPTION

1. *Location of the event*

England, North West

2. *Cause of the event and offense committed*

Discharge of sewage from a pumping station into a WFD waterbody. This resulted in criminal liability under the Water Resources Act 1991. A fine was given plus costs and fish restocking costs.

3. *Date and duration of the event*

The event was discovered on 2 July 2009. The Environment Agency was told by the company responsible that the discharge started on 30 June and discharges were intermittent until 2 July.

4. *Natural resources and services involved and adversely affected*

Natural resources affected (damage was found) were fish. No impact was found on invertebrates. The Water Framework Directive classification of the biological element was lowered as a result of the impact.

ASCERTAINMENT

5. *How was the event known?*

A member of the public contacted the Environment Agency regarding the incident through a free phone emergency number.

6. *Who conducted the ascertainment / investigation?*

The investigation (information and data collection of the event, data collection of the environmental quality status before and after the event, sampling and analysis, ascertainment/investigation plan and actions) was conducted by the Environment Agency's in-house ecologist for that geographical area.

7. *Timeline of the event and of the determination of clues and evidence*

Incident reported on 2 July 2009.
Fisheries stock assessment carried out on 22 July 2009 [post-incident].
Biological impact assessment report on 27 July 2009.
Report completed on 14th October 2009.

8. *Identification of the source of impact*

The impact was through the release of screened sewage to a WFD waterbody.

9. *Magnitude of the event*

The discharge volume was estimated at 10,741 m^3.
10. *Spatial extent*
5 kilometres length of watercourse was affected.
11. Consequences to the natural resources and description of the causal link
Fish mortality caused by water pollution. Two thousand kilos of dead fish were removed from the water body. Exact numbers of fish and individual weights or species bulk weights were not taken during the clean up process. However, assuming each fish weighed around 0.5lbs it can be estimated that approximately 6000 fish were removed. The value of 0.5lbs per fish is an average weight taking account of the fact that smaller sized fish made up the majority of the fish removed. The number of fish removed in the clean-up operation must be less than the total fish kill because not all dead fish will have been netted, and some will have sunk to the bottom and decomposition will have started to occur. The full extent of the mortality is therefore not known.
Due to the slow flowing nature and existing presence of low levels of organic enrichment in the water body there was no evidence of invertebrate impact.
12. Legal requirements
Compliant with legal procedural and technical requirements.
Followed detailed internal procedures, which ensure that legal and technical requirements are complied with.
The gathering and evaluation of evidence was undertaken to enable decisions required of regulators under the ELD. Under English law there is also the possible criminal offence of water pollution. Therefore, this incident was investigated in such a way that, if required and appropriate, a prosecution could take place.
Technical requirements – there is generic guidance and procedures on how we respond to pollution incidents. In the early stages of an incident the responses is generic and not dependent on a particular regime. If it becomes apparent that specific legislation may be more relevant, then further regime specific work may be required.
13. Tools/equipment and methods used
Fish survey and invertebrate sampling were used to determine clues.
14. Other Applied Legislation
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Screening
15. Conduction of the the screening
The screening was conducted through the Environment Agency's National Incident Reporting System which collects information about environmental incidents reported to the Environment Agency. The system includes the location of the incident, time and date of the report, and information on the potential impact.
16. Guidelines used
The Environment Agency has internal guidance "Incidents and their classification: the Common Incident Classification Scheme (CICS)" including impact on fish stocks.
Determination of clues
17. Clues found
The clues of environmental damage were the release of sewage into the water body breaching the conditions of the (then) Water Resources Act 1991 discharge consent. The pathway was direct to the watercourse through sewer outfall. It resulted in a significant fish kill. Approximately two thousand kilos of dead fish were removed from the water body. Exact numbers of fish, individual weights and species bulk weights were not taken during the clean up process. However, assuming each fish to weigh around 0.5lbs it can be estimated that approximately 6000 fish were removed.
18. Conduction of the determination of clues
Discharge consent conditions are put in place to protect the environment. Any breach of these

indicates environmental damage may have occurred.
A fish survey had been carried out two months before the incident. Four seine nettings were carried out, on 100 metre stretches located over the length of the water body. The results gave a combined total of approximately 285lb of fish, which consisted of mainly bream, roach, pike, tench and perch of varying sizes indicating that natural recruitment was occurring. The amount and size of fish found indicated a reasonably diverse healthy fish population.
After clean-up, a post incident survey was carried out on 22 July 2009. The sewage discharge had affected approximately 5 kilometers stretch of water. Four 100m seine nettings were carried out over this affected stretch. Only 12 small perch and a tench of 3lbs were recovered from the four nettings combined.
19. Guidelines used
UK Technical Advisory Group on the Water Framework Directive: Recommendations on Surface Water Classification Schemes for the Purposes of the Water Framework Directive
http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Recommendations%20on%20surface%20water%20status%20classification_Final_010609.pdf
Determination of evidence
20. Evidence found
The evidence of environmental damage was the mortality of 2000 kilograms (~6000 fish) and its consequence: the classification of the biological element was lowered as a result of the impact.
21. Conduction of the determination of evidence
The evidence of environmental damage was found through a fisheries stock assessment on the water body 22 July 2009 [post-incident].
1) Pre-incident classification of water body
In its pre-damaged state the water body was classified at 'moderate ecological potential' as it is a heavily modifed water body. This was based on classifying its biological quality as 'good' and its physiochemical quality as 'moderate'; the lower classification determining the overall status of the water body.
The pre-incident fish information confirmed this classification of 'good' ecological potential for the biological quality element. This classification was supported by the large numbers of dead fish recovered after the incident.
2) Post-incident classification of water body
The biological quality element was reduced to at least 'poor' due to the extensive loss of fish as a result of the pollution incident. 'Poor' means that there is a major deviation in the numbers and composition of fish from that expected in normal circumstances.
22. Significance thresholds considered
Water body status thresholds: Pre-incident fish information confirms classification of 'good' ecological potential for the biological quality element; post-incident fish information confirms classification of 'at least poor' for the biological quality element.
23. *Guidelines used*
EA Guidelines on Assessing fish kills.
Recommendations on Surface Water Classification Schemes for the purposes of the Water Framework Directive (UK Technical Advisory Group on the Water Framework Directive), see par. 19.

KEY FINDINGS AND LESSONS LEARNED

1) The volume of fish killed was so substantial that the conclusions were not hard to reach.
2) Normal internal procedures were followed to assess the impact on the WFD status.
3) In this incident, the criminal investigation was concluded swiftly – and the operator accepted their responsibility. If the facts had been less clear, and the operator had contested them, the situation would have been more complex, as the requirements of the criminal legislation and the civil Environmental Liability regime are slightly different, and sometimes do

not proceed in tandem. This can introduce additional tensions and constraints on how the different regimes are progressed. In the UK criminal matters have a higher standard of proof: 'beyond reasonable doubt'. By comparison, for civil cases - like most environmental damage matters - the standard of proof is lower. We have to prove things on a balance of probabilities (that they are more likely than not). In criminal cases, there is complex case law governing what might be admissible in a criminal trial. Many of these "extra criminal requirements" would not apply in EDR civil proceedings. There are also differences in what has to be proved. For criminal cases, taking a very broad overview – for water pollution, we only need to prove that pollution occurred. UK water legislation and case law has developed an extremely wide definition of what this might encompasses. By comparison the UK environmental damage legislation has a very prescriptive description of what amounts to water damage. This means that for environmental damage whilst we don't have to prove things to the higher standard required for a criminal prosecution, we do have to prove that a very narrow definition has been met. Sometimes it can take a long time to gather the evidence to decide if there has been a change in e.g. the water quality standards, before a decision can be made about whether environmental damage has actually occurred. Also, whether or not an incident results in formal environmental damage, could affect how seriously a criminal prosecution is viewed. This in turn could affect the sentencing if there is a guilty plea or the courts find that such an offence has occurred.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE For the determination of evidence in similar cases, it is advisable to follow the criteria that allow an assessment to be made of a change in WFD elemental class.
TRAINING NEEDS E-learning to employees joining the Environment Agency, or as a refresher to existing employees on Environmental Liability Directive.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 8 - Solvent leak on railway

Case study name	Solvent leak on railway
Country	Estonia
Contributor	Ministry of the Environment
Type of damage	Imminent threat of Water damage and Land damage
Legislation	ELD case Criminal law
Site	Railway
Source of impact	Contaminated soil, imminent threat to groundwater In Sonda soil was polluted but the intention was that the pollution wouldn't go to the groundwater
Natural Resources	The natural resource affected was the soil around the railway. The natural resource involved was the groundwater. Tapa – imminent threat of damage to groundwater and land damage. Two years of water monitoring (every month) shows that water

	complies to permitted limit values and the soil samples are also ok (complies to permitted limit). Sonda – soil, ground is polluted Preventive/remedial measures – excavation of soil; soil washing and polluted water collecting; chemical treatment with hydrogen peroxide; water monitoring every month.
Effects of the impact	All the pollution could not be to cleaned up and 17 tons of solvent were left to the soil

EVENT DESCRIPTION

1. *Location of the event*

Estonia, Ida-Viru county, railway between Kiviõli and Sonda stations and Estonia, Lääne-Viru county, railway between Kadrina and Tapa stations.

2. *Cause of the event and offense committed*

The wagons of a cargo train transporting solvent started to leak (negligence).

The competent authority, the Environmental Board must prove a causal link between the activity and the damage, except in the case of a list of hazardous activities, which includes those that require an integrated waste management licence or relate to dangerous chemicals.

Environmental Board has the legal right to assume that the person who caused the damage is the transport company who transports the dangerous goods in rail.

3. *Date and duration of the event*

The event occurred/discovered 27.03.2017, from 4:21 p.m. to 9:52 p.m.

The procedure is ongoing (ELD and criminal law) also preventive and remedial measures in Sonda. Tapa - water monitoring was stopped/ended in September 2019. Land damage was not established. Water monitoring showed some marks of pollution in the water but was still in permitted limit values. No water (groundwater) damage was established. No land damage was established.

4. *Natural resources and services involved and adversely affected*

The natural resource affected was the soil around the railway.

The natural resource involved was the groundwater.

Tapa – imminent threat of damage to groundwater and land damage.

Two years of water monitoring (every month) shows that water complies to permitted limit values and the soil samples are also ok (complies to permitted limit).

Sonda – soil, ground is polluted.

Preventive/remedial measures – excavation of soil; soil washing and polluted water collecting; chemical treatment with hydrogen peroxide; water monitoring every month.

ASCERTAINMENT

5. *How was the event known?*

The Emergency Response Centre was informed that solvent is leaking from a wagon at the Sonda railway station.

Publicity and the Environmental Inspectorate informed the Environmental Board.

6. *Who conducted the ascertainment / investigation?*

The Environmental Inspectorate conducted the criminal proceeding.

The Environmental Board was engaged in the ascertainment of environmental damage.

The Environmental Board is responsible for the environmental liability procedure and the Environmental Inspectorate is responsible for criminal law procedure.

Other authorities involved: Estonian Rescue Board, Health Board, local municipality, Consumer Protection and Technical Regulatory Authority.

Environmental Board organized every month a meeting where we discussed the preventive/remedial measures. The next meeting will be in October-November (after new soil samples are collected and analysed).

7. *Timeline of the event and of the determination of clues and evidence*

27/3/2017 at 4:21 p.m. the Emergency Response Centre was informed about the leakage in Sonda.
27/3/2017 at 5:20 p.m. the leakage was stopped.
27/3/2017 at 8:14 p.m. leaking of another wagon was discovered between Kadrina and Tapa stations.
27/3/2017 at 8:23 p.m. the Rescue Board was sent to Tapa.
27/3/2017 at 9:10 p.m. the valve of the wagon was closed.
27/3/2017 at 9:52 p.m. the pollution was covered.
The investigation lasted until spring 2019.

8. Identification of the source of impact

Contaminated soil, danger to groundwater.
In Sonda soil was polluted but the intention was that the pollution wouldn't go to the groundwater.

9. Magnitude of the event

52 t of solvent leaked into the soil.

10. *Spatial extent*

The area around the 20 km long railway section.

11. Consequences to the natural resources and description of the causal link

All the pollution could not be to cleaned up and 17 tons of solvent were left to the soil.
See also answer in par. 8 above.
If the rail transport company feels it is not guilty and someone else has caused the environmental damage, then the rail transport company has to prove the casual link and someone else guilt.

12. Legal requirements

The Code of Criminal Procedure
The Penal Code
The Chemicals Act
The Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
The Environmental Liability Act

13. Tools/equipment and methods used

Observation of the scene, sampling, expertise, interviews.

14. Other Applied Legislation

Criminal law.

Screening

15. Conduction of the screening

The Emergency Response Centre was informed that solvent is leaking from a wagon at the Sonda railway station. The accident involved transports of dangerous goods in rail.
Publicity and the Environmental Inspectorate informed the Environmental Board.

16. Guidelines used

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Determination of clues

17. Clues found

52 tons of solvent leaked into the soil.
Samples were taken from both the soil and the wagons and they matched.
The groundwater shows marks for pollution but is still in permitted limits.
296,320 kg of soil containing hazardous substances was collected, as well as 4,150 kg of solvent/water mixture and 812,200 kg of hazardous waste.
All the pollution could not be cleaned up and 17 tons of solvent was left to the soil.

18. Conduction of the determination of clues

As the accident occurred, we started to monitor the groundwater and made soil samples.
The pollution research was carried out and the monitoring plan was approved.

The Environmental Board as the competent authority organized sampling, analysing and supervision. The screening peaks and a KeA (Key Expert Assessment) was conducted. A private expert was involved. Environmental Board worked out water monitoring plan (for groundwater monitoring). Expert made soil surveys. Photos were taken; samples were taken from soil, groundwater and wells. It became evident that pollution reached the soil but not the groundwater, although this was also suspected. Chemical treatment with hydrogen peroxide didn't give any effect in wintertime when the soil was frozen. *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* Samples were taken from both the soil and the wagons and they matched (causal link determination). It became evident that pollution reached the soil but not the groundwater although this was also suspected. Land damage was not established. Water monitoring showed some marks of pollution in the water but was still in permitted limit values. No water (groundwater) damage was established. Two years of water monitoring (every month) shows that water complies to permitted limit values and the soil samples are also ok (complies to permitted limit). Clues of imminent threat of damage for groundwater were found as all the pollution could not be cleaned up and 17 tons of solvent was left in the soil. *21. Conduction of the determination of evidence* Again KeA (Key Expert Assessment). A private expert took the water and soil samples. Environmental Board worked out water monitoring plan (for groundwater monitoring). Expert made soil surveys. *22. Significance thresholds considered* The pollution research was carried out and the monitoring plan was approved. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED Better cooperation between authorities in the event of a major accident.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS Different authorities are thinking about to use this case as a training material (railway accident, how and what to do and what to do now better).
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS I have many documents about this case (expert opinions, water monitoring, protocols about preventive/remedial measures meetings) but as the procedure is still ongoing the documentation is not public yet. And the documentation is in Estonian language.

Case study no. 9 – Surface water contamination by the release of hydraulic oil through cooling water canalisation

Case study name	Surface water contamination by the release of hydraulic oil through cooling water canalisation

Country	Finland
Contributor	Centre for Economic Development, Transport and the Environment (ELY Centre)
Type of damage	Water damage
Legislation	ELD case
Site	Power plant in Finland, South-Karelia, Joutseno
Source of impact	The source of impact was identified in the release of hydraulic oil through cooling water canalisation into surface water
Natural Resources	1) The natural resources involved/impacted (damage was not found) were birds and fish 2) Natural resources affected were not found
Effects of the impact	No long-term environmental damage due to rapid preventive actions

EVENT DESCRIPTION

1. *Location of the event*

Finland, South-Karelia, Joutseno.

2. Cause of the event and offense committed

In connection with maintenance of a power plant turbine, a hydraulic oil pipeline was disconnected with the intention of connecting a pressure measuring device to it. The power plant was then started although the pipeline was disconnected, which led to leak of about 1000 litre of hydraulic oil into lake Saimaa.

3. Date and duration of the event

1) The event occurred/was discovered on 2.5.2016

2) The event lasted from 14:30 to 14:45

4. Natural resources and services involved and adversely affected

1) The natural resources involved/impacted (damage was not found) were birds and fish.

2) Natural resources affected were not found.

ASCERTAINMENT

5. How was the event known?

The operator noticed the event and informed the fire brigade.

6. Who conducted the ascertainment / investigation?

1) The ascertainment/investigation on site (information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysis, ascertainment/investigation plan and actions) was conducted by the operator and by a consultant.

2) The ascertainment/investigation onsite was led by the fire brigade and the Centre for Economic Development, Transport and the Environment (ELY).

7. Timeline of the event and of the determination of clues and evidence

The leak was noticed on 2.5.2016 at 14:30 and the cooling water canal was shut immediately after that. The fire brigade was informed 16:30 and had started oil spill response during the same evening.

8. Identification of the source of impact

The source of impact was identified in the release of hydraulic oil through cooling water

canalisation into surface water.

9. Magnitude of the event

The quantity of hydraulic oil was about 1000 liters. The hydraulic oil contents 0,25% 2,6-di-tert-butylphenol as hazardous substance. Thus 1000 liter hydraulic oil contents about 2 kg of 2,6-di-tert-butylphenol.

10. *Spatial extent*

The event involved and area of approximately 230 ha.

11. Consequences to the natural resources and description of the causal link

No long-term environmental damage due to rapid preventive actions.

12. Legal requirements

Not applicable.

13. Tools/equipment and methods used

The tools/equipment/methods used for the determination of clues were sampling equipment, oil collection equipment and operators' interviews. Sampling equipment was used to find out the toxic substances and their concentrations, the oil collection equipment to find out the amount of collected oil and interviews to find out the identity and quantity of the leaked oil. The collected amount was about 450 litres, which revealed that not all leaked oil could be collected. The analysis showed that the concentration of toxic substances was very low and did not cause any damage. No dead fish or oil covered birds were found.

14. Other Applied Legislation

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Screening

15. Conduction of the screening

The operator quickly noticed the event and informed the fire brigade communicating the knowledge of the oil leak and location of the end of the cooling water pipeline.

The leak was noticed 2.5.2016 14:30 and the cooling water canal was shut immediately after that. The fire brigade was informed 16:30 and had started oil spill response during the same evening.

The quantity of hydraulic oil was about 1000 litres. The hydraulic oil contents 0,25% 2,6-di-tert-butylphenol as hazardous substance. Thus 1000 litres of hydraulic oil contents about 2 kg butylphenol into lake Saimaa.

16. Guidelines used

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Determination of clues

17. Clues found

The safety data sheet of the leaked hydraulic oil was rather incomplete. This made it difficult to choose the appropriate prevention equipment.

The substance 2,6-di-tert-butylphenol, according to the European Chemical Agency (ECHA), is very toxic to aquatic life (H400), is very toxic to aquatic life with long lasting effects (H410). This substance is not included in the WFD for the assessment of the ecological and chemical quality status.

The tools/equipment/methods used for the determination of clues were sampling equipment, oil collection equipment and operators' interviews. Sampling equipment was used to find out the toxic substances and their concentrations, the oil collection equipment to find out the amount of collected oil and interviews to find out the identity and quantity of the leaked oil. The collected amount was about 450 litres, which revealed that not all leaked oil could be collected. The analysis showed that the concentration of toxic substances was very low and did not cause any damage. No dead fish or oil covered birds were found.

The event involved and area of approximately 230 ha. This is the area, which the fire brigade closed with oil barriers. The area covers part of a bay. The lake itself is much bigger.

18. Conduction of the determination of clues

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19. Guidelines used -- **Determination of evidence** *20. Evidence found* No long-term environmental damage was found due to rapid preventive actions. Keystone in the process on prevention of environmental damage was the quick notice from the operator to the authorities. *21. Conduction of the determination of evidence* The evidence of environmental damage was found on site by the fire brigade and ELY. *22. Significance thresholds considered* For the determination of environmental damage, no significance thresholds have been considered. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED The safety data sheet of the leaked hydraulic oil was rather incomplete. This made it difficult to choose the appropriate prevention equipment. Keystone in the process of determination of environmental damage was the quick notice from the operator to the authorities.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 10 - Destructive fire in a waste treatment recycling facility

Case study name	Destructive fire in a waste treatment recycling facility
Country	Greece
Contributor	Ministry of the Environment and Energy
Type of damage	Land damage
Legislation	ELD case
Site	Greece/ Attica Region/ Aspropyrgos. WTRF was located in an industrial area.
Source of impact	A noticeable fire in Attica region (were the capital city of Athens is located) burst causing atmospheric pollution from airborne particles and other hazardous substances. According to measurements held on-site, air pollution affected urban areas of vicinity and special measures and advice were suggested to the citizens for the protection of public health (such as closing of schools, water control, restrictions for the consumption of agricultural and animal products of the affected area). The incident was appraised that affected mainly the surrounding area and the air quality in the city of Athens was incurred.

Natural Resources	During the fire incident, the region's atmosphere was affected by the gas emissions (particulates, PAHs, etc.) produced from the burning of the materials and dispersed due to winds in the vicinity. Because of the fire, land was mainly affected (soil samples were taken to examine concentration of harmful substances) and it was appraised that there was a possibility of imminent threat to underground water.
Effects of the impact	The incident was considered as significant but mainly for a short-term period and the damage was limited into the premises of the Waste Treatment Recycling Facility (WTRF). The gases produced by the fire were directed because of the wind towards the city of Athens. The National Institutes mentioned above, were measuring on a 24h basis the emissions during the incident, advising for preventive measures and giving instructions to the residents of the neighbouring areas. The samples of soil from the WTRF site, indicated high concentrations on several heavy metals, organic carbon etc. Measures were determined and imposed for on-site remediation of land. Apart from air pollution monitoring mentioned above, the Ministry of the Environment and Energy (MEE) assigned the Institute of Geology & Mineral Exploration (IGME) to analyse the soil and water samples and report its findings. Five months later, there was a re-examination of soil and groundwater off-site samples and no deterioration was detected.

EVENT DESCRIPTION

1. *Location of the event*

Greece/ Attica Region/ Aspropyrgos. WTRF was located in an industrial area.

2. *Cause of the event and offense committed*

The cause that provoked the incident is unknown. In WTRF premises were concentrated huge amounts of mixed waste (recyclable and not). The facility was licensed but did not comply with its environmental terms and security legislation and regulations and did not provide for an emergency plan. Moreover, legislation on environmental protection (Law 1650/86) and waste management (Common Ministerial Decision 50910/2727/2003) was violated. The above findings also resulted to the insurance company's rejection to compensate for the damages caused by fire.

3. *Date and duration of the event*

The event happened on 06/\06/2015 and the fire was set under control 5 days later. During the summer period there were fire flare ups due to the highly flammable materials.

4. *Natural resources and services involved and adversely affected*

During the fire incident, the region's atmosphere was affected by the gas emissions (particulates, PAHs, etc.) produced from the burning of the materials and dispersed due to winds in the vicinity. Because of the fire, land was mainly affected (soil samples were taken to examine concentration of harmful substances) and it was appraised that there was a possibility of imminent threat to underground water.

ASCERTAINMENT

5. *How was the event known?*

In 06/06/2015 a fire occurred in WTRF sited in Aspropyrgos of Attica Region. The event was considered as an emergency case by the Fire Service and the Civil Protection authority, thus the MEE and the Regional Authority of Attica undertook the environmental inspections. After the incident, it was concluded that remediation measures were needed to be taken. Mass media were also covering developments regarding the event because of air pollution from fire and the duration of the event.

6. Who conducted the ascertainment / investigation?

Three days following the incident both National and Regional authorities (environmental inspectors from MEE and Regional Authority) undertook common on-site inspections and sampling of soil & surface water (on site and off-site). The Coordination Office for the Implementation of Environmental Liability (COIEL) participated in inspections and sampling procedures. At the same time National Research Centres (namely the National Observatory of Athens & Democritos Institute) were assigned to install monitoring stations for measuring air pollutants concentration. All scientific data and evidence were collected by the COIEL for drafting the appropriate remediation measures.

7. Timeline of the event and of the determination of clues and evidence

Since the occurrence of the incident on the 6th of June 2015, the Fire Service managed to control the fire 5 days later. From that point there were made several inspections by the National and Regional authorities. Following the event, the MEE invited the Regional Authorities and other competent authorities (such Ministry of Agriculture, Ministry of Health, etc.) to participate and support the procedures. The MEE undertook the case as an ELD case. The appropriate remediation measures were determined and the operator was requested for its implementation.

- On 09/06 by the environmental inspectors of MEE and Regional Authorities
- On 12/06 by the environmental inspectors and COIEL.
- On 14/07/2015 a Ministerial Decision was issued that defined the remedial measures needed to be taken by the facility operator. However, the operator did not respond to its obligation since he declared bankruptcy two days after the incident. The Ministry for Environment and Energy funded Regional Administration to undertake remediation measures. Moreover, MEE set up the procedure for cost recovery from the responsible operator (Ministerial Decision for recovery, January 2016).

8. Identification of the source of impact

A noticeable fire in Attica region (were the capital city of Athens is located) burst causing atmospheric pollution from airborne particles and other hazardous substances. According to measurements held on-site, air pollution affected urban areas of vicinity and special measures and advice were suggested to the citizens for the protection of public health (such as closing of schools, water control, restrictions for the consumption of agricultural and animal products of the affected area). The incident was appraised that affected mainly the surrounding area and the air quality in the city of Athens was incurred.

9. Magnitude of the event

The actual quantity of the waste material was not officially registered by WTRF (the files were destroyed by the fire). After the incident it was estimated that approximately 50.000 tons of burnt waste remains were to be treated and disposed at appropriate waste facilities according to their chemical composition and the relevant legislation. More specifically, some samples of soil were analysed and found to contain Dissolved Organic Carbon (DOC), Selenium (Se), Antimony (Sb), Arsenic (As) and other, exceeding the limits for hazardous and non-hazardous waste. Surface water was also examined.

10. *Spatial extent*

The WTRF comprised 0.07 square kilometres of industrial land.

11. Consequences to the natural resources and description of the causal link

The incident was considered as significant but mainly for a short-term period and the damage was limited into the premises of the WTRF. The gases produced by the fire were directed because of the wind towards the city of Athens. The National Institutes mentioned above, were measuring on a 24h basis the emissions during the incident, advising for preventive measures and giving instructions to the residents of the neighbouring areas. The samples of soil from the WTRF site, indicated high concentrations on several heavy metals, organic carbon etc. Measures were determined and imposed for on-site remediation of land. Apart from air pollution monitoring mentioned above, MEE assigned the Institute of Geology & Mineral Exploration (IGME) to analyse

the soil and water samples and report its findings. Five months later, there was a re-examination of soil and groundwater off-site samples and no deterioration was detected outside the premises of the WTRF. That action took place before the completion of the remediation measures. Further sampling is foreseen after the completion of remediation measures.

12. Legal requirements

1. Legal requirements: Activation of Presidential Decree 148/2009 on environmental liability.
2. Procedural: the Ministry for Environment and Energy (COIEL) noticed operator to attend a hearing in order to propose and submit measures for remediation of environmental damage. He proceeded but claimed bankruptcy and could not undertake any remediation measures.
3. Technical requirements: Sampling of soil and water was conducted from experts and researchers. All findings from chemical analysis were compared to national legislation limits as provided by the a) Joint Ministerial Decision no 51354/2641/E103/2010 on the "Determination of Environmental Quality Standards (EQS) for concentrations of certain pollutants and priority substances in surface water, in compliance with the provisions of Directive 2008/105 / EC of the European Parliament and of the Council of 16 December 2008 " for surface water and b) Joint Ministerial Decision no. 39626/2208/2009 "Establishment of measures to protect groundwater against pollution and deterioration, in compliance with the provisions of Directive 2006/118 / EC" on the protection of groundwater against pollution and deterioration " of the European Parliament and of the Council of 12 December 2006" (Β΄ 2075)…") for underground water. Because no national standards for soil have been adopted samples were compared with the limits for leaching deriving from Decision of EU Council 2003/33/EC.
4. Right of defense: Liability was documented on environmental inspection findings.

13. Tools/equipment and methods used

- Sampling equipment of soil and water
- Installation of mobile air pollution monitoring station
- Experts from Inspectorates, National Institutions and Regional authorities contributed to a multidisciplinary approach and led to a better understanding and decision-making of environmental emergencies
- Cameras
- Satellite images & maps
- Internet research
- Witnesses interviews, media information since the incident was covered by journalists

14. Other Applied Legislation

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Screening

15. Conduction of the screening

The incident was discovered by journalists.

The event was considered as an emergency case by the Fire Service and the Civil Protection authority.

The trigger of the intervention was the uncontrolled massive fire in a waste treatment facility of non- hazardous and hazardous waste.

The region's atmosphere was affected by the gas emissions (particulates, PAHs, etc.) produced from the burning of the materials and dispersed due to winds in the vicinity. The screening was conducted by expert inspections, multiple sampling of soil and water and continuous monitoring of air pollutants during the fire. These procedures was held by taking into account the provisions of P.D. 148/2009.

16. Guidelines used

Screening process for this ELD case is based on relevant legislation of water, waste management and environmental impact assessment.

Determination of clues

17. Clues found

The actual quantity of the waste material was not officially registered by WTRF (the files were destroyed by the fire). After the incident it was estimated that approximately 50.000 tons of burnt waste remains (piled up in the premises of the WTRF) were to be treated and disposed. The above findings were materials of burned waste, glass, plastic, metal that were not responding to the environmental license of the WTRF. From the characterization of the sampling (solid waste, fly ashes, leachates) occurred that a 5%-15% of the burnt waste were identified as hazardous for human health and the environment.

The samples of soil from the WTRF site, indicated high concentrations on several heavy metals, organic carbon etc. More specifically, some samples of soil were analyzed and found to contain Dissolved Organic Carbon (DOC), Selenium (Se), Antimony (Sb), Arsenic (As) and other, exceeding the limits for hazardous and non-hazardous waste. Surface water and groundwater were also examined. The results of monitoring and sampling were compared to the national legislation guidelines on quality characteristics for surface waters and groundwater (as mentioned above in par. 12: Joint Ministerial Decision no 51354/2641/E103/2010 and Joint Ministerial Decision no. 39626/2208/2009").

18. Conduction of the determination of clues

The determination of clues was conducted by expert inspections, multiple sampling of soil and water and continuous monitoring of air pollutants during the fire. These procedures was held by taking into account the provisions of Presidential Decree. 148/2009.

Sampling of soil and water was conducted from experts and researchers. All findings from chemical analysis were compared to national legislation limits. Since there are not national legislation for soil, there were used the thresholds within the framework of the Decision of EU Council 2003/33/EC for the determination of the appropriate treatment of the burnt material as well as for its final environmentally sound disposal.

Photos and on-site inspections revealed the extent and the quantity of burnt flammable materials.

Air sampling and analysis results revealed the concentrations on air.

The results of monitoring and sampling were compared to the national legislation guidelines on quality characteristics for surface waters. Since there are not national legislation for soil, there were used the thresholds within the framework of the Decision of EU Council 2003/33/EC for the determination of the appropriate treatment of the burnt material as well as for its final environmentally sound disposal.

19. Guidelines used

It was mainly used the following legislation:

1. P.D. 51/2007 on "Measures and procedures for the integrated protection and management of water in accordance with the provisions of Directive 2000/60 / EC "establishing a framework for Community action in the field of water policy" of the European Parliament and of the Council of 23 October 2000 for water regulation".
2. 2003/33/EC: Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.
3. Ministerial Decision 50910/2727/2003 on "Measures and conditions for solid waste management. National and regional management planning" as amended.
4. Ministerial Decision 13588/725/2006 on "Conditions and restrictions for the management of hazardous waste in accordance with the provisions of Council Directive 91/689 / EEC on hazardous waste of 12 December 1991" as amended.

Determination of evidence

20. Evidence found

From the characterization of the sampling (solid waste, fly ashes, leachates) occurred that a 5%-15% of the burnt waste were identified as hazardous for human health and the environment and

should be disposed according to the legislation for hazardous waste (namely 13588/725/2006 as amended). No risk assessment took place as the characterisation of the waste was hazardous. The evidence was under the scope of ELD because the burnt waste containing plastic and other flammable material new fires were breaking out especially in summertime so health risk was assessed as very high.

21. Conduction of the determination of evidence

The values of physiochemical parameters that were measured in the leachates of the soil and waste samples were compared to the relevant thresholds defined by the decision 2003/33/EC.

The concentration of dissolved organic carbon (DOC) in multiple soil samples was higher than the limit values for hazardous waste. The selenium (Se) and chromium (Cr) exceeded the thresholds for non-hazardous waste. The same results were observed for the leachates from the soil samples, which in many samples contained higher values of DOC than the limit for hazardous and higher concentration in antimony (Sb) and selenium (Se) than the limit for non-hazardous waste.

Five months following the incident new sampling was conducted on site and off-site. It occurred that no environmental degradation happened in groundwater that was linked to the incident. All measurements of soil samples off-site were at the level of the previously existing situation (background level).

22. Significance thresholds considered

Thresholds according to the legislation mentioned in par. 19 above.

23. *Guidelines used*

As mentioned in par. 19 above, guidelines of national and EU legislation were used.

KEY FINDINGS AND LESSONS LEARNED

Weaknesses:

- After the incident the site was unsupervised and additional waste quantities were disposed by unknown individuals. Moreover, any valuable material (e.g. metal) was removed by unauthorized metal collectors for own profit. The facility premises needed security services to prohibit unauthorized access.
- Lack of precise data/ record due to non-compliance of the operator before the damage.
- The MEE had to undertake the financial cost and ensure the financial resources as well as the management mechanism for implementation of remediation measures. Cost recovery was pursed.
- Administrative obstacles (public procurement procedures, legislation changes etc.) led to delays. Because of these delays, the remediation measures took long to begin.
- Lack of national legislation on soil to provide for standards and thresholds.
- Insufficient staffing in competent Authorities for ELD implementation.

Strengths:

- Co-operation between National and Regional authorities and Institutes was immediate and successfully achieved in order to better co-ordinate the actions and ensure complementarity.
- All relevant authorities took the preventive measures needed and made the controls for civil protection (e.g. control of agricultural/ farming products, potable water controls).

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

1) For the determination of clues in similar case we find useful to follow the criteria deriving from EU legislation

2) For the determination of evidence in similar cases, it is advisable to follow the criteria that estimate the intensity, the size and the emergency of the incident as soon as possible. Specifically, for Greece there is a need for legislation determining the national soil standards and thresholds.

3) Environmental inspections should be enhanced

TRAINING NEEDS

Training for developing public sector is needed to achieve proactive national and regional awareness. Continuous vigilance concerning environmental damage incidents is required. All

Authorities, Institutes and NGO's should cooperate to organize case-study seminars and workshops for civil servants and provide public awareness campaigns.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 11 - Destruction of dry and wet heath protected habitats within a protected area

Case study name	Destruction of dry and wet heath protected habitats within a protected area
Country	Ireland
Contributor	Environmental Protection Agency
Type of damage	Damage to natural habitats and protected species
Legislation	ELD case
Site	Comeragh Mountains cSAC (1952) ,County Waterford, Ireland
Source of impact	The impact was caused by using an excavator to clear a trackway that was significantly larger than envisaged by the local government through the cSAC and an area of protected habitat.
Natural Resources	The natural resources involved were areas of natural vegetation (approx. 2ha) within the cSAC, directly beside the local river designated for the Freshwater Pearl Mussel. Damage was found to be significant for the dry heath (4030) and wet heath (4010) habitats within the impacted area.
Effects of the impact	An estimated 1545m^2 of dry heath and 650m^2 of wet heath was lost.
EVENT DESCRIPTION 1. *Location of the event* Comeragh Mountains candidate Special Area of Conservation (1952), County Waterford, Ireland *2. Cause of the event and offense committed* A local volunteer group had been given a grant by local government to construct a pathway to a local waterfall within the cSAC. In constructing the pathway, the group used an excavator to construct a trackway 3km in length and between 4 and 9m wide. *3. Date and duration of the event* Complaint notified to the National Parks and Wildlife Service on the 24/09/15. Activity had ceased at the site visit on the 08/10/15. The EPA appear to have been notified of the event in July 2017 by the National Parks and Wildlife Service. *4. Natural resources and services involved and adversely affected* The natural resources involved were areas of natural vegetation (approx. 2ha) within the cSAC, directly beside the local river designated for the Freshwater Pearl Mussel. Damage was found to be significant for the dry heath (4030) and wet heath (4010) habitats within the impacted area.	
ASCERTAINMENT *5. How was the event known?*	

The event was discovered by the National Parks and Wildlife Service upon receipt of a complaint from a member of the public.

6. Who conducted the ascertainment / investigation?

The National Parks and Wildlife Service conducted the ascertainment/investigation.

7. Timeline of the event and of the determination of clues and evidence

The event was discovered by the National Parks and Wildlife Service on the 24/09/15. Their regional ecologist visited the sites on the 08th October 2015 and based on his observations of the extent of the damage, and from a review of literature available for the site and the habitat types, had concluded in his report of the 12/10/15 that there had been significant adverse effects on reaching or maintaining the favourable conservations status of the dry and wet heath habitats at the site. (Total of 19 days).

8. Identification of the source of impact

The impact was caused by using an excavator to clear a trackway that was significantly larger than envisaged by the local government through the cSAC and an area of protected habitat.

9. Magnitude of the event

The pathway was 3km in length and ranged from 4-9m in width.

10. *Spatial extent*

3km of trackways varying from 4-9m in width impacted in total with an estimated 1545m2 of dry heath and 650m2 of wet heath was lost.

11. Consequences to the natural resources and description of the causal link

An estimated 1545m^2 of dry heath and 650m^2 of wet heath was lost.

12. Legal requirements

Environmental Liabilities Regulations

Environmental Liabilities Regulations Guidance Document

13. Tools/equipment and methods used

EPA GIS systems were used to determine the status of the site.

14. Other Legislation Applied

--

Screening

15. Conduction of the screening

Complaint notified to the National Parks and Wildlife Service.

Triggers: 1. The habitat affected was protected under the Habitats Directive.

Trigger 2. The information provided by the complainant with regard to the extent of the impact.

The EPA appear to have been notified of the event by the National Parks and Wildlife Service 2 years after they determined that there was environmental damage which breached the thresholds in the ELD. They had been, and continue to, address the environmental damage as specified in the legislation governing the National Parks and Wildlife Service, to an equivalent standard specified in the ELD, since they determined the case of damage. The operator did not notify the EPA.

The case was screened for applicability of the European Communities (Environmental Liabilities) Regulations 2008, hereafter referred to as the Environmental Liability Regulations, which transposes the ELD, upon receipt of the information by the Environment Protection Agency (EPA) from the National Parks and Wildlife Service – the operator was known. The operational activity was not listed in Schedule 3 of the Environmental Liability Regulations and so only damage to protected species and habitats was relevant. There were no applicable exclusions under the Environmental Liability Regulations (temporal or otherwise). The habitat affected was protected under the Habitats Directive.

16. Guidelines used

EPA have published guidelines on the Environmental Liability Regulations and pages 25-33 are relevant to damage to habitats and species.

Determination of clues

17. Clues found

The clues were:

1. The activity took place in a designated area (cSAC).
2. The habitats affected had a poor status in the island of Ireland.
3. The trackway was constructed without planning permission and so no assessment of the potential damage from the operation had been completed prior to it taking place.
4. The reported trackway was significantly larger than envisaged by the local government.

18. Conduction of the determination of clues

The determination of clues was completed by the National Parks and Wildlife Service and appear to have been determined by:

1. Searching GIS systems to determine the status of the habitats
2. Referencing biodiversity data and any available literature on the site and habitats affected (the conservation plan for the site, the Natura 2000 – Standard Data Form for the Comeragh Mountains cSAC and Interpretation Manual of European Habitats)
3. The information provided by the complainant with regard to the extent of the impact.

19. Guidelines used

I am unaware of whether or not the National Parks and Wildlife Service have guidelines on this matter. However, the EPA have published guidelines (see the par. 16 above) and pages 25-33 are relevant to damage to habitats and species.

Determination of evidence

20. Evidence found

3km of trackways varying from 4-9m in width impacted in total with an estimated 1545m^2 of dry heath and 650m^2 of wet heath was lost.

The figures of 1545m^2 of dry heath 650m^2 of wet heath is the area of protected species impacted. The total area impacted was reported to be approximately 2ha. The pathway was not authorised so there is no comparison available for authorised vs unauthorised area.

21. Conduction of the determination of evidence

- Referencing biodiversity data and any available literature on the site and habitats affected to determine the baseline and the current conservation status of the impacted habitats (the conservation plan for the site, the Natura 2000 – Standard Data Form for the Comeragh Mountains cSAC and Interpretation Manual of European Habitats)
- Site visit to determine the extent of the impact

22. Significance thresholds considered

The thresholds specified in the Regulations (same as Annex 1 of the ELD).

The report received states that the trackway was considered to have a significant adverse effect on reaching or maintaining the favourable conservations status of heath habitats, due to the significant net loss of the habitat within the Comeragh Mountains cSAC and because the overall status of both of these habitats in Ireland is bad so both area covered and rarity of species at national level were taken into consideration. These types of habitats also would not recover in a short timeframe without intervention. There are no figures/percentages that set a clear threshold by which environmental damage was determined.

23. *Guidelines used*

I am unaware of whether or not the National Parks and Wildlife Service have guidelines on this matter. However, the EPA have published guidelines (see the par. 16 above) and pages 25-33 are relevant to damage to habitats and species.

KEY FINDINGS AND LESSONS LEARNED

Strengths:

1. There was good baseline data available for the site
2. The National Parks and Wildlife Service responded quickly and were able to make a rapid assessment of the extent and significant of the damage.

Weaknesses: 1. The National Parks and Wildlife Service do not appear to have notified the EPA of the incident until almost 2 years after they determined that there was environmental damage which breached the thresholds in the ELD. 2. The operator did not notify the EPA.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE Clues: 1. Status of the impacted area (in this instance a cSAC) 2. Protected status of the impacted habitat Evidence: 1. The conservations status of the protected habitat – it was already of poor status and so any loss would be considered significant 2. The extent of the damage to the protected habitat relative to the coverage of that habitat in the cSAC and in the country
TRAINING NEEDS Operators and other national authorities which may be notified of, or have roles in the assessment of, environmental damage cases need to be more aware of the requirement of, and their obligations under, the ELD and transposing Regulations. In general, all inspectors involved in site visits for the Regulatory Authoritiesshould be trained on screening for potential or suspect ELD cases to ensure that any such cases are identified quickly and investigated adequately upon discovery.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 12 - Water over-abstraction from a lake operated by an occupational activity

Case study name	Water over-abstraction from a lake operated by an occupational activity
Country	Italy
Contributor	ISPRA (Italian National Institute for the Environmental Protection and Research)
Type of damage	Damage to natural habitats and protected species
Legislation	ELD case
Site	Lazio Region
Source of impact	The source of the impact was identified in the lowering of the lake level and the consequent abstraction of water which left dry coasts.
Natural Resources	The natural resource involved/impacted (damage was not found) was the lake water. Natural resources affected (damage was found) were protected habitats: 3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea; 3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.;

	3150 Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation; 92A0 Salix alba and Populus alba galleries.
Effects of the impact	The over-abstraction of the water caused the appearance of 5-10 m of the lakebed. The consequences to protected habitats were the reduction of the surface extension (about -20%) and the loss of the natural condition for their regeneration.

EVENT DESCRIPTION

1. *Location of the event*

A Lake in the Lazio Region.

2. *Cause of the event and offense committed*

The event was caused by an excessive water abstraction operated by an occupational activity in conjunction with a long drought period with very low rainfall scarcity.

3. *Date and duration of the event*

The water abstraction was authorized in 1990.
In the summer of 2017 an excessive lowering of the level of the lake was observed.
In September 2017 the water intake operations were suspended.

4. *Natural resources and services involved and adversely affected*

The natural resource involved/impacted (damage was not found) was the lake water.
Natural resources affected (damage was found) were protected habitats:
3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea;
3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.;
3150 Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation;
92A0 Salix alba and Populus alba galleries.

ASCERTAINMENT

5. *How was the event known?*

The event was discovered by local people.
The event was communicated to the competent authority by Prefecture of Rome at the request of a Local Committee.

6. *Who conducted the ascertainment / investigation?*

Investigation was led by ISPRA. Several departments of the Institute were involved in the activity for the damage ascertainment with the collaboration of the Local Environmental Protection Agency. Data of the scientific literature and of local monitoring studies conducted by academic research centres were taken into account.

7. *Timeline of the event and of the determination of clues and evidence*

In summer 2017 local villagers observed the withdrawal of the water.
27th June 2017: a local committee notified the lake condition and asked the competent authority for the environmental damage ascertainment pursuant with art. 309 of the Italian Law Decree 152/2006 (art. 6 of 2004/35 European Directive).
10th July 2017: the competent authority asked the technical support of ISPRA.
20th July – 8th September: activity for the environmental damage assessment.

8. *Identification of the source of impact*

The source of the impact was identified in the lowering of the lake level and the consequent abstraction of water which left dry coasts.

9. *Magnitude of the event*

The magnitude of the event is characterized by:
Water over abstraction.
The lowering of the lake level reported by the Local Committee was about 1.5 m below the "zero" level and about 0.35 m below the minimum level defined in the water abstraction

concession approved by the authority for the protection of the water resource and its habitat.
10. *Spatial extent*
--
11. Consequences to the natural resources and description of the causal link
The over-abstraction of the water caused the appearance of 5-10 m of the lakebed.
The consequences to protected habitats were the reduction of the surface extension (about -20%) and the loss of the natural condition for their regeneration.
12. Legal requirements
Not applicable.
13. Tools/equipment and methods used
The assessment of the damage to protected habitat was carried out by expert operator in the field of water resource and biodiversity preservation. The investigation consisted of monitoring of the lake vegetation.
14. Other Applied Legislation
--
Screening
15. Conduction of the screening
The screening phase was conducted on the basis of the information given by the Local Committee. Information and scientific consulting attached to the notification were sufficient to assess the relevance of the case considering the involvement of protected habitat.
16. Guidelines used
--
Determination of clues
17. Clues found
The clues of environmental damage were:
- the lowering of the lake level reported by the Local Committee (about 1.5 m below the "zero" level and about 0.35 m below the minimum level defined in the water abstraction concession approved by the authority for the protection of the water resource and its habitat.)
- photos and on-site inspection revealed the suffering condition of the lake vegetation.
18. Conduction of the determination of clues
The clues of environmental damage were indicated in the notification submitted to the competent authority and they were confirmed by ISPRA by means of site inspections.
19. Guidelines used
--
Determination of evidence
20. Evidence found
The evidence of environmental damage was a combination of the following:
• the reduction in surface extension of the protected habitats
• the rarity of the habitat at regional level (Lazio region)
• the conservation status and its trend at biogeographical region level
• the estimated long time of natural restoration of the protected habitat
21. Conduction of the determination of evidence
The evidence of environmental damage was found by ISPRA. The observations on site were compared with data present in literature or collected in previous monitoring plans. Also, the comparison with other regional lakes confirmed that the lowering of the lake surface was much higher than the other lakes (so meteorological causes were excluded), and in other lakes the vegetation was not affected.
22. Significance thresholds considered
Variation of the water level higher than that tolerable for the habitat conservation (about 50-60 cm).
The maximum tolerability of 50-60 cm was determined by previous studies on the lake and of its

vegetation. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED Positive aspects: • Notification submitted to the competent authority was rich in scientific information. • The identification of protected habitats was fast due to the presence of the site in the Natura 2000 database. • Participation of several operator from ISPRA and Local Environmental Agencies with good expertise in habitats. Negative aspects: • The absence of biological data referred to the lake (baseline) did not permit to evaluate the environmental impact on the water resource (lack of data with respect to fish and other biological stocks in general).
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE For the determination of clues in similar cases, it is advisable to quickly verify whether the site investigated is a protected area and assess the natural status of species and habitat by means of site visit. For the determination of evidence in similar cases, the evaluation of the conservation status is needed in accordance with the ELD definitions. The type of evidence was then: the impact on habitat extent, the observation of vegetation dieback, expected extended period of time required for the regeneration of the habitat, the rarity of the habitat at regional level, the conservation status and the trend of it at biogeographical region level.
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 13 - Surface water contamination by wastewater treatment plant spill

Case study name	Surface water contamination by wastewater treatment plant spill
Country	Italy
Contributor	ARPA Calabria (Italian Regional Environmental Agency)
Type of damage	Water damage
Legislation	Non ELD case Italian Legislative decree 152/2006 (Environmental Code)
Site	Italy, Calabria
Source of impact	Urban wastewater treatment plant
Natural Resources	River waters

Effects of the impact	--

EVENT DESCRIPTION

1. *Location of the event*

Italy, Calabria.

2. *Cause of the event and offense committed*

Illegal discharge from a urban wastewater treatment plant. Unauthorized discharge without any type of treatment was ascertained due to the breakdown of the sewage system. The discharge affected the river and the sea.

3. *Date and duration of the event*

In the year 2018.

4. *Natural resources and services involved and adversely affected*

River waters.

ASCERTAINMENT

5. *How was the event known?*

The event was claimed to the Port Authority.

6. *Who conducted the ascertainment / investigation?*

The ascertainment/investigation onsite was led by the Port Authority of the Ministry for infrastructure and transport.

7. *Timeline of the event and of the determination of clues and evidence*

--

8. *Identification of the source of impact*

Urban wastewater treatment plant discharge exceeding national limits for wastewater discharges.

9. *Magnitude of the event*

--

10. *Spatial extent*

--

11. *Consequences to the natural resources and description of the causal link*

--

12. *Legal requirements*

The legal procedural and technical requirements to comply with D.Lgs. 152/06 (Environmental Code).

13. *Tools/equipment and methods used*

--

14. *Other Legislation Applied*

-

Screening

15. *Conduction of the screening*

--

16. *Guidelines used*

--

Determination of clues

17. *Clues found*

In the sample collected downstream the discharging point an increasing of BOD5, COD, ammoniacal nitrogen and phenols and, furthermore, an exponential increase in concentration of Escherichia coli was found.

18. *Conduction of the determination of clues*

By collecting instantaneous samples.

River water was sampled in two different location situated upstream and downstream of the discharging point: the determination of clues of environmental damage was the comparison

between chemical and biological relevant parameters of samples. *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* The case was dealt pursuant to the Italian Legislative decree 152/2006 (Environmental Code) and the penal code. In the sample collected after the discharge site an increasing of BOD5, COD, ammoniacal nitrogen and phenols and, furthermore an exponential increase in concentration of Escherichia coli. *21. Conduction of the determination of evidence* -- *22. Significance thresholds considered* -- 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED --
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 14 - Groundwater contamination by halogenated hydrocarbons

Case study name	Groundwater contamination by halogenated hydrocarbons
Country	Italy
Contributor	ARPA Friuli Venezia Giulia (Italian Regional Environmental Agency)
Type of damage	Water damage and Imminent threat to water damage
Legislation	ELD case
Site	Italy, Friuli Venezia Giulia
Source of impact	The source of the impact was identified in the release of a mixture of halogenated solvents (perchloroethylene, trichloroethylene, trichloroethane) used as cleaning agents in aluminium industry processing.
Natural Resources	Damage found in the aquifer used for drinking waters. The groundwater body is also classified pursuant to WFD.
Effects of the impact	Aquifer contamination which led to a non-compliance of drinking water standards. Drinking water interdiction. Degradation of the groundwater body chemical quality status.
EVENT DESCRIPTION	

1. *Location of the event*
Italy, Friuli Venezia Giulia.
2. *Cause of the event and offense committed*
Spillage from tanks burying of barrels filled with halogenated solvents.
3. *Date and duration of the event*
The contamination was discovered in the late '80s and is still going on.
4. *Natural resources and services involved and adversely affected*
Damage found in drinking waters aquifer. The groundwater body is classified pursuant to WFD.

ASCERTAINMENT

5. *How was the event known?*
The event was discovered during monitoring activities of groundwater acquifer chemical quality status pursuant to WFD.
6. *Who conducted the ascertainment / investigation?*
Investigation was led by a public laboratory of Italian Healthcare System in the late '80s.
7. *Timeline of the event and of the determination of clues and evidence*
In 1987 public health laboratory notified the contamination to the judicial authority. Several corrective measures and remediation attempts followed ever since.
8. *Identification of the source of impact*
The source of impact was identified in the release of a mixture of halogenated solvents (perchloroethylene, trichloroethylene, trichloroethane) used as cleaning agent in aluminium industry processing.
9. *Magnitude of the event*
42.000.000 m^3 of groundwater.
10. *Spatial extent*
About 14 Km^2.
11. *Consequences to the natural resources and description of the causal link*
Aquifer contamination which led to a non-compliance of drinking water standards. Drinking water interdiction. Degradation of the groundwater body chemical quality status.
12. *Legal requirements*
European Directive 80/778/CEE relating to the quality of water intended for human consumption. Transposition of the WFD in the Environmental Code (part. 3 of D.Lgs. 152/06) and subsequent secondary legislation.
13. *Tools/equipment and methods used*
Sampling equipment, permanent laboratory, on-site inspections and interviews. Monitoring of plane water wells have been undertaken ever since. Assessment of groundwater chemical quality status pursuant to WFD.
14. *Other Legislation Applied*
--

Screening

15. *Conduction of the screening*
The drinking water pollution was significant and led immediately to an investigation to define the extent of the contamination.
16. *Guidelines used*
--

Determination of clues

17. *Clues found*
Presence of high concentrations of perchloroethylene, trichloroethylene, trichloroethane in the aquifer used for drinking waters and groundwater body classified pursuant to WFD.
About 14 Km^2 of territory estimated in 42,000,000 m^3 of groundwater.
18. *Conduction of the determination of clues*
The clues of environmental damage were indicated in the notification submitted to the health

care authority and confirmed by means of site inspections and monitoring of groundwater contamination through drilling of new wells and analysis of existing wells, as well as construction of new piezometers for the use in the monitoring network. The investigation was conducted in several groundwater wells upstream and downstream of the industrial site to define the plume of contamination. *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* Degradation of the chemical status of the groundwater body for two cycles and foreseen for a further subsequent cycle. Since the contamination of the groundwater body is still ongoing due to the inefficient measures of containment, the active source of damage was assessed as actual and hence as an imminent threat of (further) water damage to the same ground water body. *21. Conduction of the determination of evidence* The evidence of water damage was found according to the assessment of the degradation of the chemical quality status of the groundwater body pursuant to WFD in relation to perchloroethylene, trichloroethylene, trichloroethane. *22. Significance thresholds considered* At the beginning of investigation in the '80s: threshold limit value of 30 micrograms/l of perchloroethylene (transposition of the European Directive 80/778/CEE). Evidence of degradation of the chemical quality status of the groundwater body classified pursuant to WFD. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED Difficulties in spotting the responsibility and the source of the contamination, because of the quick turnover of the chief executive of the installation.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 15 - Permanence in the soil of buried waste in disused industrial site, near a water body

Case study name	Permanence in the soil of buried waste in disused industrial site, near a water body
Country	Italy
Contributor	ARPA Lazio (Italian Regional Environmental Agency)
Type of damage	Land damage
Legislation	ELD case
Site	Italy, Lazio Region

Source of impact	The source of contamination is identified in a large quantity of special waste buried underground, both hazardous and non-hazardous, in areas outside and inside the industrial sheds. Hence, the permanence in the soil of buried waste was the cause of the release of contaminants in the soil.
Natural Resources	The natural resources potentially involved are surface water of the nearby water body and groundwater. It has been hypothesized that the mobilization and transport of the contaminants contained in the waste, favoured by the percolation of contaminated rainwater in the subsoil and in the most superficial stratum, may have spread to the river waters.
Effects of the impact	To date, the impact on the natural resources involved (groundwater and surface water) was not investigated. However, a hypothesis has been made about the mobilization and transport of the contaminants present in the waste. The hypothesis states that the contaminated soil and the percolation of contaminated rainwater in the subsoil and in the most superficial aquifer have favoured the pollutant propagation in the river waters. This hypothesis is also based on the hydrogeological data obtainable from the official scientific literature which claims that the surface aquifer is in direct and continuous hydraulic connection with the river waters.

EVENT DESCRIPTION

1. *Location of the event*

Italy, Lazio Region.

2. *Cause of the event and offense committed*

Special hazardous and non- hazardous waste buried inside an abandoned industrial site.
The crimes committed are related with the waste abandonment, uncontrolled waste storage on the ground surface, buried waste in the soil and the illegal traffic of waste.

3. *Date and duration of the event*

The crime was found out in 2010. Currently, the source of contamination (primary source) is still active.

4. *Natural resources and services involved and adversely affected*

The permanence in the soil of buried waste was the cause of the release of contaminants in the soil. The natural resources potentially involved are surface water of the nearby water body and groundwater. It has been hypothesized that the mobilization and transport of the contaminants contained in the waste, favoured by the percolation of rainwater in the subsoil and in the most superficial stratum, may have spread to the river waters.

ASCERTAINMENT

5. *How was the event known?*

From witnesses among the local population.

6. *Who conducted the ascertainment / investigation?*

Initial investigations were conducted by the police in collaboration with the Local Environmental Protection Agency (ARPA Lazio). Subsequently the investigations were carried out by the judicial police of the Public Prosecutor's Office with the collaboration of the Local Environmental Protection Agency (ARPA Lazio), Italian National Institute for the Environmental Protection and Research (ISPRA) and the Ministry of the Environment.

7. *Timeline of the event and of the determination of clues and evidence*

The investigations started in June 2010. Then in 2017 the Public Prosecutor ascertained that no administrative procedures for soil protection were activated on the site as required by the Italian environmental law on contaminated sites.

The Public Prosecutor, with the collaboration of ARPA Lazio, ISPRA and the Ministry of the Environment, decided to continue the investigation.

8. Identification of the source of impact

The source of contamination was identified in a large quantity of special waste buried underground, both hazardous and non- hazardous, in areas outside and inside the industrial sheds.

9. Magnitude of the event

The quantity and volume of buried waste have not been estimated. The concentrations of some of the pollutants in the land (metals, heavy and light hydrocarbons, aromatic compounds, carcinogenic chlorinated aliphatic) have exceeded the concentrations of potential land contamination named 'CSC' (the thresholds are defined in the Italian legislation of the D.Lgs.152/06). Therefore, the site is potentially contaminated according to the Italian law. Some of the waste which have been analysed have hazardous characteristics.

10. *Spatial extent*

The event involved an area of approximately 35,000 m^2 because of groundwater contamination.

11. Consequences to the natural resources and description of the causal link

So far, the impact on the natural resources involved (groundwater and surface water) was not investigated.

However, a hypothesis has been made about the mobilization and transport of the contaminants present in the waste. The hypothesis states that the contaminated soil and the percolation of rainwater in the subsoil and in the most superficial aquifer have favoured the pollutant propagation in the river waters.

This hypothesis is also based on the hydrogeological data obtainable from the official scientific literature which claims that the surface aquifer is in direct and continuous hydraulic connection with the river waters.

12. Legal requirements

National / international quality standards have been met for laboratory analysis (mainly EPA and APAT IRSA).

13. Tools/equipment and methods used

The sampling of the investigated soil has been performed by ARPA Lazio technicians with the help of the Institute of Geophysics and Volcanology and the Fire Brigade. The sampling points were identified with the collaboration of the Institute of Geophysics and Volcanology.

Excavations were carried out in collaboration with the firefighters. Soil samples were taken with the Fire Brigade instrumentation.

14. Other Legislation Applied

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Screening

15. Conduction of the screening

The screening was conducted on the basis of the witnesses among the local population.

16. Guidelines used

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Determination of clues

17. Clues found

The clues were the presence of the contaminants in the soil in concentrations exceeding the CSC thresholds defined by the Italian legislation. The pollutants found in the soil are: metals, heavy and light hydrocarbons, aromatic compounds, carcinogenic chlorinated aliphatic. The following excavations performed have highlighted the presence of broken drums containing chemical substances in direct contact with the soil. Volatile Organic Compounds (VOC) alarm values were recorded with the PID instrumentation operated by the fire brigade.

The event involved an area of approximately 35,000 m^2 because of groundwater contamination.

Prevention measures that have not been activated by the contamination responsible (for

example measures to prevent the spread of contaminants). The remediation procedure has not yet begun.

18. Conduction of the determination of clues

The determination of clues was conducted by:

1) The collection of witnesses from the population
2) The Judicial Police carried out inspections in collaboration with ARPA Lazio for environmental investigations (waste sampling and excavated land)
3) ARPA Lazio technical report with the results of the environmental investigations
4) ARPA communication to the Province, Region and Prefecture for exceeding the soil threshold values
5) The Province has taken steps to identify the person responsible for the contamination

After the excavation and sampling of land and waste, the samples have been analysed in the laboratory.

19. Guidelines used

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Determination of evidence

20. Evidence found

No evidence under ELD was found.

21. Conduction of the determination of evidence

--

22. Significance thresholds considered

Significance thresholds that have been considered are the CSC thresholds that indicate the potential contamination of a soil.

23. *Guidelines used*

--

KEY FINDINGS AND LESSONS LEARNED

For the determination of similar cases of environmental damage it is necessary to elaborate "Specific guidelines for cases" that include the legislative and technical aspects. The strength was the collaboration between all the subjects involved such as ARPA, ISPRA, Fire Brigade (VVF) and the Institute of Volcanology. The technical document sent to the competent authority was full of information for evidence of the contamination of soil.

Negative aspect: it was not possible to investigate river sediments, groundwater and surface water of the river due to technical and practical reasons such as:

1. lack of wells and piezometers inside the industrial site for the analysis of the groundwater;
2. lack of adequate instrumentation for the sampling of surface water and sediment of the river.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

The collection of data on the site (type of industrial process, etc.), cartographic data to verify for example the presence of water courses and protected areas.

Perform indirect investigations to verify the presence of waste in the soil.

Perform direct surveys to verify the presence of contaminants in soils and underground waters and sediments and surface waters (if a watercourse exists).

For this specific case, use bibliographic data to hypothesize possible hydraulic interconnection between the aquifer with the surface waters of streams or rivers.

TRAINING NEEDS

Training through workshops and on the site and comparisons with the National System of the Environmental Agencies (SNPA).

ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

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Case study no. 16 - Spill of crude oil in a stream and into the sea

Case study name	Spill of crude oil in a stream and into the sea
Country	Italy
Contributor	ARPA Liguria (Italian Regional Environmental Agency)
Type of damage	Water damage (Imminent threat of Water Damage)
Legislation	ELD case
Site	Italy, Liguria region
Source of impact	The spill of crude oil was caused by the accidental breakage of an underground pipeline of an oil pipeline and consequent spillage of crude oil along a portion of the slope and into the catchment area of three streams and consequently into the sea.
Natural Resources	The natural resources affected were surface waters, alluvial sediments, the sea and neighbouring beaches. The natural resources involved: groundwater, the soil and the subsoil, protected natural areas, species and habitats.
Effects of the impact	The free product has reached the catchment area of three waterways classified as streams and left a residual contamination in the river sediments. Dispersion of contaminated river sediments to the sea and the beach. The migration of the contaminant (crude oil) through the soil / sediment to the groundwater was not excluded. The crude oil spilled in the accident represented a significant imminent threat in terms of toxicity for aquatic ecosystems.

EVENT DESCRIPTION

1. *Location of the event*

The event occurred in Italy, Liguria region.

2. *Cause of the event and offense committed*

Breaking of an underground pipeline and consequent accidental spillage of crude oil.

3. *Date and duration of the event*

The safety measures (identification of the spillage, immediate activation of the procedures necessary for the elimination of the spillage and emergency and safety measures for the recovery of the product) were carried out daily within 5-6 days.

4. *Natural resources and services involved and adversely affected*

The natural resources affected were surface water, alluvial sediments, the sea and neighbouring beaches. The natural resources involved: groundwater, the soil and the subsoil, protected natural areas, species and habitats.

ASCERTAINMENT

5. How was the event known?

Notification by the operator.

6. Who conducted the ascertainment / investigation?

The investigations immediately following the event were conducted by the operator and ARPA Liguria (Regional Environmental Agency).

The baseline data were obtained by the scientific literature or acquired during the monitoring activities carried out by ARPA Liguria.

7. Timeline of the event and of the determination of clues and evidence

2016 accidental breakage of the underground pipeline.

5-6 days of interventions to make the site safe:

• Securing of the slope where the pipeline was broken;

• Positioning of dams along the interested watercourses;

• Removal of the free product in a separate phase by self-purging in the points of uptake upstream of the barriers;

• Positioning of sea barriers and use of skimmers.

July 2016 start of the procedure of environmental damage.

December 2016 - transmission of the report on "Measures Adopted For Environmental Restoration".

January 2018 - River sediment risk analysis - operator document.

October 2018 Decree of ordinance from the Ministry of the Environment.

8. Identification of the source of impact

The spill of crude oil was caused by the accidental breakage of an underground pipeline and consequent spillage of crude oil along a portion of the slope and into the catchment area of three streams and into the sea.

9. Magnitude of the event

A crude oil release of 580,847 litres was estimated, equal to about 485 tons. The source of contamination, the type of contaminant, its chemical and physical characteristics, the spilled volume and the main migration routes are known.

The crude oil leaking from the pipeline was characterized by laboratory analysis for the determination of metals, sulphur and the chromatographic gas profile of the hydrocarbons.

10. *Spatial extent*

The accident involved a portion of the slope (about 100 m^2) and the catchment area of waterways immediately downstream of the breaking point. The area involved by the potential contamination had an extension of about 4 km from the breaking point up to the mouth to the sea for the width of the interested riverbeds.

11. Consequences to the natural resources and description of the causal link

The free product has reached the catchment area of three waterways classified as streams.

Residual contamination due to the river sediment of the riverbed of two streams.

Dispersion of contaminated river sediment to the sea and the beach. The migration of the contaminant (crude) through the soil / sediment to the groundwater was not excluded.

The crude oil spilled in the accident represented a significant imminent threat in terms of toxicity for aquatic ecosystems.

12. Legal requirements

Environmental law and penal code.

13. Tools/equipment and methods used

The analysis of environmental matrices was conducted by personnel of ARPA Liguria adequately equipped for inspections aimed at a visual assessment as well as with drones. The samples taken were analysed in the agency's laboratory and the results evaluated with respect to what is known from the scientific literature as well as with respect to what is defined in the specific sectorial legislation.

The analysis of biodiversity has been limited to a series of inspections, always represented by walking routes and direct observations, carried out on three different days in different months (April, May, July), during which a progressive recovery of the vitality of all the components considered was noted: faunal, floristic and vegetation.
Coordination was carried out by the Public Prosecutor and the Regional Authority in the context of the execution of the Civil Protection functions.
14. Other Applied Legislation
--
Screening
15. Conduction of the screening
The accident notified by the operator concerned a massive release of an environmentally hazardous substance (crude oil) into a waterway.
ARPA Liguria intervened from the incident detection phase until the conclusion of the emergency safety procedure.
16. Guidelines used
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Determination of clues
17. Clues found
Clues of environmental deterioration were:
• Visual evidence of product released in surface water, sea and nearby beaches and traces in alluvial sediments;
• Reports sent by ENPA(National Animal Protection Agency), referring to some individuals, belonging to different species of birds, deceased or intoxicated;
• Direct observations, carried out during the first site inspection from which it was possible to hypothesize that a death of mullet and amphibian larvae occurred in the stream, particularly belonging to the common toad, hardly quantifiable due to the absence of previous data.
18. Conduction of the determination of clues
Inspections, sampling and analysis of surface water and sediment samples, photographic analysis also through the use of drones.
The considerations mentioned above were derived from the transmission of data by ENPA, which intervened to save the birds in the first hours after the spill, and from direct observations, made during the first site inspection during which the entire stretch of affected water bodies was covered on foot from the upstream part of the pipe break point to the mouth of the last stream to the sea.
For aspects related to biodiversity, the determination of clues phase consisted in verifying the maps and naturalistic data contained in the regional databases, with particular reference to the Ligurian Biodiversity Observatory (LiBiOss), in order to identify any interactions with protected areas, sites belonging to the Natura 2000 Network or other flora and fauna elements of conservation interest.
19. Guidelines used
--
Determination of evidence
20. Evidence found
Evidence of damage to flora and fauna and habitats: few larvae of amphibian anurans (tadpoles) have been observed only in isolated pools, in the areas on the edge of the riverbed, together with a low quantity of fish. This has led to an impact on these systematic groups. With reference to birds, the evidences mentioned above were acquired indirectly, and are represented by:
• 1 Water Hen - Deceased
• 11 Royal Germans - Deceased
• 1 Goose - Tarpaulin and intoxicated
• 1 Muscovy Duck - Poisoned

• 1 Gray Heron – Intoxicated. No information about degradation of the chemical and ecological water quality status was found. The crude oil spilled in the accident represented a significant imminent threat in terms of toxicity for aquatic ecosystems. *21. Conduction of the determination of evidence* The acquired data were compared with what was reported in the scientific literature or with the information acquired during scheduled monitoring or normal institutional activities performed by ARPA Liguria. No direct determination was made regarding biodiversity. This is because, in the absence of previous data and in a heavily populated area, it was not possible to quantify the damage itself, but only a hypothesis. The only reliable data are those detected by ENPA, as during the site inspection no signs of damage were detected on the birds present at that time. The same applies to another site inspection during which ARPA Liguria focused on the observation of the bird life present in the focal section. *22. Significance thresholds considered* Significance thresholds relating to each environmental matrix involved in relation to current regulations. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED Strengths: Internal organization, possibility to count on multidisciplinary and professionally prepared personnel, timeliness in the intervention. Weaknesses: Problematic coordination due to the presence of more subjects in the process (Prefecture, Region, ...) From a naturalistic point of view, it is essential to have up-to-date and integrated databases, in order to characterize the territory in an adequate manner. This makes it possible to immediately identify the most sensitive components, on which to focus assessments for research and quantification of the damage.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE It is important to have homogeneous databases available in which existing data are collected and systematized and that these databases are continuously updated as well as a nationally integrated database containing information relating to all cases of environmental damage on the Italian Territory. It would also be important to arrive at the definition of procedures for environmental damage investigations, defining timing and methods of exchange, transmission and processing of data useful for the assessment of environmental damage and the imminent threat of environmental damage. These procedures will also guarantee homogeneity in the investigations themselves.
TRAINING NEEDS It is important to think about moments of training and discussion on general topics and on specific topics aimed at assessing the research and quantification of the damage as well as the environmental damage investigations.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 17 - Groundwater and soil contamination of a wide urban area

Case study name	Groundwater and soil contamination of a wide urban area
Country	Italy

Contributor	ARPA Lombardy (Italian Regional Environmental Agency)
Type of damage	Water Damage and Land damage
Legislation	ELD case
Site	Italy, Lombardy
Source of impact	The source of the impact was identified in the release of the following substances: arsenic, mercury, PCB, PCDD, pesticides, chlorinated compounds.
Natural Resources	The natural resources involved/impacted (damage was not found) were soils and groundwater.
Effects of the impact	Serious restrictions on the use of green residential areas, crops in agricultural areas and public waters due to widespread pollution.

EVENT DESCRIPTION

1. *Location of the event*

Italy, Lombardy.

2. *Cause of the event and offense committed*

Industrial discharge of hazardous chemicals and transport through the irrigation of surface waters.

3. *Date and duration of the event*

The event lasted from 1995 to 2002.

4. *Natural resources and services involved and adversely affected*

The natural resources involved/impacted (damage was not found) were soils and groundwater.

ASCERTAINMENT

5. *How was the event known?*

Through control activities by local authorities.

6. *Who conducted the ascertainment / investigation?*

The ascertainment/investigation on site (information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysis, ascertainment/investigation plan and actions) was conducted by the company responsible for the pollution under supervision of Ministry of the Environment, local authorities and health and environmental control agencies.

7. *Timeline of the event and of the determination of clues and evidence*

In 2000, started the environmental investigation and reclamation procedures of the industrial site.

In 2002, following the first investigations carried out in the site, the local environmental protection agency (ARPA Lombardy) conducted the first samplings on the agricultural lands located south of the plant. The results of the investigations showed a widespread and consistent contamination by mercury, PCBs and dioxins.

In 2003, the Ministry of Environment included the industrial site and the agricultural areas in the south of it as a National Interest Site by decree.

In 2012, the civil trial of compensation for environmental damage initiated by the Ministry of the Environment against the company responsible for pollution began.

8. *Identification of the source of impact*

The source of the impact was identified in the release of the following substances: arsenic, mercury, PCB, PCDD, pesticides, chlorinated compounds.

9. Magnitude of the event
Pollution has involved surface soil and groundwater over an area of about 8 km from the source area. The volume estimated of soil contaminated is 3.128.613 m^3, whereas contaminated sediments of irrigation channels are estimated to be 41.689 m^3.
The median (50° percentile) of the PCBs totals in the southern areas (included in the National Interest Site) of the plant is 0.21 mg/kg (about 3.5 times the national thresholds for potentially contaminated soil (CSC)).
10. *Spatial extent*
About 600 ha.
11. Consequences to the natural resources and description of the causal link
Serious restrictions on the use of green residential areas, crops in agricultural areas and public waters due to widespread pollution.
12. Legal requirements
--
13. Tools/equipment and methods used
--
14. Other Applied Legislation
--
Screening
15. Conduction of the screening
The pollution was discovered through control activities by local authorities.
16. Guidelines used
--
Determination of clues
17. Clues found
The event included the release of environmental hazardous and persistent substances such as: arsenic, mercury, PCB, PCDD, pesticides, chlorinated compounds.
Pollution has involved surface soil and groundwater over an area of about 8 km from the source area, the spatial extent was about 600 ha. The volume estimated of soil contaminated is 3.128.613 m^3, whereas contaminated sediments of irrigation channels are estimated to be 41.689 m^3.
The median (50° percentile) of the PCBs totals in the southern areas of the plant is about 3.5 times the national thresholds for potentially contaminated soil (CSC)).
18. Conduction of the determination of clues
The determination of clues and evidence such as information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysis, ascertainment/investigation plan and actions, was conducted by the company responsible for the pollution under supervision of Ministry of the Environment, local authorities and health and environmental control agencies.
19. Guidelines used
--
Determination of evidence
20. Evidence found
No information available.
21. Conduction of the determination of evidence
See par. 18.
22. Significance thresholds considered
National thresholds for potentially contaminated soil (CSC) of the national legislation on soil protection.
23. *Guidelines used*
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KEY FINDINGS AND LESSONS LEARNED
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DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE
--
TRAINING NEEDS
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ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS
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Case study no. 18 - Hexavalent chromium contamination of groundwater

Case study name	Hexavalent chromium contamination of groundwater
Country	Italy
Contributor	Pool Ambiente Italia - Consortium for Insurance and Reinsurance of Liability for Environmental Damage
Type of damage	Water damage and Land damage
Legislation	ELD case
Site	Underground pipeline of Chemical Industry
Source of impact	The source is an underground pipeline containing Hexavalent chromium that is toxic and carcinogenic for humans and other species. Over 5 micrograms/l in water is dangerous for health.
Natural Resources	1)Contamination of groundwater used as a water drinking source 2)Contamination of land.
Effects of the impact	Groundwater was impacted by the contamination and moved to drinking water wells.

EVENT DESCRIPTION

1. *Location of the event*

Lombardy Region - Italy

2. Cause of the event and offense committed

Breakage of underground pipeline and contamination of the land on site and groundwater for many Km.

Lack of maintenance of the pipeline – there are no rules/obligation on maintenance in Italy.

On the basis of Italian legislation is a criminal offence named as “Environmental Disaster”.

3. Date and duration of the event

It’s not technically possible to define exactly the origin/time of the breakage because there are two possible sources. We presume the contamination started in 2008.

4. Natural resources and services involved and adversely affected

1) Contamination of groundwater used as a water drinking source

2) Contamination of land.

ASCERTAINMENT

5. How was the event known?

ARPA Lombardy found the contamination during a groundwater quality monitoring.

6. Who conducted the ascertainment / investigation?

The on-site investigation was carried out by the operator. The off-site investigation was carried out by ARPA Lombardy (Regional Environmental Agency).

7. Timeline of the event and of the determination of clues and evidence

- End of 2008 detection of the groundwater contamination by ARPA Lombardy
- 2008-2019 (still working) Immediate Preventive Measures installing barrier wells
- 2009-2012 Soil and groundwater investigation
- 2013 Risk Analysis and Remediation project approved by public authorities
- 2014-2019 (still ongoing) Primary Remediation on soil and groundwater

8. Identification of the source of impact

The source is an underground pipeline containing Hexavalent chromium that is toxic and carcinogenic for humans and other species. Over 5 micrograms/l in water is dangerous for health.

9. Magnitude of the event

The magnitude of the event is characterized by:

- the quantity of 300 kg;
- the volume of 4,5 million m^3 of saturated soil;
- the concentration of the specified pollutants was equal to 300 micrograms/l.

10. *Spatial extent*

0,5 km^2.

11. Consequences to the natural resources and description of the causal link

Groundwater was impacted by the contamination and moved to drinking water wells.

12. Legal requirements

Yes, compliant.

National Technical Standard for clean-up, ISS 27/7/2001 for quality analytical data control.

13. Tools/equipment and methods used

Groundwater sampling pumps.

Permanent Laboratories.

14. Other Applied Legislation

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Screening

15. Conduction of the screening

ARPA Lombardy found the contamination during a groundwater quality monitoring conducted according to WFD. Soon after ARPA started to investigate the issue.

16. Guidelines used

Manual for environmental investigations in contaminated sites – APAT (now ISPRA) 2006.

Determination of clues

17. Clues found

The concentration of hexavalent chromium detected was above standard reference limit for groundwater contamination (CSC – D.Lgs. 152/2006 – Annex 5, Table 2). The direction of the groundwater was towards drinking water wells.

18. Conduction of the determination of clues

ARPA Lombardy collected groundwater samples from existing monitoring wells and matched the detected concentration with the groundwater thresholds for contamination (CSC).

19. Guidelines used

Main reference is the D.Lgs. 152/2006, Part 4, Title 5.

Manual for environmental investigations in contaminated sites – APAT (now ISPRA) 2006.

Determination of evidence

20. Evidence found

No information is available about the evidence found to land and water damage pursuant to the ELD transposed legislation. The case was dealt under the legislation on land protection. *21. Conduction of the determination of evidence* -- *22. Significance thresholds considered* The threshold considered is indicated in the Table 2, Annex 5, Part 4, D. Lgs. 152/2006 (land protection): that is 5 micrograms/l for hexavalent chromium. 23. *Guidelines used* The same mentioned above.
KEY FINDINGS AND LESSONS LEARNED The determination process is effective for soil and groundwater damage thanks to the existence of table of reference values (thresholds). The absence of table values for damage to: - Surface water (lake, river, sea) - Protected species and natural habitat - Sediment in surface water make it difficult to determinate the presence of an environmental damage and reduce the effectiveness of the ELD.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE In the analysed case study the determination of clues and evidence is already effective and clear.
TRAINING NEEDS It is necessary to conduct training for operators to increase the awareness about ELD. It would be also important to make the operator sensitive about a more effective prevention of event of environmental damage.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS To define at European level table reference values for all the natural resources. It is also necessary to harmonise at European level the obligation on maintenance on premises/plants. In order to compensate the legislative lack in Italy about the prevention of Environmental Damages there is a need of an innovative standard for certification of operators, containing criteria for an effective prevention of Environmental Damage. The new standard for certification should be complementary to ISO 14001 and EMAS and should strengthen the environmental risk management and prevention.

Cases study no. 19 - Illegal scattering of depuration sludge

Case study name	Illegal scattering of depuration sludge
Country	Italy, Puglia
Contributor	ARPA Puglia (Italian Regional Environmental Agency)
Type of damage	Water damage and Land damage
Legislation	ELD case
Site	Puglia Region, Italy

Source of impact	The impact was not yet evaluated, but potentially could be identified in the release on the soil and in the groundwater of contaminants.
Natural Resources	The natural resources involved and potentially affected were land and groundwater.
Effects of the impact	The consequences on natural resources were not evaluated.

EVENT DESCRIPTION

1. *Location of the event*

Italy, Puglia

2. Cause of the event and offense committed

The event was caused by an illegal scattering of depuration sludge on agricultural ground.

3. Date and duration of the event

From 2013 to 2016 in one site and from 2013 to 2015 in another site.

4. Natural resources and services involved and adversely affected

The natural resources involved and potentially affected were soil and groundwater.

ASCERTAINMENT

5. How was the event known?

Prosecutor investigation.

6. Who conducted the ascertainment / investigation?

The investigation was led by the local Prosecutor, police officers and the local Regional Environmental Protection Agency of Puglia (ARPA Puglia). The preliminary assessment was conducted the National Institute for the Environmental Protection and Research (ISPRA) with the collaboration of ARPA Puglia. Data and information on characterization of depuration sludge, the groundwater quality and the presence and interactions with natural habitats in the area were provided by ARPA Puglia.

7. Timeline of the event and of the determination of clues and evidence

Information not available.

8. Identification of the source of impact

The source of the impact was the release in the soil and in the groundwater of contaminants.

9. Magnitude of the event

Information not available.

10. *Spatial extent*

Information not available.

11. Consequences to the natural resources and description of the causal link

The consequences on natural resources were not yet evaluated.

12. Legal requirements

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13. Tools/equipment and methods used

--

14. Other Legislation Applied

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Screening

15. Conduction of the screening

The screening was conducted by the prosecutor, the criminal police and ARPA Puglia.

16. Guidelines used

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Determination of clues

17. Clues found

Information not available because it is owned by the prosecutor.

18. Conduction of the determination of clues The determination of clues was conducted by the following activities: • data on the characterization of sewage sludge deriving from inspection activity carried out; • data deriving from the monitoring of groundwater bodies collected; • information deriving from the possible presence of decontamination procedures initiated, in order to verify the possible overcoming of the thresholds for soil contamination; • interaction with sites subject to environmental constraints (protected natural areas according to habitat directive) assessed. *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* Information not available because it is owned by the prosecutor. *21. Conduction of the determination of evidence* Information not available because it is owned by the prosecutor. *22. Significance thresholds considered* Thresholds from the most relevant legislation in the field of • The Groundwater Directive (2006/118/EC); • Commission Directive 2014/80/EU; • The Water Framework Directive (2000/60/CE) 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED --
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE For the determination of clues in similar cases, it is advisable to quickly verify the concentration of contaminants associated to the typology of scattered sludge in the soil and in the groundwater.
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 20 - Landfill of non-hazardous waste, illegal disposal of waste and contamination of soil and groundwater by the leachate of the waste

Case study name	Landfill of non-hazardous waste, illegal disposal of waste and contamination of soil and groundwater by the leachate of the waste
Country	Italy
Contributor	ARPA Umbria (Italian Regional Environmental Agency)
Type of damage	Water Damage (Imminent threat of water damage to groundwater)
Legislation	ELD case
Site	Landfill in the Umbria region

Source of impact	Spill of leachate from a landfill.
Natural Resources	The natural resource involved / affected (damage was not found) were the soil and subsoil.
Effects of the impact	Soil and subsoil contamination due to the spill of leachate from a landfill.

EVENT DESCRIPTION

1. *Location of the event*

Italy, Umbria Region.

2. Cause of the event and offense committed

Soil and subsoil contamination subsequent to the spill of leachate from a landfill of non-hazardous waste, due to the illegal disposal of waste.

3. Date and duration of the event

The event was discovered in 2015. The event happened in 2009 and lasted until 2015.

4. Natural resources and services involved and adversely affected

The natural resources involved / affected (damage was not found) were the soil and subsoil.

ASCERTAINMENT

5. How was the event known?

The event was known following investigations conducted by the Prosecutors Department on the illegal transportation and disposal of waste.

6. Who conducted the ascertainment / investigation?

The event was investigated by the Prosecutors Department.

The assessment of damage was led by ISPRA and supported by the data provided by ARPA Umbria (the Regional Environmental Agency).

7. Timeline of the event and of the determination of clues and evidence

In 2015, a portion of the landfill was seized in connection with leachate leakage and ARPA Umbria issued a communication of potential contamination.

Following the investigations and interventions carried out by the operator of the landfill in 2016 a communication of no-need for remediation was issued.

In 2017, the characterization of soil with ARPA was carried out.

In 2018 the proceeding was declared concluded.

8. Identification of the source of impact

The illegal disposal of waste and the subsequent leachate that spilled out of the landfill.

9. Magnitude of the event

Heavy hydrocarbons concentration in soils was 55 mg/kg (exceeding the thresholds for soil contamination).

10. *Spatial extent*

Unknown.

11. Consequences to the natural resources and description of the causal link

The illegal disposal of waste and the subsequent leachate that spilled out of the landfill determined the impairment of the woodland in the proximity with consequent drying of the arboreal and shrubby vegetation from 2013 to 2016 and the impairment between 2013 and 2016 of the waters of the stream nearby. The crime of pollution was disputed in relation to the exceeding of CSCs (contamination concentration thresholds for potential soil contamination and for groundwater contamination) for heavy hydrocarbons in soils and for iron and manganese and high concentrations of ammoniacal nitrogen in the groundwater.

12. Legal requirements

-

13. Tools/equipment and methods used

Damage assessment was carried out by experts in the field of water resources and biodiversity conservation. *14. Other Applied Legislation* -- **Screening** *15. Conduction of the screening* The event was screened by the Prosecutors Department on the illegal transportation and disposal of waste. *16. Guidelines used* -- **Determination of clues** *17. Clues found* Exceeding of CSCs (contamination concentration thresholds for potential soil contamination and for groundwater contamination) for heavy hydrocarbons in soils and for iron and manganese and high concentrations of ammoniacal nitrogen in the groundwater. Impairment of the woodland in the proximity with consequent drying of the arboreal and shrub vegetation from 2013 to 2016 and impairment between 2013 and 2016 of the waters of the stream nearby. *18. Conduction of the determination of clues* The clues of damage were found by the Public Prosecutor's Office in collaboration with ARPA Umbria and ISPRA (Italian National Institute for the Environmental Protection and Research). *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* It has been ascertained that there is an imminent threat of water damage, in particular the threat is addressed to groundwater. The existence of the imminent threat of environmental damage is determined by the presence in the area of an active source (instability of the landfill embankment ascertained following the leachate out-of-site in 2015) and of exposed targets (land and significant water bodies). *21. Conduction of the determination of evidence* The evidence of the imminent threat of environmental damage was conducted by ascertainment activities on-site and by the assessment of results. *22. Significance thresholds considered* Concentrations Thresholds of Potentially Contaminated Soils and of Contaminated Groundwaters (CSCs) and desiccation of the arboreal and shrub vegetation. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED --
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS --
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 21 - Chemical warehouse fire, chemical spills during fire extinction

Case study name	Chemical warehouse fire, chemical spills during fire extinction

Country	Latvia
Contributor	State Environmental Service
Type of damage	Water damage
Legislation	ELD case
Site	Mārupe, Mārupe county, Latvia Mārupite and Māra pond
Source of impact	The release of chemicals into Marupite, Mara pond and Daugava caused damage to the environment as a result of water damage - water pollution with chemicals.
Natural Resources	The natural resource involved/impacted was the Māra pond water - in Marupīte and Mara ponds have caused damage to fish resources (pike, perch, roach, tench, pigeon, catfish, carp, grouse).
Effects of the impact	The release of chemicals into Marupite, Mara pond and Daugava caused damage to the environment as a result of water damage - water pollution with chemicals. Damage to water (Marupīte and Mara pond) is assessed as a loss for fish resources by calculating the loss of fish resources in Marupe and Mara pond after chemical pollution of chemical substances and mixtures entering the fire. According to the Institute of Food Safety, Animal Health and Environment "BIOR" (ZI BIOR) calculations, chemical spills during fire extinction in Marupīte and Mara ponds have caused damage to fish resources in the amount of Ls 7219.84 (pike, perch, roach, tench, pigeon, catfish, carp, grouse). The chemical pollution that has occurred (damage caused) The Mara pond is defined as significant. The chemicals in Mārupīte were dissolved in water and could not be collected or neutralized, so the chemical pollution of water was not prevented by human activities. Chemicals remained in the water, but diluted with flowing water, lost their concentration and danger in the course of time. However, the chemicals that were not collected remained in the water and created lasting pollution and consequently environmental damage, which would not have occurred if there had been no pollution. The State environmental service SES, considering the situation, considered and assessed the damage to water, because water damage is any damage that has a significant adverse effect on the ecological or chemical quality, quantitative status or ecological potential of a particular water body. Water Damage (Marupīte and Mara Pond) is assessed as a loss for fish resources by calculating fish resource losses in Marupe and Mara pond after chemical contamination of chemical substances and mixtures flowing as a result of fire extinction in accordance with Cabinet Regulation No. 188 of May 8, 2001 “Procedure for Determination and Compensation for Damage Caused by Fish to Fish Resources”.

EVENT DESCRIPTION

1. *Location of the event*

Mārupe, Mārupe county, Latvia.

2. Cause of the event and offense committed

The chemical substances and chemical mixture of Mārupīte and Māras entering the fire extinguishing waters of a burnt chemical and compound warehouse.

3. Date and duration of the event

03.07.2011 information about the chemical substances and chemical mixture of Mārupīte and Māras entering the fire extinguishing waters.

08.07.2011 The results show that Mara pond water quality slowly but gradually was improving, as the water exchange (intake and exhaust) was slow. As for water exchange in Mara pond, its pollution indicators decreased, reaching the parameters specified in regulatory enactments (chemical EQSs and short term in the Surface water indicator norm).

14.07.2011 Release of burned and unusable chemical substances and mixtures from the burnt chemical and compound warehouse area at Ulmaņa gatve was completed.

4. Natural resources and services involved and adversely affected

The natural resource involved/impacted was the Māra pond water - in Marupīte and Mara ponds have caused damage to fish resources (pike, perch, roach, tench, pigeon, catfish, carp, grouse).

ASCERTAINMENT

5. How was the event known?

Received information from the State Fire and Rescue Service.

6. Who conducted the ascertainment / investigation?

Investigation was led by State environmental service.

Institutions involved:

- Riga City Council Environmental Protection Department and Mārrupes Municipality
- The Ministry of environmental protection and regional development
-The State fire and rescue service
- Cooperation with the Health Inspectorate to assess drinking water quality in nearby drinking water wells.

7. Timeline of the event and of the determination of clues and evidence

See par. 3 above.

8. Identification of the source of impact

The release of chemicals into Marupite, Mara pond and Daugava (not protected water bodies), as a consequence of a chemical warehouse fire, caused water damage to the environment as a result of water damage - water pollution with chemicals. The chemicals in Mārupīte were dissolved in water and could not be collected or neutralized, so the chemical pollution of water was not prevented by human activities.

9. Magnitude of the event

Summary of water analysis results.

On 3, 4 and 6 July 2011, water samples were removed and transferred to the Laboratory of the Latvian Environment, Geology and Meteorology Center at three sites (in the area, behind the booms and at the site of the discharge). On 7 and 11 July 2011, by mutual agreement with the State Environmental Service Mārupīte Water Sampling was provided by the Riga City Council - the mouth of the Mara pond, the source from the Mara Pond and the Daugava (Āgenskalns Bay). The results show a slow improvement of the situation, self-cleaning process. Water from Mārupīte Daugava flows into the water of adequate quality, the last results showed an increased amount of total chlorine and ammonium, which, however, does not have negative consequences for the environment and living organisms.

Within four days, the chemical oxygen consumption has leveled out and reached the level observed at the control site - 100 meters above the ditch in Mārupīte.

Chemical oxygen demand (COD), mg / l (background 66+9 mg/l) 1700+200 mg/l (Surface water

indicator norm - Republic of Latvia Cabinet Regulation No. 118 Adopted 12 March 2002 Regulations Regarding the Quality of Surface Waters and Groundwaters).
10. *Spatial extent*
No information.
11. Consequences to the natural resources and description of the causal link
The release of chemicals into Marupite, Mara pond and Daugava caused water damage as a consequence of water pollution with chemicals. Damage to water (Marupīte and Mara pond) is assessed as a loss for fish resources by calculating the loss of fish resources in Marupe and Mara pond after chemical pollution of chemical substances and mixtures entering the fire. According to Food Safety, Animal Health and Environmental Science "BIOR" calculations, chemical spills during fire extinction in Marupīte and Mara ponds have caused damage to fish resources in the amount of Ls 7219.84 (pike, perch, roach, tench, pigeon, catfish, carp, grouse).
The chemical pollution that has occurred (damage caused) in the Mara pond is defined as significant.
The chemicals in Mārupīte were dissolved in water and could not be collected or neutralized, so the chemical pollution of water was not prevented by human activities. Chemicals remained in the water, but diluted with flowing water, lost their concentration and danger in the course of time. However, the chemicals that were not collected remained in the water and created lasting pollution and consequently environmental damage, which would not have occurred if had there been no pollution.
The State environmental service, considering the situation, considered and assessed the damage to water, because water damage is any damage that has a significant adverse effect on the ecological or chemical quality, quantitative status or ecological potential of a particular water body. Water Damage (Marupīte and Mara Pond) is assessed as a loss for fish resources by calculating fish resource losses in Marupe and Mara pond after chemical contamination of chemical substances and mixtures flowing as a result of fire extinction in accordance with Cabinet Regulation No. 188 of May 8, 2001 "Procedure for Determination and Compensation for Damage Caused by Fish to Fish Resources".
12. Legal requirements
Not applicable.
13. Tools/equipment and methods used
State environmental service asked the Institute of Food Safety, Animal Health and Environment "BIOR" (hereinafter referred to as "BIOR") to calculate the loss of fish resources due to the chemical substance leaked in Marupe and Mara pond.
14. Other Applied Legislation
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Screening
15. Conduction of the screening
The information for the screening were:
1. fire of a chemical warehouses.
2. the chemical substances and mixtures (types and characteristics with reference to Reach Regulations) entering the fire extinguishing waters of the chemical warehouses.
3. Firefighters first extinguished the fire with water, all of which leaked into the sewer system, then in Mārupīte and Mara ponds.
16. Guidelines used
The operator shall prepare a report regarding the manufacture of chemical substances and mixtures or imported into the territory of Latvia (is not publicly accessible). Special data base (the Latvian Environment, Geology and Meteorology Centre (LEGMC)):
http://parissrv.lvgmc.lv/#viewType=reportIndexView&addrefreshtimer=true&donotrenderwithoutrole=true&donotusewrapper=true&type=CH&incrementCounter=1
Determination of clues

17. Clues found

The results show a slow improvement of the situation, self-cleaning process. Water from Mārupīte Daugava flows into the water of adequate quality, the last results show an increased amount of total chlorine and ammonium, which, however, does not have negative consequences for the environment and living organisms.

Within four days, the chemical oxygen consumption has leveled out and reached the level observed at the control site - 100 meters above the ditch in Mārupīte.

Chemical oxygen demand (COD), mg / l (background 66+9 mg/l) 1700+200 mg/l

Death of fishes in the amount of Ls 7219.84 (pike, perch, roach, tench, pigeon, catfish, carp, grouse).

The State environmental service asked the Institute of Food Safety, Animal Health and Environmental Science "BIOR" (hereinafter referred to as BIOR) to calculate the loss of fish resources as a result of the chemical substance leaked in Marupe and Mara pond.

According to the letter of the Food Safety, Animal Health and Environmental Science "BIOR" it can be concluded that the most significant losses to fish resources are caused by the death of fish. Taking into account the information on the total weight of fish killed, the potential fishing productivity of the pond and the area of the water mirror, it can be concluded that most of the fish were killed in the Mara pond as a result of chemical spills. It should also be bear in mind that the actual fish mortality due to various reasons (predators, bottom sinking, etc.) was higher than the number of fish killed. However, the quantity of fish not counted is currently impossible to determine.

18. Conduction of the determination of clues

The clues of environmental damage were founded by State environmental service.

On 3, 4 and 6 July 2011, water samples were removed and transferred to the Laboratory of the Latvian Environment, Geology and Meteorology Center at three sites (in the area, behind the booms and at the site of the discharge). On 7 and 11 July 2011, by mutual agreement with the State Environmental Service Mārupīte Water Sampling was provided by the Riga City Council - the mouth of the Mara pond, the source from the Mara Pond and the Daugava (Āgenskalns Bay).

19. Guidelines used

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Determination of evidence

20. Evidence found

Water Damage (Marupīte and Mara Pond) was assessed as a loss for fish resources by calculating fish resource losses in Marupe and Mara pond after chemical contamination of chemical substances and mixtures flowing as a result of fire extinction in accordance with Cabinet Regulation No. 188 of May 8, 2001 "Procedure for Determination and Compensation for Damage Caused by Fish to Fish Resources".

Damage to fish resources in the amount of Ls 7219.84 (pike, perch, roach, tench, pigeon, catfish, carp, grouse).

Due to the high fish mortality and limited fish migration possibilities, the shortage of spawning fish is expected in the coming years, which will significantly slow down the recovery of the fish fauna of Mara pond. The natural reproduction of moss and carp in the Mara pond is unlikely.

In order to assess the significance of the resulting chemical pollution, the State environmental service used the developed criteria for determining the significance of environmental damage. Determines both "Importance" and "Stop Options" to determine "Importance". Calculates: Importance of environmental damage 3 x Possibilities of halting environmental damage 2 = Significance of environmental damage 6, where the damage caused by the named activity is significant.

As a result, it was found that the chemical pollution (damage caused) was defined as significant by the Mara pond.

No baselines condition was needed in this case and the declassification of the ecological status was not assessed according to Water Framework Directive (WFD).

21. Conduction of the determination of evidence

The evidence of environmental damage was found by State environmental service.

In order to determine the number of fish killed on 4, 7, 8 and 11 July, a water catchment area of the Marupe and Mara ponds and the collection of dead fish were carried out (SES Marine and Inland Waters Administration) of different species of fish (the inspectors read all the dead fish along the ponds with their boats, their nets and their hands).

Institute of Food Safety, Animal Health and Environment "BIOR" carried out a fishery expert's report and estimate of fish mortality in Marupite and Mara pond in July 2011.

The opinion describes the characterization of the water bodies and their ichthyofauna, the impact of the object of expertise on fish resources and the calculation of losses. The calculation includes losses due to fish mortality and losses due to future spawning.

SES inspectors provided basic information on the types and numbers of fish that died.

22. Significance thresholds considered

For determining the significant of environmental damage, the criteria for assessing the significance of the injury are drawn on a points system. The evaluation remains subjective.

In this case, it was determined: Importance of environmental damage 3 x Possibilities of halting environmental damage 2 = Significant of environmental damage 6, where the damage caused by the named activity is significant.

23. *Guidelines used*

Cabinet Regulation No. 188 of May 8, 2001 “Procedure for Determination and Compensation for Damage Caused by Fish to Fish Resources”.

SES used the developed criteria for determining the significance of environmental damage:

Cabinet Regulation No. 281 Adopted 24 April 2007 Regulations Regarding Preventative and Rehabilitation Measures and the Procedures for Evaluation of Environmental Damage and Calculation of Costs of Preventative, Emergency and Rehabilitation Measures (https://likumi.lv/ta/en/en/id/157197-regulations-regarding-preventative-and-rehabilitation-measures-and-the-procedures-for-evaluation-of-environmental-damage-and-calculation-of-costs-of-preventative-emergency-and-rehabilitation-measures)

KEY FINDINGS AND LESSONS LEARNED

- SES action was in compliance with the Ministry of Environment Order No. 516 of 30 December 2009 “On Co-operation of the Ministry of Environment and Subordinated Institutions and Co-ordination of Information Circulation in Emergency Situations Related to Environmental Protection and Procedure of the State Secretary of the Ministry of Environment of 30 December 2009” the co-ordination of the co-operation and information circulation of the institutions subordinated to the Ministry of Environment in the emergency procedure ”.
- Good cooperation with experts who have estimated the loss of fish resources.
- identified problems:

1) No private houses connected to a single water supply system.
2) A beloved place for walking
3) Firefighters first extinguished the fire with water, all of which leaked into the sewer system, then in Mārupīte and Mara ponds.

- no guidelines for assessing and determining environmental damage.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

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TRAINING NEEDS

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ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

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Case study no. 22 - Laying of alien material in a Special Area of Conservation

Case study name	Laying of alien material in a Special Area of Conservation (SAC)
Country	Malta
Contributor	Environment and Resources Authority (ERA)
Type of damage	Damage to protected species and natural habitats
Legislation	ELD case
Site	Malta, Gozo island
Source of impact	Extraneous sediment originating from a local quarry was deposited at a site in a SAC in Gozo.
Natural Resources	The area affected was small and did not include any species or natural habitats for which the site was designated under the Habitats Directive.
Effects of the impact	An independent scientific assessment was commissioned to evaluate the extent of damage incurred to the site. The result of the scientific assessment concluded that negligible to no damage was inflicted on the affected area. No damage was found.

EVENT DESCRIPTION

1. *Location of the event*

Malta, Gozo island.

2. Cause of the event and offense committed

Extraneous sediment originating from a local quarry was deposited at a site in a SAC in Gozo for staging activities. Deposition of the sediment was made by a sub-contractor commissioned for the purpose following the granting of a permit issued by the MEPA. Besides requiring that the sediment be removed after the stage was completed, the permit was subject to 26 consent conditions, of which two conditions specifically stated that the permitted activities were to be confined to a spatial extent of 750 m^2 and that the surfacing and dressing of sites, other to the levelled rock surface, was prohibited.

Before the extraneous sediment was removed from the site in the SAC, the material underwent consolidation and cementation following heavy rainfall. As a result, the contractor commissioned to remove the sediment initially used heavy machinery and impact tools to remove the material. The MEPA subsequently intervened and requested that further removal of the extraneous sediment be carried out manually.

3. Date and duration of the event

The event occurred from the 19 to 21 October and the then MEPA was alerted on the 25 October.

4. Natural resources and services involved and adversely affected

The area affected was small and did not include any species or natural habitats for which the site was designated under the Habitats Directive.

ASCERTAINMENT

5. How was the event known?

The Malta Environment and Planning Authority (MEPA) was alerted through a third party.

6. Who conducted the ascertainment / investigation?

The ascertainment/investigation on site was led by a team of experts who are external consultants commissioned by the MEPA. They investigated the impact of filming activities on Geology, Geology, Geomorphology and palaeontology, landscape and the visual scene, protected area integrity as well as terrestrial and marine ecological resources.

7. Timeline of the event and of the determination of clues and evidence

The event occurred from the 19 to 21 October and the MEPA was alerted on the 25 October. The date of commencement of remedial action was the 25th October and the date of closure of the proceedings was the 3rd December.

8. Identification of the source of impact

Extraneous sediment originating from a local quarry was deposited at a site in a SAC in Gozo.

Before the extraneous sediment was removed from the site in the SAC, the material underwent consolidation and cementation following heavy rainfall. As a result, the contractor commissioned to remove the sediment initially used heavy machinery and impact tools to remove the material.

9. Magnitude of the event

Although no quantitative data was collated, the magnitude of the event was considered to be small in view that the assessments of impact on the various environmental features was concluded to be largely insignificant.

10. *Spatial extent*

The event involved an area of deposition (AoD) of approximately 750 m^2 and for some environmental receptors the area potentially impacted extended beyond this.

11. Consequences to the natural resources and description of the causal link

An independent scientific assessment was commissioned to evaluate the extent of damage incurred to the site. The result of the scientific assessment concluded that negligible to no damage was inflicted on the affected area. No damage was found.

12. Legal requirements

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13. Tools/equipment and methods used

See answer to par. 21 below.

14. Other Applied Legislation

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Screening

15. Conduction of the screening

MEPA was alerted.

16. Guidelines used

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Determination of clues

17. Clues found

The findings from the assessment of impact on palaeontology indicated that, given that the fossils and ichnofossils in the entire area are impacted by trampling on a regular basis, and that there are also known instances of fossil theft from the area, the experts concluded that the observed damage could not be linked definitively to the specific activities carried out in connection with the staging activities.

The findings in relation to the impact on geology and geomorphology indicated that the significance of impacts related to sediment accumulation were considered to be low, as such impacts are temporary and reversible with little lasting damage. Nevertheless, the significance of impacts relating to damaged karstic features was considered to be high, given the permanent and irreversible nature of such impacts.

The impact on landscape and the visual scene was limited since the spatial extent of the impact was contained and absorbed within the large scale and expansive landscape context. The assessment of impacts on the protected area integrity concluded that there were no long-term impacts, whilst the assessment of impact on terrestrial ecology indicated that there was no direct evidence that any macroscopic fauna was buried by the deposition of extraneous sediment in the area of operations. The overall disturbance represented by the deposition of the sediment did not compromise the integrity of the biological communities within the SAC.
Finally, no adverse impact on the marine environment within the study area was evident and therefore the integrity of the marine ecosystem, in particular the biotic assemblages and habitats present within the marine SAC, were not compromised.
18. Conduction of the determination of clues
The clues of environmental damage were found by various methods depending on the environmental feature being investigated.
19. Guidelines used
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Determination of evidence
20. Evidence found
The evidence of environmental damage varied by environmental receptor:
In the case of the assessment of impact, evidence was from freshly fractured fossils and damaged ichnofossils of thalassinoides burrow infills beneath seemingly fresh heavy vehicle tyre tracks.
The evidence from the assessment of impact on geology and geomorphology was related to the fact that several rock pinnacles appeared to have been broken off; given the size of broken-off fragments, the damage is likely to have been caused by the use of heavy mechanical machinery. However, notwithstanding that the clean-up operation removed the vast bulk of deposited sediment, the nature of the karstic rock surface made it difficult for all sediment to be removed.
Evidence found in relation to the assessment of impact on landscape and visual scene was related primarily to the characteristics of the deposited sediment, which left behind a reddish residue on the affected rock surface. The bedrock in the eastern parts of the area of deposition (AoD) is generally yellowish in colour. The composition of the deposited material, which was derived from a variety of sources, was also a factor in its solidification and persistence in the AoD; the sheen of deposited sediment which was likely to persist until it is washed away by rainfall, has thus produced an alteration in the colour characteristics of the AoD.
In relation to the assessment of impact on terrestrial ecology there was no direct evidence that any macroscopic fauna were buried by the deposition of extraneous sediment in the area of operations, although this possibility could not be excluded for small sedentary species that live in crevices and fissures in the rock, under overhangs, under stones, or at base of the vegetation that was buried. Plants along the eastern fringes of the area of deposition were, in places, partially buried by sediment arising from overspill but were still photosynthetic at the time of survey. No macroscopic fauna in the areas receiving overspill sediment from the area of deposition were found to have been impacted. However, vegetation in such areas was found to have a number of animal species associated with it suggesting that the partially buried plants may have had fauna that were negatively impacted by sediment transported or spilled from the area of deposition. At the time of survey, the bottom sediment in rockpools in areas adjacent to the area of deposition did not exhibit any differences from the bottom sediment in rockpools situated well away from the site, suggesting that transport of sediment into the pools through surface runoff was not significant in the long term. Any transported sediment would have been unlikely to reach the sea in large volumes as the intervening rockpools and other depressions act as efficient sediment traps. Overall, the disturbance represented by the deposition of sediment has not compromised the integrity of the biological communities within the SAC, but impacts were localized.
With respect to the assessment of impact on marine ecology there was no evidence to indicate that (i) there were accumulations of sediment on the seabed that may have originated from the

extraneous material, and the underwater visibility was very good (> 30 m) during all fieldwork sessions, indicating the absence of any suspended material in the water column at the time of survey; (ii) naturally occurring patches of sediment did not appear to have increased in size as a result of addition of extraneous material; (iii) no burial or smothering of infralittoral benthic biota and habitats or other adverse effects on these biotic features that may have resulted from the extraneous sediment were detected; (iv) a rich demersal and pelagic fish fauna was recorded from the study area, which did not appear to have been affected adversely by any potential introduction of extraneous material to the marine environment.
Examination of the mediolittoral zone for the presence of extraneous sediment did not result in any such material being present in this zone.

21. Conduction of the determination of evidence

The evidence of environmental damage was gathered by on-site monitoring and fieldwork observations both on land and at sea. In the case of the terrestrial environment, walk-over surveys of flora and fauna were carried out covering the whole area. In the case of the marine environment broad brush surveys of the infralittoral zone were carried out within a 0 m-45 m depth range. Scuba divers carried out underwater monitoring using transects, and photographs of the benthic assemblages were taken.

22. Significance thresholds considered

For the determination of environmental damage, the level of significance was determined based on the following criteria:

• Duration: whether the damage is of permanent nature.
• Extent: Whether the extent of damage was confined to the area of damage where the deposition of sediment occurred or to and the area beyond such deposition.
• Nature: whether the observed impacts are of a detrimental nature, and are a direct result of actions that took place on the site.
• Reversibility: whether the impacts on the natural resource or feature is irreversible.
• Sensitivity of resources to impacts: whether the resource/feature is the result of a unique heritage value and irreplaceable
• Scope of mitigation/ enhancement: Whether there is scope for mitigating the impacts which have occurred
• Residual impacts: This is dependent on whether these is scope for mitigation. Should there be none, the observed impacts are residual.
• Magnitude: The magnitude of damage to the resource or environmental feature
• Significance: The level of significance of damage based on the: (i) extent of observed damage, (ii) the sensitivity of the resource to damage, (iii) nature of the damage (permanency and irreversibility of damage), and (iv) the scope for mitigating impacts.

23. *Guidelines used*

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KEY FINDINGS AND LESSONS LEARNED

Given that the determination process was carried out by external consultants commissioned by then MEPA, we are not in a position to reply to this.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

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TRAINING NEEDS

In view of the limited technical adaptation in the local scenario of the ELD, various options can be explored in terms of training needs for the ascertainment of environmental damage and threats and a better general understanding of the Directive. Furthermore, Malta does not currently have a system whereby a system for the screening/evidence of damage/clues of damage are strategically collected, thus this form of technical assistance would be beneficial.

ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

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Case study no. 23 - Gasoline leak at a filling station

Case study name	Gasoline leak at a filling station
Country	Portugal
Contributor	Portuguese Environment Agency (APA)
Type of damage	Water damage and Land damage
Legislation	ELD case Decree-Law No. 147/2008 of 29 July 2008
Site	Vilamoura, Loulé, Portugal
Source of impact	The source of the impact was an unleaded 95 gasoline leak from a buried tank.
Natural Resources	The natural resources affected were soil and subsequently groundwater.
Effects of the impact	The incident affected an area of approximately 190 m^2 of soil and an extent of 290 m^2 of groundwater. In soil, it was detected the presence of hydrocarbons (TPH) in concentrations up to 3,300 mg/kg and naphthalene up to 6.0 mg/kg. In groundwater, it was detected the presence of dissolved TPH in concentrations up to 109 mg/l, of MTBE up to 20,081 mg/l and of naphthalene up to 152.8 µg/l.

EVENT DESCRIPTION

1. *Location of the event*

Vilamoura, Loulé, Portugal.

2. *Cause of the event and offense committed*

The cause of the damage was a gasoline leak at a gasoline filling station.

The single-walled steel tank, where the spill occurred, was buried directly in the ground, and had been installed 24 years ago. The soil became contaminated with hydrocarbons, and subsequently the groundwater as well. The Risk Analysis confirmed the risk to human health from inhalation of volatiles in confined spaces, which was assessed in the basement of the site auxiliary building.

3. *Date and duration of the event*

The event was detected in March 2009 and the tank was lined during that year.

4. *Natural resources and services involved and adversely affected*

The natural resources affected were soil and subsequently groundwater.

ASCERTAINMENT

5. *How was the event known?*

The operator detected a gasoline leak from an unleaded 95 gasoline tank, confirmed by sealing tests and subsequently by on-site soil sampling and analysis.

6. *Who conducted the ascertainment / investigation?*

The investigation of environmental damage or imminent threat of such damage was carried out under the responsibility of the operator and of a specialised company.

7. *Timeline of the event and of the determination of clues and evidence*

- March 2009 – Leakage of fuel detected at a filling station.
- April 2009 – Sealing tests on tanks and pipelines were negative for a petrol tank. Four

drillings were performed, soil and groundwater samples were collected, and contamination of both natural resources was confirmed (see answer to par. 9).

8. Identification of the source of impact

The source of the impact was an unleaded 95 gasoline leak from a buried tank.

9. Magnitude of the event

The incident affected an area of approximately 190 m^2 of soil and an extent of 290 m^2 of groundwater.

10. *Spatial extent*

See answer to par. 9 above.

11. Consequences to the natural resources and description of the causal link

See answer to par. 9 above.

12. Legal requirements

National/international quality standards of laboratorial analysis. The Portuguese Environment Agency (APA), as an entity of the Public Administration, comply with all legal procedural and technical requirements.

13. Tools/equipment and methods used

- Routine inspections of regulated sites and random site visits;
- The register of data on ELD environmental damage and imminent threat of such damages that has been maintained by the competent authority (APA) since 2008;
- The bilingual platform for communication of environmental damages or imminent threats of environmental damages with the description of the occurrence by the operator or an interested party, available at: https://ra.apambiente.pt/form

14. Other Applied Legislation

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Screening

15. Conduction of the screening

The operator detected a gasoline leak from an unleaded 95 gasoline tank.

The authorities carried out a site visit.

A bilingual platform for communication of environmental damages or imminent threats of environmental damages, with the description of the occurrence by the operator or an interested party, is available at: https://ra.apambiente.pt/form

16. Guidelines used

APA, "*Guide for the Assessment of Imminent Threats and Environmental Damages – Environmental Liability*", October 2011, English version available at: http://apambiente.pt/_zdata/Instrumentos/Responsabilidade%20Ambiental/2011-10_Portugal%20-%20Guide.pdf and https://ec.europa.eu/environment/legal/liability/pdf/eld_guidance/Portugal%20-%20Guide.pdf

APA, "*Guia Técnico – Valores de Referência para o Solo*", last version - January 2019, available at: http://apambiente.pt/_zdata/Politicas/Solos/Guia%20Tecnico_Valores%20de%20Referencia_2019_01.pdf

APA, "*Guia Técnico – Análise de risco e critérios de aceitabilidade do risco*", last version - January 2019, available at: http://apambiente.pt/_zdata/Politicas/Solos/Guia%20Tecnico_Analise%20de%20Risco_Criterios%20de%20Aceitalidade_2019_01.pdf

Determination of clues

17. Clues found

Analysis of the soil samples confirmed the presence of TPH and naphthalene in concentrations above the reference values used in Portugal (see answers to par. 21 and 22) and in the case of groundwater the presence of dissolved TPH, MTBE and naphthalene in concentrations higher than those set in the national law (see answers to par. 21 and 22).

18. Conduction of the determination of clues

A site visit was conducted by the authorities, sealing tests and subsequently on-site soil and groundwater sampling and analysis.
The register of data on an ELD environmental damage and imminent threat of such damages database.

19. Guidelines used

See answer to par. 16 above.

Determination of evidence

20. Evidence found

See answer to par. 17 above.

21. Conduction of the determination of evidence

The investigation of environmental damage or imminent threat of such damage was under the responsibility of the operator and was carried out by a specialised company.
In soil, the presence of hydrocarbons (TPH) in concentrations up to 3,300 mg/kg and naphthalene up to 6.0 mg/kg were detected. In groundwater, the presence of dissolved TPH in concentrations up to 109 mg/l, of MTBE up to 20,081 mg/l and of naphthalene up to 152.8 µg/l was detected.
The Risk Analysis confirmed risk for human health from inhalation of volatiles in confined spaces.

22. Significance thresholds considered

For soils, APA recommends the use of reference values published in "*Guia Técnico – Valores de Referência para o Solo*", last version – January 2019, available at: http://apambiente.pt/_zdata/Politicas/Solos/Guia%20Tecnico_Valores%20de%20Referencia_2019_01.pdf (adapted from Ontario Standards) and the adoption of a methodology of Risk Assessment according to "*Guia Técnico – Análise de risco e critérios de aceitabilidade do risco*", last version – January 2019, available at: http://apambiente.pt/_zdata/Politicas/Solos/Guia%20Tecnico_Analise%20de%20Risco_Criterios%20de%20Aceitalidade_2019_01.pdf
Under the scope of the Water Framework Directive (Directive 2000/60/EC), Portugal established quality standards and threshold values for surface waters and groundwater, that take into account site specific characteristics (The environmental quality standards and the threshold values are published in the River Basin Management Plans and remain valid during a six years cycle, and are available at: http://apambiente.pt/?ref=16&subref=7&sub2ref=9&sub3ref=834)

23. *Guidelines used*

See answer to par. 16 above.

KEY FINDINGS AND LESSONS LEARNED

- Nowadays the communication to the competent authority (APA) of the environmental damages or the imminent threats of such damages has improved considerably with the development of the bilingual platform available at: https://ra.apambiente.pt/form
- Site visits are very important for a more comprehensive understanding of the occurrence, knowing the surrounding, observing which natural resources could potentially have been affected, confirmation of the estimation of the affected area and initiatory causes, and clarifying doubts
- Regular meetings with the operators to discuss the assessment of the occurrence; the preventive measures implemented; the remedial measures to be implemented/already implemented; the monitoring program to be carried out for the assessment of the situation, at the end of the remedial measures and after, to ensure the achievement of the restoration of affected natural resources within the timetable foreseen; the involvement of the stakeholders, are all measures of added value for the purpose.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

The criteria for the determination of the clues and the determination of evidence, among other aspects, were established in the "*Guide for the Assessment of Imminent Threats and Environmental Damages – Environmental Liability*", APA, October 2011, English version available at: http://apambiente.pt/_zdata/Instrumentos/Responsabilidade%20Ambiental/2011-

10_Portugal%20-%20Guide.pdf and https://ec.europa.eu/environment/legal/liability/pdf/eld_guidance/Portugal%20-%20Guide.pdf
TRAINING NEEDS Training on-the job and workshops seem very effective.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS The development of an environmental damage database at EU level or the development of IT tools for evaluation of damages would be very important.

Case study no. 24 - Land contamination by illegal dumping of waste by occupational activity on unregulated site

Case study name	Land contamination by illegal dumping of waste by occupational activity on unregulated site
Country	Republic of Croatia
Contributor	State Inspectorate
Type of damage	Land damage
Legislation	Non-ELD case Croatian national legislations in force at the time the event occurred: 1. Environment Protection Act, O.G.110/07 2. Regulation on the Manner of Establishing Environmental Damage, O.G. 139/08 3. Ordinance on Measures for Remediation of Environmental Damage and Restoration Programmes, O.G. 145/08 4. Waste Management Act, O.G. 178/04; 111/06; 60/08; and 87/09 5. Ordinance on Waste Catalogue, O.G. 50/05 and 39/09 6. Ordinance on Waste Management, O.G.23/07 and 111/07 7. Agricultural Land Act, O.G. 152/08; 25/09; 153/09; 21/10; 39/11 8. Ordinance on the Protection of Agricultural Land from Contamination, O.G. 32/10
Site	Republic of Croatia - Varaždin County
Source of impact	The source of impact was release of hazardous substances and hazardous waste from metal surface protection – shot blasting and spraying.
Natural Resources	The natural resource involved/impacted was land inside and outside of the fence of the operator's establishment.
Effects of the impact	The contamination of the agriculture land by harmful substances (heavy metals in the observed case) disabled the production of safe food, what creates a significant risk of human health.
EVENT DESCRIPTION 1. *Location of the event* Republic of Croatia - Varaždin County. *2. Cause of the event and offense committed* The cause of event: the operator of the occupational activity (use of dangerous substances (Annex III, point 7, (a) of ELD)) on purpose disposed hazardous waste inside and outside of the fence of the establishment. *3. Date and duration of the event*	

The beginning of illegal disposal of waste was not known, because there were no waste generation and flaw records.
The event was discovered at November 2011.
The waste was excavated and given to authorized person in December 2011.

4. Natural resources and services involved and adversely affected

The natural resource involved/impacted was land inside and outside of the fence of the operator's establishment.

ASCERTAINMENT

5. How was the event known?

Environmental Protection Inspector was at the routine on-site inspection of the operator performing metal production including surface protection – shot blasting and spraying of metal products. Construction works on new fence were going on. On the spot of excavation of earth to build a foundation for a fence, Inspector noticed buried barrels.

6. Who conducted the ascertainment / investigation?

The investigation was conducted by Environmental Protection Inspector. The Police were involved from the beginning on suspicion of environmental crime. In order to detect the buried waste, Police Officers searched the operators circle using a metal detecting device and located possible waste disposal sites. District Attorney Office was informed about the case. In collection the evidences the authorized laboratory was involved to take samples and make the analysis of the illegally buried waste. The sampling and analysis of contaminated land (agricultural land) was also conducted by licenced laboratory.

7. Timeline of the event and of the determination of clues and evidence

The event was discovered in routine on-site inspection 23, 29 and 30. November 2011.
The report of the analysis of contaminated land and buried waste was issued on 6. December 2011.

8. Identification of the source of impact

The source of impact was the release of hazardous substances and hazardous waste from metal surface protection – shot blasting and spraying.

9. Magnitude of the event

The magnitude of event was characterized by the amount of waste found buried inside and outside of the fence of operator's establishment and with amount of contaminated soil:

1. 16,750 kg of waste 08 01 11* (waste paint and varnish containing organic solvents or other dangerous substances)
2. 29,120 kg of waste 12 01 02 (ferrous metal dust and particles) – shot blasting dust
3. 13,340 kg of waste 12 01 01 (ferrous metal filings and turnings)
4. 28,120 kg of waste 17 05 05* (dredging soil containing dangerous substances, outside of the fence) contaminated soil

According to the soil analysis conducted by the official laboratory accredited to Croatian standards, the presence of contamination in the agriculture land (declared as pasture) out of operator's fence was found in following concentrations:

- 504.0 mg/kg of led (Pb)
- 56.9 mg/kg of chromium (Cr)
- 26.5 mg/kg of nickel (Ni)

Inside of operator's fence the contamination was found in following concentrations:

- 1,079.3 mg/kg of led (Pb)
- 5.59 mg/kg of cadmium (Cd)

10. *Spatial extent*

Approximately 250 m^2 of surface of contaminated soil.

11. Consequences to the natural resources and description of the causal link

The contamination of the agriculture land by harmful substances (heavy metals in the observed case) disabled the production of safe food, what creates a significant risk of human health.

12. Legal requirements

Sampling and analysis of the land was conducted by the official laboratory accredited to Croatian standards.

Sampling and analysis of the waste was conducted by the official laboratory accredited to Croatian standards.

Environmental Protection Inspector in line with his authority and the provisions of Waste Management Act, issued the Inspection Decision to the operator to remove all the waste and contaminated soil from the spot. Legally, there is the possibility of appeal, but the operator did not consume it. Operator obeyed the Inspection Decision and removed all the waste and contaminated soil. All expenses of sampling and analysis of waste and contaminated soil, removing the waste and soil by authorised company were paid by the operator.

Environmental Protection Inspector also started misdemeanour procedure in the Court. The operator was declared guilty and punished with financial fine. He did not use his right to appeal, but paid the fine.

13. Tools/equipment and methods used

Sampling and analysis of the land/waste was conducted by the official laboratory accredited by Croatian Accreditation Agency, according to Standard: ISO/IEC 17025:2017; EN ISO/IEC 17025:2017. To obtain accreditation for analysis of land/waste operator is obligated to have permanent laboratory with standardize equipment and required staff for certified methods of analysis and sampling.

The environmental inspector used different databases for collecting information about the inspection site: purpose of land (cadastre database, ARKOD database with data about: Natura 2000, protected areas, vulnerable areas, permanent herbage, protected habitats, hydrological and other relevant data).

Also, he did a lot of internet research about operator: insight of court register to identify the operator, examine the PRTR data for the operator, checked e-register of waste generation and flow.

There were a lot of interviews of responsible persons of operator, workers and other witnesses conducted by Inspector, Police and District Attorney Office.

Court Expert was included on the request of District Attorney Office.

14. Other Applied Legislation

Croatian national legislations in force at the time the event occurred:

1. Environment Protection Act, O.G.110/07
2. Regulation on the Manner of Establishing Environmental Damage, O.G. 139/08
3. Ordinance on Measures for Remediation of Environmental Damage and Restoration Programmes, O.G. 145/08
4. Waste Management Act, O.G. 178/04; 111/06; 60/08; and 87/09
5. Ordinance on Waste Catalogue, O.G. 50/05 and 39/09
6. Ordinance on Waste Management, O.G.23/07 and 111/07
7. Agricultural Land Act, O.G. 152/08; 25/09; 153/09; 21/10; 39/11
8. Ordinance on the Protection of Agricultural Land from Contamination, O.G. 32/10

Screening

15. Conduction of the screening

The screening in the observed case was done by the Environmental Protection Inspector according to his findings in on-site inspection. These findings were complemented by investigation of the land use and the eventual existence of protected species and/or natural habitats on the contaminated area or in the vicinity of contaminated area.

16. Guidelines used

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Determination of clues

17. Clues found

The clues of land damage were:

- Findings of buried hazardous waste at the operator's location
- Presence of contaminated soil by hazardous substances, namely Pb, Cr, Ni

18. Conduction of the determination of clues

The determination of clues was conducted through on-site inspection.

19. Guidelines used

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Determination of evidence

20. Evidence found

The evidence of land damage was not found.

21. Conduction of the determination of evidence

--

22. Significance thresholds considered

The thresholds about contamination of agriculture land from harmful substances, from national legislation - Ordinance on the Protection of Agricultural Land from Contamination.

Example for heavy metals thresholds:

mg kg-1	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Sandy soil	0,0-0,5	0-40	0-60	0,0-0,5	0-30	0-50	0-60
Powdery-loamy soil	0,5-1,0	40-80	60-90	0,5-1,0	30-50	50-100	60-150
Clay soil	1,0-2,0	80-120	90-120	1,0-1,5	50-75	100-150	150-200

Findings:

- 504.0 mg/kg of led (Pb)
- 56.9 mg/kg of chromium (Cr)
- 26.5 mg/kg of nickel (Ni)

23. *Guidelines used*

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KEY FINDINGS AND LESSONS LEARNED

Positive aspects:

1. The result of routine on-site inspection with discovering of serious illegal disposal of waste and soil contamination proves a good level of competency and professional approach from Environmental Protection Inspection in Croatia.
2. The cooperation with other competent bodies (Police, District Attorny Office, certified laboratories) resulted with good administrative and court case. The state of environment was improved what was confirmed in follow-up inspection. The offender was punished by financial fine.
3. In crime procedure the District Attorney's Office has indicted the operator for endangering the environment with waste. The indictment was upheld in court. The final judgment was rendered. The operator was found guilty and fined. The operator's responsible person was punished with 8 months in prison, what was replaced by probation.

Negative aspects:

1. The clear decision about the appearance of the environmental damage was very difficult to deliver. Although the ELD directive is transposed to national legislation, the practical knowledge and competences among all stakeholders is limited.

2. The nature protection authority in Croatia should be more involved in (potential) environmental damage cases. 3. There is the lack of technical capacity to understand environmental cases at the courts. 4. Although there are 30 legal persons authorised for assessment of environmental damage, including threats, as professional environmental protection activities, there is still a very little experience with the real case assessments of environmental damage.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS The training needs for the ascertainment of environmental damage and threats of damage in Croatia exist among inspectors (environmental protection, nature protection, agriculture soil protection and water protection), officials from relevant Ministries, police officers, attorney offices, judges from one side, local administration, civil society NGOs and other interested parties from the other side. Also, operators have very limited knowledge and awareness about possible environmental damage caused by their occupational activities. All methods are acceptable: • workshops with proactive approach to participants (maybe mixed groups with different authorities) • on-line seminars for specific issues • e-learning through reports on real cases
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Study case no. 25 - Major fish kill from release of chemical into waterbody

Case study name	Major fish kill from release of chemical into waterbody
Country	Scotland, UK
Contributor	Scottish Environment Protection Agency (SEPA)
Type of damage	Water damage
Legislation	ELD case
Site	Farm
Source of impact	The source of the impact was leakage of a chemical from a storage tank.
Natural Resources	The main natural resources affected were fish and the main environmental service affected was recreational fishing. There was no damage to protected habitats.
Effects of the impact	The consequence was fish kill.
EVENT DESCRIPTION 1. *Location of the event* UK.	

2. Cause of the event and offense committed

The event was caused by release of a liquid chemical to a field drain which flowed into a burn and resulted in a fish kill.

3. Date and duration of the event

The event probably lasted a few hours.

4. Natural resources and services involved and adversely affected

The main natural resources affected were fish and the main environmental service affected was recreational fishing. There was no damage to protected habitats.

ASCERTAINMENT

5. How was the event known?

The event was communicated to the responsible authority by the operator.

6. Who conducted the ascertainment / investigation?

It was conducted by local pollution control officers, chemists and ecologists.

7. Timeline of the event and of the determination of clues and evidence

The event was discovered in 2016.

The fish kill and the source were identified on this date.

Collection of dead fish happened shortly after.

Investigations commenced shortly after including an ecology survey.

Follow up ecology surveys were undertaken at time + 6 month and time +12 months to establish whether the damage was sustained and when the water body would return to baseline condition.

8. Identification of the source of impact

The source of the impact was leakage of a chemical from a storage tank.

9. Magnitude of the event

The quantity of chemical released is not known but it would be reasonable to conclude that it was up to the full capacity of the tank because the tank had just been filled. The concentration was neat chemical. The concentration of pollutants in the burn downstream of the spill was an order of magnitude higher than the Environmental Quality Standard. The concentrations were between two and 10 times greater than the more relevant short-term exposures standards which are derived from the WFD status boundaries.

10. *Spatial extent*

The event affected a length of up to 5km of a stream.

11. Consequences to the natural resources and description of the causal link

The consequence was fish kill.

12. Legal requirements

Compliant with legal procedural and technical requirements.

13. Tools/equipment and methods used

Electro fishing survey, water sample collection and analysis River Foundation evidence collection and historical fish population data.

Witness statements and environment protection officer notebooks, etc.

14. Other Applied Legislation

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Screening

15. Conduction of the screening

Operator advised of spillage and dead fish were reported to the competent authority.

16. Guidelines used

The Scotland River Basin District (Standards) Directions 2014

The Scotland River Basin District (Status) Directions 2014 **Determination of clues** *17. Clues found* Physical evidence of leak. Presence of field drain connecting source with stream. Dead fish were collected and counted. Water quality standard was exceeded in downstream samples. *18. Conduction of the determination of clues* The discharge was an unauthorised discharge into the water environment. Post incident water sampling and analysis and ecology survey. *19. Guidelines used* SEPA chemistry and ecology procedures. **Determination of evidence** *20. Evidence found* Significant adverse effect on the ecological status of the water body (status deteriorated). *21. Conduction of the determination of evidence* Ecology survey and report. *22. Significance thresholds considered* Significant adverse impact on classification status for fish ecology. Fish killed were predominantly trout and salmon and some stoneloach over a stretch of up to 5km. Natural regeneration of the fish population is likely, providing that conditions remain favourable, but it may take several years to fully recover. Chemical levels in the samples of the water body exceeded the short-term standards which reflect short term impacts on ecosystem health, such as lethality. 23. *Guidelines used* SEPA Guidelines on electrofishing procedure. Scottish Government Environmental Liability (Scotland) Regulations Draft Guidance https://www.webarchive.org.uk/wayback/archive/20170702032135/http://www.gov.scot/Topics/Environment/waste-and-pollution/Pollution-1/ELD/ELDGuidance
KEY FINDINGS AND LESSONS LEARNED Key aspects are: 1) Early collection of relevant evidence 2) Availability of information on the baseline condition 3) Determination of water damage can take some time because evidence of sustained damage needs to be collected
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS All of the above are useful. The most important, because ELD cases are infrequent, is to build consideration of ELD clues into routine officer decision making procedures
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 26 - Operation of water works for a small hydroelectric power plant

Case study name	Operation of water works small hydroelectric power plant

Country	Slovakia
Contributor	Slovak Environmental Agency
Type of damage	Water damage and Damage to natural habitats and protected species
Legislation	ELD case
Site	Slovak Republic, Nitriansky kraj (region), Levice (district), Želiezovce (city)
Source of impact	The source of the impact was found after the construction, during the trial and subsequent operation of the hydroelectric power plant (Želiezovce), as an intervention in groundwater and surface water bodies and in migratory fish and forest habitats.
Natural Resources	There were natural resources adversely affected where damage was not found or confirmed and natural resources adversely affected where damage was found (see par. 4 of this factsheet for details).
Effects of the impact	There were consequences of the construction of water works on natural resources (see par. 11 of this factsheet for details).

EVENT DESCRIPTION

1. *Location of the event*

Slovak Republic, Nitriansky kraj (region), Levice (district), Želiezovce (city).

2. Cause of the event and offense committed

The cause of the damage was a small hydroelectric power plant.

Drying up of EU habitats of importance, disruption of fish migration, deterioration of ecological status of surface water (river Hron) and decrease of groundwater level.

1) deepening of the riverbed bottom (by 4 m) during the construction of a water works (hydroelectric power plant), thereby deteriorating the ecological status of waters in the watercourse of the river Hron and lowering the ground water level in the adjacent area and in this connection to the drying up of alluvial habitats.

2) Insufficient functioning duct for the migration of migratory fish pulling upstream against non-Rhesus.

3) there was no offense.

3. Date and duration of the event

The event lasted from 31.05.2017 to 10.06.2017, found on 02.06.2017 by local fishermen. In May in 2018, namely on 24.05.2018 and 30.05.2018 at the hydroelectric power plant, the event (death of migrating fish) from the previous year was repeated in two waves. The event took place to a much lesser extent, with a few dozen pieces of northern mackerel dying.

4. Natural resources and services involved and adversely affected

1) The following natural resources have been adversely affected (damage not found or confirmed):

(a) a line bank (alley) of planted black poplar trees (about 22 pcs, about 65 years of age) in the city's reaction zone along the river - willow and poplar in the cadastral area of Želiezovce and in the cadastral area Mikula (Environmental damage not found - not biotopes of EU Importance)

(b) Barbus barbus of 500 to 800 pieces, which is not a species of EU significance, is included in Directive 92/43/EEC Annex V, 1. Annex, Part D: animal and plant species in EU, the capture, collection and use of which may be subject to certain regulatory measures. In this case, it was an

adult egg - size 50 - 70 cm, pulling fish to spawning places upstream Hron, whose thrust stopped the dysfunctional equipment of the duct, which caused them to stop and build up in the turbines MVE and subsequently their massive death.
(c) protected habitats of EU importance:
- 91GO * Pannonian oak-hornbeam forests, 9110 * Thermophilous Pontic-Pannonian oak forests on loess and sand under water (VD), which have not been directly damaged but are potentially endangered due to groundwater level decline
d) habitat and reproductive habitats of river species: on the area of 12 ha they were disturbed by the construction of a waterworks and subsequently in the flooded area - by the watercourse level, serious adverse effects on the habitat status of river species were recorded; (Barbus barbus), golden yellow (Sabanejewia balcanica). Other species of European significance - Barbus carpathicus, Kessler's knot (Romanogobio kesslerii) and Spindle-knot (Zingel streber).
2) The following natural resources were adversely affected (damage was found):
(a) surface waters of the river Hron, a decrease in the water level in the river Hron in the section below the hydroelectric power plant (38,45 rkm) over a length of approximately 5 km due to the sinking of the riverbed bottom (by 4 m); the ecological status of the waters was deteriorated.
b) groundwater in the water body, decrease due to deepening of the bed of the river Hron under the Water Works (VD) Želiezovce in the cadastral area. Mikula a k.ú. Želiezovce by 2-2.5 m (in wells of inhabitants decrease from 0,5 - 1,5 m, documented by the Municipal Office Želiezovce)
(c) protected EU habitats of importance: drying of EU protected habitats of importance in connection with the sinking of the bottom of the Hron riverbed, resulting in a fall in groundwater levels below the reservoir resulting in total damage to the following habitats: 91EO *; 91FO Oak-Brest-Ash Lowland Floodplain Forests on an area of 3,552 m^2.
Note: * - priority habitat of European importance

ASCERTAINMENT

5. How was the event known?

The event was detected by local fishermen, members of the organization of the Slovak Fishermen's Association in Želiezovce, who initiated an investigation into the Slovak Environmental Inspectorate, workplace in Nitra - as an event of Extraordinary Deterioration of Waters (MFA), pursuant to which was not confirmed, the petition on fish mortality was subsequently resigned to the District Environmental Office in Nitra, which allowed the water work (MVE) pursuant to Section 26 of the Water Act. An environmental non-governmental organization (name: Slatinka Association) learned about the event and reported to the local competent District Office in Levice (OÚ OSŽP) pursuant to Section 26 of Act no. 359/2007 Coll. - a Communication on environmental and EU protected habitats.

6. Who conducted the ascertainment / investigation?

1) On-the-spot surveys were carried out by local fishermen, and the dead fish were collected and documented. On-site investigations were conducted by the Slovak Environmental Inspectorate (SEI). The SEI did not confirm the event as a case of Extraordinary Deterioration of Waters (MFA). The SEI complaint has been resigned to the competent authority for the procedure encroachment of environmental damage pursuant to Act No. 352/2007 Coll.
The District Office in Levice (OÚ OSŽP) subsequently collected information and evidence of the event. The activities of stakeholders were coordinated by the Slovak Environment Agency (SEA) in cooperation with the Ministry of the Environment, The District Office (OSŽP) Levice requested expert opinions and data from the Slovak Fishermen's Association (SRZ), Council Žilina; ŠOP SR (headquarters and administration of PLA Ponitrie); Slatinka associations (notifier); Municipal Office, dept. construction, land development and environment in Želiezovce (local government); the operator; SHMI and WRI (water quality); specialist in water structures (fish ducts).
2) Actions: meetings of the Managing Authority and the professional organizations concerned
3) on-the-spot investigations.

7. Timeline of the event and of the determination of clues and evidence

31.05.2017 - local fishermen found fish mortality under MVE, which lasted until 10.6.2017, which represented an intervention and significant impact on the habitat of migrating fish
02.06.2017 - fishermen have identified that mechanical damage to fish was caused by turbines of hydroelectric power plant, a similar event to a much smaller extent was repeated in May 2018 (May 24, 2018 and May 30, 2018, in two waves, several dozen pieces of northern mullet died)
02.06.2017 - local fishermen reported this fact to the district office (OÚ OSŽP in Nitra) as a massive fish mortality
04.06.2017 - fishermen also reported this fact to the SEI (as in the case of the MFA, which was not confirmed)
21.06.2017 - OÚ OSŽP in Nitra convened an oral hearing of interested parties to find out the facts in which they attended: OÚ OSŽP in Nitra, state water administration, as authorizing body of water works (MVE) Želiezovce, SRZ Council Žilina - regional ichtyoóg
08.08.2017 - NGO Association Slatinka submitted a notification of Environmental Damage to the competent authority of the Regional Authority of the OSŽP Levice
04.10.2017 - SRZ Zilina Council filed a notification on environmental damage to the operator
- environmental damage assessment activities - monitoring, expert opinions, statistics, local inspections

8. Identification of the source of impact

The source of the impact was found after the construction, during the trial and subsequent operation of the hydroelectric power plant, as an intervention in groundwater and surface water bodies and in migratory fish and forest habitats.

9. Magnitude of the event

The scope (size, quantity) of an event is characterized as follows:
- 3 km of the Hron River - SKR0005 Hron
- 500 - 800 fish dead during migration (North Sea)
- 22 pcs of black poplar (approx. 65 years old) - line bank stand (alley) in the reaction zone of Želiezovce
- in 6 wells of inhabitants in the cadastral area. The level of groundwater (GW) was evaluated to be decreased around 0.5-1.5 m deeper. Afterwards, the Slovak Hydrometeorological Institute, confirmed the decreased level of groundwater in the water body of about 0.77 m deeper near of the hydroelectric power plant, and said it was a significant drop in groundwater levels.
- 286,690 m^2 of habitat area - Willow-lowland lowland floodplain forests (code N2000: 91EO *)
- 3,552 m^2 of habitat area - Oak-Brest-Ash lowland floodplain forests in the area (code N2000: 91FO)

Note: * - priority habitat of European importance

10. *Spatial extent*

Construction of water works (MVE) Želiezovce in the cadastral area Mikula; the area of damaged habitats is approximately 290 242 m^2, the area of the flooded area is approximately 12 ha, the flow of the river Hron - affected in the length of 3 km.

11. Consequences to the natural resources and description of the causal link

Consequences of the construction of water works on natural resources are:
- reduction of surface and ground water levels, drying of floodplain forest habitats, including priority habitat, disturbance and intervention in biodiversity
- 12 ha of flooded area of water has caused changes in habitat and reproduction habitats of river species.

These consequences arose despite the warnings of ŠOP SR in the process of environmental impact assessment (EIA) and at the time of preparation of the construction of the waterworks, when the possible impacts and anticipated impacts of the construction of the waterworks were identified. The requirement of KÚŽP Nitra dated 23 November 2012, which stipulated the following:
- realize the identification and distribution of habitats prior to construction, ensure monitoring

during construction and then 10 years during operation.
No monitoring of habitats and species was carried out prior to construction. A long period of time between the assessment process (EIA) and the construction of the waterworks itself, i.e. since the construction of the water works (2008) and the time of the construction of the water works (issued permission for the construction of the water works dated 31/12/2012) and real construction in the years 2014 – 2016. During this period the conditions were changed and no assessment of the cumulative effects of water works on the lower reaches of the Hron river was carried out (Šárovce Water Works and the planned Vozokany Water Works).

12. Legal requirements

Yes, compliant.

Act no. 359/2007 Coll. on Prevention and Remedy of Environmental Damage, Act no. 543/2002 Coll. on Nature and Landscape Protection, Act no. 364/2004 Coll. about waters.

13. Tools/equipment and methods used

- Sampling
- Internet research
- Coordination of public authorities

14. Other Applied Legislation

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Screening

15. Conduction of the screening

Screening - event development sequence:

1) the event was discovered - by local fishermen, members of the Slovak Fishermen's Association in Želiezovce

2) the investigation was initiated by fishermen at the Slovak Environmental Inspectorate, workplace in Nitra - as an event of minor deterioration of water (MFA, pursuant to §41 of Act No. 346/2004 Coll. on waters), which was not confirmed (since it was not polluting chemicals in surface waters of the river Hron)

3) complaint on fish mortality from SEI was withdrawn - District Environmental Office in Nitra, which, in accordance with §26 of the Water Act, authorized the water works (MVE)

4) fishermen have published information in the media captured by an environmental non-governmental organization (NGO) entitled: Slatinka Association

5) NGOs have reported on water and on EU protected habitats. importance to the local competent District Environmental Office in Levice (*OÚ* OSŽP) pursuant to Section 26 of Act No. 359/2007 Coll.

16. Guidelines used

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Determination of clues

17. Clues found

Dead fish and dried-up habitats, water level decrease in the wells of local inhabitants, shift of the banks of the river Hron about 3 m on both sides of the watercourse due to the deepening of the bottom of the riverbed under the MVE.

The following natural resources have been adversely affected (damage not found or confirmed):

(a) a line bank (alley) of planted black poplar trees (about 22 pcs, about 65 years of age) in the city's reaction zone along the river - willow and poplar in the cadastral area of Želiezovce and in the cadastral area Mikula (Environmental damage not found - not biotopes of EU Importance)

(b) Barbus barbus of 500 to 800 pieces, which is not a species of EU significance, is included in Directive 92/43/EEC Annex V, 1. Annex, Part D: animal and plant species in EU, the capture, collection and use of which may be subject to certain regulatory measures. In this case, it was an adult eggs - size 50 - 70 cm, pulling on the Neresiska upstream Hron, whose thrust stopped the dysfunctional equipment of the duct, which caused them to stop and build up in the turbines MVE and subsequently their massive death.

(c) protected habitats of EU importance:
- 91GO * Pannonian oak-hornbeam forests, 9110 * Thermophilous Pontic-Pannonian oak forests on loess and sand under water (VD), which have not been directly damaged but are potentially endangered due to groundwater level decline
d) habitat and reproductive habitats of river species: on the area of 12 ha they were disturbed by the construction of a waterworks and subsequently in the flooded area - by the watercourse level, serious adverse effects on the habitat status of river species were recorded; (Barbus barbus), golden yellow (Sabanejewia balcanica). Other species of European significance - Barbus carpathicus, Kessler's knot (Romanogobio kesslerii) and Spindle-knot (Zingel streber).
18. Conduction of the determination of clues
On-site inspections, condition monitoring and expert judgement.
District Office in Levice (OŽ OSŽP) - gathered information, evidence and expert opinions on the event. In this case he addressed:
a) Slovak Fishermen's Association, Council Žilina, b) ŠOP SR (headquarters - ichthyologist and territorially competent Administration of the Protected Landscape Area of Ponitrie), c) Slatinka Association (whistleblower), d) Municipal Office, dept. construction, land development and environment in Želiezovce (local government), e) the operator f) Slovak Hydrometeorological Institute (SHMI), g) Research Institute of Water Management (WRI), h) specialist for water structures (fish ducts), i) District Office in Nitra (OÚ OSŽP) as the authorizing body of water works. The activities of stakeholders were coordinated by the MoE SR in cooperation with the SEA.
On-the-spot investigations were carried out by:
- a) local fishermen, b) regional ichthyologist, c) SEI (extraordinary deterioration of water), d) employee of the Municipal Office in Želiezovce (control of drying of habitats and replacement plantings, drop of ground water level in wells of inhabitants in the affected area), SR PLA Ponitrie report (assessment of habitat status and assessment), f) SEA (assessment of the overall situation on the site of river basin and habitats and consultation with locals)
Conduction of clues was also performed as follows:
a) local fishermen - on damaged and dead fish caught: they measured the size, counted the quantity caught, carried out monitoring of the fishpond's throughput (2018), tagged captured fish and released it again into the river
b) regional ichthyologist - coordinated catching and monitoring activities, made records, in. 2018 invited the Police Force of the Slovak Republic and the State Veterinary Administration, ensured the disposal of carcasses in the rendering plant
c) SEI (extraordinary deterioration of water) - sampling and analysis of water, withdrawal of the case
d) employee of the Municipal Office in Želiezovce - control of substitute plantings and control of the state of habitats around the river, solution of water drop in wells of inhabitants of the town
e) ŠOP SR Administration of the Protected Landscape Area of Ponitrie (assessment of the state and assessment of habitats on site), IT tools were used http://www.biomonitoring.sk/
f) SEA - consultation and guidance for the acting authority https://zbgis.skgeodesy.sk
19. Guidelines used
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Determination of evidence
20. Evidence found
These natural resources were adversely affected (damage was found):
(a) surface waters of the river Hron, a decrease in the water level in the river Hron in the section below the hydroelectric power plant (38.45 km) over a length of approximately 5 km due to the sinking of the riverbed bottom (by 4 m); the ecological status of the waters deteriorated
b) ground water in the water body, decrease due to deepening of the bed of the river Hron under the Water Works (VD) Želiezovce in the cadastral area. Mikula a k.ú. Želiezovce by 2-2.5 m (in wells of inhabitants decrease from 0.5 – 1.5 m, documented by the Municipal Office Želiezovce)

(c) protected EU habitats of importance: drying of eu protected habitats of importance in connection with the sinking of the bottom of the Hron riverbed, resulting in a fall in groundwater levels below the reservoir resulting in total damage to the following habitats: 91EO * ; 91FO Oak-Brest-Ash Lowland Floodplain Forests on an Area of 3,552 m^2. Note: * - priority habitat of European importance. *21. Conduction of the determination of evidence* On-site inspections, condition monitoring and expert opinions. See par. 17 above. *22. Significance thresholds considered* No thresholds were taken into account. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED Case not completed.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS We recommend developing and organizing training activities on technical, procedural and organizational aspects. In terms of efficiency, we consider it appropriate: workshops, on-the-job trainings, e-learning.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 27 - Protected nature, land and water pollution due to a massive fire of mostly hazardous waste

Case study name	Protected nature, land and water pollution due to a massive fire of mostly hazardous waste
Country	Slovenia
Contributor	Inspectorate of environment and spatial planning
Type of damage	Water damage, Land damage, Damage to natural habitats and protected species
Legislation	ELD case
Site	Central Slovenia, 20 km south-west from capital Ljubljana. Municipality Vrhnika. The company that burned deals with the collection, recovery, and disposal of various sorts of waste, mostly hazardous. In close vicinity is a protected area with more different acts (Natura 2000, Protected landscape parc).
Source of impact	The facility had stored 1,402 tonnes of waste at the time of the fire, 948 of which was hazardous. The list of the items is topped by various kinds of oils, varnishes and paints, numerous pesticides, including banned atrazine and propazine. In the stream was no living animal.
Natural Resources	WATER: nearby, Tojnica stream was polluted with numerous pesticides, including banned atrazine and propazine that came to stream with a large amount of water for extinguishing the massive fire in the company. In Tojnica stream lived also protected species before the event.

	SOIL: Until the release of the analysis of soil pollution it was advised against the consummation of local vegetables and the free-range grazing of animals. Later The Public Health Institute still advised against the consumption of food from nearby gardens and fields, although it also highlighted analyses showing the soil is suitable for growing food everywhere but in the immediate vicinity of the company.
Effects of the impact	No more life in the stream after the event. After cleaning and remediation already in few months, again fishes were noticed in the stream.

EVENT DESCRIPTION

1. *Location of the event*

Event happened in central Slovenia, 20 km south-west from capital Ljubljana. Municipality Vrhnika. The company that burned deals with the collection, recovery, and disposal of various sorts of waste, mostly hazardous. In close vicinity is a protected area with more different acts (Natura 2000, Protected landscape parc).

2. *Cause of the event and offense committed*

Police announced the forensic investigation had identified a possible source location of the fire. Fire started at the storage where household hazardous waste was stored. Fire cause was not determined. Forensic and criminal investigations have found that the fire was not due to negligence or improper methods of work.

3. *Date and duration of the event*

A massive fire started in the evening on 15.5.2017. The fire has been extinguished during the night with great efforts of more than 250 firemen, has destroyed part of the business premises and the warehouse for storage of low hazardous solid and liquid waste.

4. *Natural resources and services involved and adversely affected*

WATER: nearby, Tojnica stream was polluted with numerous pesticides, including banned atrazine and propazine that came to stream with a large amount of water for extinguishing the massive fire in the company. In Tojnica stream lived also protected species before the event.

SOIL: Until the release of the analysis of soil pollution it was advised against the consummation of local vegetables and the free-range grazing of animals. Later The Public Health Institute still advised against the consumption of food from nearby gardens and fields, although it also highlighted analyses showing the soil is suitable for growing food everywhere but in the immediate vicinity of the company.

ASCERTAINMENT

5. *How was the event known?*

A massive fire occurred at the storage facility in Vrhnika in the evening on 15.5.2017, it was seen from far distance.

6. *Who conducted the ascertainment / investigation?*

Slovenian environmental agency made investigation on site, collected the data of the event, of the environmental quality status ex-ante and ex-post, sampling and analysis and gave decree for remediation of environmental damage.

7. *Timeline of the event and of the determination of clues and evidence*

The exact determination of evidence lasted first few days and the consequences are still being occasionally measured. Exact information has the Slovenian environment agency.

8. *Identification of the source of impact*

The facility had stored 1,402 tonnes of waste at the time of the fire, 948 of which was hazardous. The list of the items is topped by various kinds of oils, varnishes and paints, numerous pesticides, including banned atrazine and propazine. In the stream was no living animal.

9. *Magnitude of the event*

Authorities have pumped out around 60,000 litres of oily sludge from the water. The cleaning

took place 5 days.
More and exact data have the Slovenian environmental agency and the Ministry for the environment and spatial planning.
10. *Spatial extent*
The length of the stream seriously impacted is approximately 200 m. More detailed determination has the Ministry.
11. Consequences to the natural resources and description of the causal link
No more life in the stream after the event. After cleaning and remediation already in few months again fishes were noticed in the stream.
12. Legal requirements
Not applicable.
13. Tools/equipment and methods used
Mobile laboratory, database consultation, measurements of parameters determined by legislation in water and soil.
14. Other Legislation Applied
- Decree on limit values, alert thresholds and critical levels of dangerous substances into the soil Rules on soil status monitoring
- Decree on surface water status
- Rules on monitoring the status of surface water

Screening
15. Conduction of the screening
The event was considered as severe because it was an uncontrolled massive fire in a non-hazardous and hazardous waste (household and industrial) facility. The screening was conducted by authorised institutes for Slovenian environment agency, which has more exact data.
16. Guidelines used
No special guidelines.
Determination of clues
17. Clues found
The facility had stored 1,402 tonnes of waste at the time of the fire, 948 of which was hazardous. The list of the items is topped by various kinds of oils, varnishes and paints, numerous pesticides, including banned atrazine and propazine. In the steam was no living animal.
Water: nearby, Tojnica stream was polluted with numerous pesticides, including banned atrazine and propazine that came to stream with a large amount of water for extinguishing the massive fire in the company. In Tojnica stream lived also protected species before the event. Natura 2000 it is right next to facility, Landscape park Ljubljansko barje – Ljubljana moors. Contaminants came through exstinguishing water.
Soil: Until the release of the analysis of soil pollution it was advised against the consummation of local vegetables and the free-range grazing of animals. Later The Public Health Institute still advised against the consumption of food from nearby gardens and fields, although it also highlighted analyses showing the soil is suitable for growing food everywhere but in the immediate vicinity of the company.
The length of the stream seriously impacted is approximately 200 m.
18. Conduction of the determination of clues
Site inspections after the event. Investigations on stored waste and raw material inventory and registers.
Measurement of all possible impacts on water and soil.
19. Guidelines used
No guidelines, everything was based only on legislation – determined measurement values and comparison between measured values and values in legislation.
Determination of evidence
20. Evidence found

No evidence under ELD. Measurement of values and comparison with values in legislation (legislation values in: Decree on surface water status, Decree on limit values, alert thresholds and critical levels of dangerous substances into the soil). Absence of baseline conditions for water quality, soil quality (the area was known as former leather industrial area) and protected species. *21. Conduction of the determination of evidence* Measurements of water and soil parameters. *22. Significance thresholds considered* Only measured parameters and comparison with legislation thresholds. 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED It would be useful to have guidelines for determination process. The biggest difficulty was lack of data about zero (previous) values of parameters in soil (since the area was known as former leather industry area).
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS The most important is to exchange experiences between as many as possible different organizations, countries, since every case is specific and it is hard to prepare universal guidelines.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS In Slovenia was described above the first ELD case in 2017 and it showed out a lot of difficulties with organization and determination of environmental damage. The case is not finished yet, remediation is still in progress. The main difficulty was not enough data on environmental state before the accident.

Case study no. 28 - Slope detachment from a mine waste dump

Case study name	Slope detachment from a mine waste dump
Country	Spain
Contributor	County Inspectorate of Galicia
Type of damage	Water damage
Legislation	ELD case
Site	Galicia - Spain
Source of impact	Sludge ash and slag from thermal power plant.
Natural Resources	The landslide affected surface watercourses. The environmental monitoring of the event did not show any environmental damage according to the regulations.
Effects of the impact	No environmental damage was demonstrated.

EVENT DESCRIPTION

1. *Location of the event*

Galicia – Spain.

2. *Cause of the event and offense committed*

It was concluded that the landslide of the dump has been the consequence of the coincidence of several causes:

- Modification of surface runoff in the area as a consequence of the expansion of a polygon next industrial and acidic water treatment activities.
- Modification of the slope geometry of the southern part of the affected area of the tailings by phenomena of misalignment, due to runoff that circulated towards one of the nearby water courses.
- Rise of groundwater levels through the area of altered natural terrain material (levels of surface alteration and / or levels of altered chalkboards-phyllites more permeable) on which supports the dump.

3. *Date and duration of the event*

The event occurred on 02/09/2014. The file agreement of the environmental liability file is dated 04/06/2015.

4. *Natural resources and services involved and adversely affected*

The landslide affected surface watercourses.

The environmental monitoring of the event did not show any environmental damage according to the regulations.

ASCERTAINMENT

5. *How was the event known?*

The operator notified the event to the competent organisms.

6. *Who conducted the ascertainment / investigation?*

The ascertainment/investigation on site (information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysys, ascertainment/investigation plan and actions) was conducted jointly by the operator and the environmental inspection.

The ascertainment/investigation onsite was lead by the regional environment agency.

7. *Timeline of the event and of the determination of clues and evidence*

This case corresponds to an accident derived from several causes that did not show previous clues.

8. *Identification of the source of impact*

Sludge ash and slag from thermal power plant.

9. *Magnitude of the event*

It is not possible to evaluate this data.

10. *Spatial extent*

Data not available.

11. *Consequences to the natural resources and description of the causal link*

No environmental damage was demonstrated.

12. *Legal requirements*

Administrative procedure.

13. *Tools/equipment and methods used*

--

14. *Other Legislation Applied*

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Screening

15. *Conduction of the screening*

The operator notified the event to the competent authorities.

16. *Guidelines used*

In 2014 there were no methodological guides prepared by the state administration. **Determination of clues** *17. Clues found* There were no clues of environmental damage. *18. Conduction of the determination of clues* The criteria and procedures were established jointly between the competent administration, the operator's engineering department and accredited entities in environmental monitoring and control. *19. Guidelines used* -- **Determination of evidence** *20. Evidence found* The inspections carried out at the accident site recognized the clues to establish control and monitoring for the assessment of environmental damage. On the part of the operator a search of old plans of his installation was realized. There was no evidence of environmental damage. *21. Conduction of the determination of evidence* The aquatic environment was monitored as well as in the land of the dump. Both the quality of the waters and the biological state were controlled over the aquatic environment. The monitoring in the area of the dump focused on the stability of the land. The control performed showed no environmental damage to the aquatic environment. *22. Significance thresholds considered* -- 23. *Guidelines used* --
KEY FINDINGS AND LESSONS LEARNED --
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE --
TRAINING NEEDS Specialized technical training. Specialized legal support. Methodological guides. Coordination between organizations involved.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS --

Case study no. 29 - Soil and groundwater pollution by a fuel station in an urban environment

Case study name	Soil and groundwater pollution by a fuel station in an urban environment
Country	Spain
Contributor	Pool Espanol de Riesgos Medioambientales
Type of damage	Water damage and Land damage It also affected third parties (neighbourhood), who claimed liability by means of civil actions.
Legislation	Non-ELD case Waste and polluted soils law. Autonomic water protection act
Site	Spain, Catalonia Region

Source of impact	Fuel station had one of their underground pipes leaking: the spill, probably happened for several years, amounts 2 to 3,000 litres of fuel.
Natural Resources	Soil and underground water It also affected third parties (neighbourhood).
Effects of the impact	Hundreds of m^3 of groundwater Hundreds of tons of soil under paved surface or building basements and parking lots.

EVENT DESCRIPTION

1. *Location of the event*

Spain, Catalonia region (some facts have been modified to better fit in this case; prefer not to provide particular details).

2. Cause of the event and offense committed

A sub-soil petrol conduction, from the tank to the pump had broken; probably due to a faulty anchorage of the tank to its container.

3. Date and duration of the event

5 years estimated.

4. Natural resources and services involved and adversely affected

Soil and underground water.

ASCERTAINMENT

5. How was the event known?

Claims from a third party. Condominium of a building across the street claimed for odours in the elevator case.

6. Who conducted the ascertainment / investigation?

The insured himself in the first stage, due to a mistake in the declaration of the claim to the insurance company. The Insurance company (led by the Pool Espanol de Riesgos Medioambientales) through the experts that they hired, once the force and applicability of the insurance was clarified.

7. Timeline of the event and of the determination of clues and evidence

Three months.

8. Identification of the source of impact

Fuel (Gasoline).

Fuel station had one of their underground pipes leaking: the spill, probably happened for several years, amounts 2 to 3,000 litres of fuel.

9. Magnitude of the event

The spill, probably happened for several years, amounts 2 to 3,000 litres of fuel.

10. *Spatial extent*

About 20,000 m^2. Some prospections were made in the area that allowed to draw a map of apparent affection to the subsoil; though, due to the urban characteristics of the subsoil this was very irregular and had to be revised several times during the clean up process.

11. Consequences to the natural resources and description of the causal link

The causal link was clearly identified and there is nothing to comment.

Hundreds of m^3 of underground water contaminated.

Hundreds of tons of soil under paved surface or building basements and parking lots contaminated.

12. Legal requirements

Yes, compliant.

13. Tools/equipment and methods used

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14. Other Legislation Applied

Waste and polluted soils law.

Autonomic water protection act.

Screening

15. Conduction of the screening

Condominium of a building across the street claims for odours in the elevator case.

The screening was made by the insurance company and the consortium, on behalf of the insured operator, with permanent reports to the competent authority and supervision by them.

Once the claim was sent to the insurance company, a claims adjustor was sent to the spot. His report advised to do the screening in order to identify: the source of the spill; the extent of pollution; the 3rd parties affected.

16. Guidelines used

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Determination of clues

17. Clues found

The analytics showed the presumed pollution in water and soil.

Due to the map of analytics, the area of analysis was widened through additional prospections, that showed irregular accumulation of fuel, due to the urban nature of the sub-soil.

18. Conduction of the determination of clues

Contractor was sent to the place and a first provisional report was made, proposing: studies to make (several prospections in given points), analytics to make and permits to request municipal and environmental authority.

Communications were sent to authorities and permits applied for.

After a meeting with both authorities representants, the permits were got and prospections and analytics begun.

19. Guidelines used

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Determination of evidence

20. Evidence found

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21. Conduction of the determination of evidence

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22. Significance thresholds considered

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23. *Guidelines used*

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KEY FINDINGS AND LESSONS LEARNED

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DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

No suggestion. The process was satisfactory.

TRAINING NEEDS

Underground water and soil pollution cases are unfortunately frequent and authorities use to have sufficient background for a correct approach.

ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS

In the Spanish transposition law (26/2007) there is a provision (art. 6.3) that rules:

"3. Si por aplicación de otras leyes se hubiera conseguido la prevención, la evitación y la reparación de daños medioambientales a costa del responsable, no será necesario tramitar las actuaciones previstas en esta ley", meaning that if the complete remediation of a given environmental damage can be achieved by means of the application of other regulations, there is no obligation to apply the process of this law. This means that, even if no ELD file is open, a pollution or environmental damage can be considered an ELD case.

Case study no. 30 - Groundwater contamination of drinking water supply by fire-fighting foam

Case study name	Groundwater contamination of drinking water supply by fire-fighting foam
Country	Sweden
Contributor	County administrative board contaminated areas coordination
Type of damage	Water damage
Legislation	ELD case This case was assessed as an ELD-case at first but after recommendation of not using the water it was reappraised as not ELD case. The case was handled as a contaminated area-case after that. The legislation is the same (Environmental code) but different paragraphs
Site	A private housing area in Sweden
Source of impact	Use of fire-fighting foam with PFAS. PFAS leaked from the ground and into the groundwater. Groundwater was used as drinking water by private wells.
Natural Resources	Ground water as drinking water.
Effects of the impact	Contamination of ground water causing severe health risk if used as drinking water.

EVENT DESCRIPTION

1. *Location of the event*

A private housing area in Sweden.

2. *Cause of the event and offense committed*

A private housing in Sweden caught fire and there was a risk of other houses catching fire. The fire-fighting service applied foam with PFAS. PFAS leaked from the ground and contaminated the groundwater. Groundwater was used as drinking water by private wells.

3. *Date and duration of the event*

The duration of the fire-fighting effort was on 3rd of January 2015.

4. *Natural resources and services involved and adversely affected*

Ground water as drinking water.

ASCERTAINMENT

5. *How was the event known?*

One of the neighbours to the burning house made a complaint to the municipality of the drinking water being foamy and with a distinct odour. The connection to the fire-fighting effort was made by the municipality.

6. *Who conducted the ascertainment / investigation?*

The municipality made the initial ascertainment/investigation.

7. *Timeline of the event and of the determination of clues and evidence*

Unknown, maybe but a few days.

8. *Identification of the source of impact*

PFAS leaked from the ground and into to the groundwater. Groundwater was used as drinking water by private wells.

9. *Magnitude of the event*

Average concentration from private wells 1400 ng/l PFAS.
10. *Spatial extent*
Not of a great extent.
11. Consequences to the natural resources and description of the causal link
Contamination of ground water causing severe health risk if used as drinking water.
12. Legal requirements
Lab standards and environmental code. The case has also been judged in environmental courts and the final outcome of responsibility for the fire-fighting service is still not clear.
13. Tools/equipment and methods used
Normal sampling equipment and certified lab.
14. Other Applied Legislation
This case was assessed as an ELD-case at first but after recommendation of not using the water it was reappraised as not ELD. The case was handled as a contaminated area-case after that. The legislation is the same (Environmental code), but different paragraphs.
Screening
15. Conduction of the screening
Based on complaints from residents.
One of the neighbours to the burning house made a complaint to the municipality of the drinking water being foamy and with a distinct odour.
16. Guidelines used
Yes. Recommendations from Swedish Food Agency: *https://www.livsmedelsverket.se/livsmedel-och-innehall/oonskade-amnen/miljogifter/PFAS-poly-och-perfluorerade-alkylsubstanser/?AspxAutoDetectCookieSupport=1*
In particular:
Measures at different levels of PFAS in drinking water from own well.
The Swedish Food Agency today recommends the following measures depending on the content of PFAS contained in your drinking water.
If the drinking water contains 0 - 90 nanograms PFAS / litre:
No special action is needed. You can continue to drink the water.
If the drinking water contains more than 90 nanograms of PFAS / litre:
You can continue to drink the water but you should as soon as possible ensure that the levels are lowered as far as possible below 90 nanograms / litre.
If the drinking water contains more than 900 nanograms of PFAS / litre:
Avoid drinking the water or eating food cooked with the water until the levels are lowered. Shower, bath or wash in the water does not pose any risk. Before using the water for food and drink, the PFAS content should be lowered to as low as possible below 90 nanograms / litre
If the drinking water in your well contains more than 90 nanograms of PFAS / litre, you should contact your municipality for advice and support.
Determination of clues
17. Clues found
The fire-fighting service applied foam with PFAS. PFAS leaked from the ground and contaminated the groundwater. Groundwater was used as drinking water by private wells.
Average concentration from private wells 1,400 ng/l PFAS.
Levels of PFAs above recommendations from Food Agency.
18. Conduction of the determination of clues
Identification of the fire-fighting service applied foam, groundwater samples collection and analysis. Comparison of concentration of PFAS with recommendations from Food Agency.
19. Guidelines used
See answer in par. 16.
Determination of evidence
20. Evidence found

Contamination of ground water causing severe health risk if used as drinking water. Levels of PFAs above recommendations from Food Agency. This case was assessed as an ELD-case at first but after recommendation of not using the water it was reappraised as not ELD case. Since the groundwater affected was not of a great magnitude, the criteria of adverse effect on health was used to deem this an ELD-damage initially. This means that the ELD is not applicable as soon as the prohibition of using the water as drinking water is issued. The case was handled as a contaminated area-case after that. *21. Conduction of the determination of evidence* See answer in par. 18. *22. Significance thresholds considered* Concentration of PFAS with recommendations from Food Agency. 23. *Guidelines used* See answer in par. 16.
KEY FINDINGS AND LESSONS LEARNED
Since the groundwater affected was not of a great magnitude, the criteria of adverse effect on health was used to deem this an ELD-damage initially. This means that the ELD is not applicable as soon as the prohibition of using the water as drinking water is issued.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE
It should be the original damage that decides the ELD applicability not the results. That is this maybe should have been an ELD-damage in spite of the fact that the health effect was mitigated by prohibiting the use of the water as drinking water.
TRAINING NEEDS
A thought that has been lifted is that it would be easier to assess the ELD applicability if you kept the criteria and guidelines apart, that is one guideline for land, one for water and one for biodiversity.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS
In practice the screening and determination of clues and evidence often might be handled in the same way and/or the same time. Therefore, in simpler cases one guideline could be to perform all of them at the same time. That is of course not applicable in complex cases. When dealing with non ELD-cases of environmental damage (contaminated areas) Sweden works in a structural step-wise manner with identification and inventory, investigation of liability, and if a liable part is found, enforcement of investigation and remediation. If you want more information concerning this there are several reports on The EPAs webpage. There is also a report on ELD (ELD – an introduction) on http://www.ebhportalen.se

Case study no. 31 - Cargo train accident with run-off of hazardous chemicals

Case study name	Cargo train accident with run-off of hazardous chemicals
Country	Switzerland
Contributor	Swiss Federal Office for the Environment (BAFU)
Type of damage	Land damage
Legislation	Not ELD case The Federal Act on the Protection of the Environment EPA, the Federal Railway Act, the Ordinance on the Safety Investigation of Transport Incidents OSITI and the relevant legislations of the canton

	in which the accident took place.
Site	Railway
Source of impact	According to the final investigation, report of the STSB the cause of the accident was a broken axel gear in one of the waggons. The report states that the maintenance of the axel gear was not accurate. However, due to the lack of a clear causal link between the inaccuracy of the maintenance of the axel gear and the accident, there were no legal consequences for the company in charge.
Natural Resources	The natural resource impacted was the soil.
Effects of the impact	The measures taken by the EPA of the canton of Vaud immediately after the accident and the following two weeks have made it possible to exclude any pollution of the ground water as well as the surface waters, in particular the nearby "Venoge" river and the "Criau" stream. Furthermore, the 1350 tonnes of polluted soil were extracted and disposed of, in an environmentally sound manner.

EVENT DESCRIPTION

1. *Location of the event*

The train accident happened in the municipality of Daillens, in the canton of Vaud.

2. *Cause of the event and offense committed*

According to the final investigation, report of the Swiss Transportation Safety Investigation Board (STSB) the cause of the accident was a broken axel gear in one of the waggons. The report states that the maintenance of the axel gear was not accurate. However, due to the lack of a clear causal link between the inaccuracy of the maintenance of the axel gear and the accident, there were no legal consequences for the company in charge.

3. *Date and duration of the event*

The accident happened on the 25th of April 2015.

4. *Natural resources and services involved and adversely affected*

The natural resource impacted was the soil.

ASCERTAINMENT

5. *How was the event known*

We do not know, but as train accidents hardly go unnoticed, this was not a problem in this particular case.

6. *Who conducted the ascertainment / investigation*

The investigation of the train accident was conducted by a specialised federal agency called the Swiss Transportation Safety Investigation Board (STSB) together with the Police of the canton of Vaud in which the accident took place. The ascertainment of the alleged impact of the environment was conducted by the Environmental Protection Agency of the canton Vaud.

7. *Timeline of the event and of the determination of clues and evidence*

See answers to questions 2 and 11.

8. *Identification of the source of impact*

See answer to question 2.

9. *Magnitude of the event*

The quantity of hazardous chemicals that were released by the accident were 25 tonnes of sulphuric acid and three tonnes of soda caustic.

10. *Spatial extent*

The spatial extent of the discharge of the chemicals was limited to the site of the accident, which

was rather limited in size.

11. Consequences to the natural resources and description of the causal link

The measures taken by the EPA of the canton of Vaud immediately after the accident and the following two weeks have made it possible to exclude any pollution of the ground water as well as the surface waters, in particular the nearby "Venoge" river and the "Criau" stream. Furthermore, the 1350 tonnes of polluted soil were extracted and disposed of, in an environmentally sound manner.

12. Legal requirements

The STSB and the EPA of the canton of Vaud complied with the legal, procedural and technical requirements.

13. Tools/equipment and methods used

We don't know.

14. Other Applied Legislation

The Federal Act on the Protection of the Environment EPA, the Federal Railway Act, the Ordinance on the Safety Investigation of Transport Incidents OSITI and the relevant legislations of the canton in which the accident took place.

Screening

15. Conduction of the the screening

We have no details about the way in which the screening was conducted by the STSB and the EPA of the canton of Vaud.

Maybe the train incident was noticed including the information of the release of massive quantity of hazardous substances.

16. Guidelines used

We do not know.

Determination of clues

17. Clues found

The quantity of hazardous chemicals that were released by the accident were 25 tonnes of sulphuric acid and three tonnes of soda caustic.

The spatial extent of the discharge of the chemicals was limited to the site of the accident, which was rather limited in size.

The run-off of hazardous chemicals from a damaged train waggon caused a contamination of the soil.

Clues of imminent threat of damage for groundwater and surface waters were excluded, because the source of damage was timely eliminated. The measures taken by the EPA of the canton of Vaud immediately after the accident and the following two weeks have made it possible to exclude any pollution of the groundwater as well as the surface waters, in particular the nearby "Venoge" river and the "Criau" stream. Furthermore the 1350 tonnes of polluted soil were extracted and disposed of in an environmentally sound manner.

18. Conduction of the determination of clues

We do not know.

19. Guidelines used

We do not know.

Determination of evidence

20. Evidence found

Environmental damage was not found. Contaminated soil was extracted and disposed of.

21. Conduction of the determination of evidence

We do not know.

22. Significance thresholds considered

We do not know.

23. *Guidelines used*

We do not know.

KEY FINDINGS AND LESSONS LEARNED
In its Final Investigation Report, the STSB has made some recommendations to the Federal Office of Transport, which is responsible for the security of the Swiss railway system, to improve the security of this kind of cargo waggons and to minimise the risk. These recommendations mainly pertain to the control and supervision of the maintenance of the axel gears as well as to the certification of the companies in charge.
DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE
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TRAINING NEEDS
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ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS
First of all, we have to say that environmental liability plays a rather minor role in Swiss environmental law. Therefore, it is difficult to find well-documented examples and case studies of environmental liability. However, environmental damages do also happen in Switzerland. The example we have chosen for this questionnaire is an example of a cargo train accident, in which the run-off of hazardous chemicals from a damaged train waggon caused a contamination of the soil.

Case study no. 32 - Fire in chemical storage and packaging facility

Case study name	Fire in chemical storage and packaging facility
Country	The Netherlands
Contributor	Ministry of Infrastructure and Water Management
Type of damage	Water damage and Land damage
Legislation	Non-ELD case Waters: Water Act Soil: Soil Protection Act and Environmental Management Act (Wet milieubeheer)
Site	Country: Nederland, Province: Noord-Brabant, Municipality: Moerdijk
Source of impact	33,000,000 kg of contaminated water was present in the local water system. Fire extinguishing water was also permeated into the soil.
Natural Resources	Three environmental compartments were polluted as a result of fire: Air. A plume of smoke arose on the northeast side of the fire. Soil. Extinguishing water and chemicals ended up in the soil and the accompanying groundwater. Water. Extinguishing water ended up in the local and main water system. Extinguishing water and chemicals also ended up in the sewer. Timely intervention (shutting down the sewage pumping station) has prevented polluted fire extinguishing water from ending up in the water board's sewage treatment plant. This sewer discharges the effluent on the Westerscheldt; a Natura 2000 area. Then the sewer system was disconnected and sealed. The rainwater

	was collected via the sewer and collected in large containers to prevent residual and pure product (chemicals) from entering into the soil together with the rainwater.
Effects of the impact	The part of the local water system that contained the fire extinguishing water was cleaned entirely: all the water, the embankments and the water bottom were removed and processed. The soil under the establishment was contaminated and is being cleaned up. The main water system also was contaminated; the contamination has been removed and processed. The air pollution was temporary (less than a day).

EVENT DESCRIPTION

1. *Location of the event*

• Country: Nederland.
• Province: Noord-Brabant.
• Municipality: Moerdijk.

2. Cause of the event and offense committed

The company repackaged chemicals from large to small packages. At the time of occurrence, it was freezing outside.
Outside a liquid was pumped out of a large tank. The pump regularly froze due to the low outside temperature. As a remedy, the pump was heated with open fire. This was the immediate reason for the fire.
According to the permit, such an act was not allowed to be performed outside, neither warming with open fire was allowed according to the permit. Especially since there was no sprinkler installation and there were no soil protection facilities. Also, the heating with open fire was not allowed according to the permit.
The discharge of the fire extinguishing water on the water is a violation of Article 6.2 of the Water Act: It is forbidden to bring substances into a body of surface water.
Contamination of the soil with fire extinguishing water and chemicals is a violation of the Soil Protection Act (including Article 13).
Article 17 of the Environmental Management Act provides that the operator of an establishment must take measures to remediate the consequences of the unusual incident. Due to the bankruptcy of the operator, he was no longer able to take measures. The municipality can then take measures based on article 17.2 of the Environmental Management Act. If there are risks for humans, the province can also take measures on the basis of Article 30 of the Soil Protection Act. In consultation between the municipality, province and the Ministry of Infrastructure and Environment, an approach based on Article 30 of the Soil Protection Act was chosen at that time.

3. Date and duration of the event

The fire raged on January 5, 2011 from around 2:30 PM till midnight. The remediation of the soil has not yet been completed and the removal and processing of the extinguishing water took about half a year.

4. Natural resources and services involved and adversely affected

Three environmental compartments were polluted as a result of the fire:
• Air. During the fire a plume of smoke arose on the northeast side of the fire.
• Soil. Extinguishing water and chemicals ended up in the soil and the accompanying groundwater.
• Water. Extinguishing water ended up in the local and main water system.
Extinguishing water and chemicals also ended up in the sewer. Timely intervention (shutting down the sewage pumping station) has prevented polluted fire extinguishing water from ending up in the water board's sewage treatment plant. This sewer discharges the effluent on the Westerscheldt; a Natura 2000 area.
Then the sewer system was disconnected and sealed. The rainwater was collected via the sewer

and collected in large containers to prevent residual and pure product (chemicals) from entering into the soil together with the rainwater.

ASCERTAINMENT

5. How was the event known?

Fire alarm at the chemical plant in Moerdijk.

6. Who conducted the ascertainment / investigation?

For the local water system: Waterboard Brabantse Delta.
For the main water system: Rijkswaterstaat.
For soil: province of Noord-Brabant and municipality of Moerdijk together.

7. Timeline of the event and of the determination of clues and evidence

It was immediately clear that the ditches were contaminated with fire extinguishing water because of the colours of the surface waters (orange and purple). Later from analyses resulted which substances were present in the extinguishing water.
Normally, water samples are taken and analysed after a suspicion of pollution. Depending on the urgency assigned to the analyses, it takes one to a few days.
Due to the extinguishing water that entered the soil and the remaining slurry at ground level, the risk of contamination was very high. In principle, the company is responsible for remediating pollution, but in parallel with this, the province has carried out an initial soil investigation in consultation with the municipality (soil and groundwater quality).

8. Identification of the source of impact

There was no (special) ecosystem in the ditch where the fire extinguishing water was located. No damage in that sense. However, 33,000,000 kg of contaminated water was present in the local water system. Fire extinguishing water was also permeated into the soil.

9. Magnitude of the event

The amount of fire extinguishing water was 33,000,000 kg. The costs of processing the extinguishing water are approximately € 11,000,000. The total cost for the government is approximately € 65,000,000.
An area of approximately 8 hectares of land and 16 hectares of groundwater has become contaminated.

10. *Spatial extent*

The soil contamination covers an area of approximately 30,000 m^2 (surface) and 80,000 m^2 of underground. The total contaminated water surface involved is approximately 10,000 m^2.

11. Consequences to the natural resources and description of the causal link

The part of the local water system that contained the fire extinguishing water was cleaned entirely: all the water, the embankments and the water bottom were removed and processed.
The soil under the establishment was contaminated and is being cleaned up. The main water system also was contaminated; the contamination has been removed and processed.
The air pollution was temporary (less than a day).

12. Legal requirements

• The water board removed the contaminated water from the ditches via a “burden under administrative procedure”. The procedure for this is described in the General Administrative Law Act. The operator used various procedural options to challenge the decision of the water board; objection, appeal and appeal.
• Technical requirements for taking water samples can be found in particular in:
- NEN 6600-2 Water - Sampling - Part 2: Surface water
- NEN-EN-ISO 5667-3 Water - Sampling - Part 3: Conservation and treatment of water samples
Both the province of Noord-Brabant and the municipality of Moerdijk have tried, with the use of (among other things) administrative enforcement instruments, to support the operator and the involved parties to induce to remediate the soil pollution. None of these parties has taken measures to remediate the pollution. Now that the addressed parties have failed to do so, the government is forced to remediate the pollution.

The province, municipality and water board have installed a security system and put it into operation in March 2012 to ensure that:
- Rainwater is collected and purified to prevent further contamination of the soil (there was still a lot of residue present before chemical clearing and demolition)
- Groundwater is extracted and purified to ensure that the contamination could not spread
- Developing, building and commissioning water purification that could purify the chemical plant blend from contamination

The municipality of Moerdijk has carried out the chemical clearance and demolition of the company premises.
The province of Noord-Brabant, in consultation with the municipality of Moerdijk and the Ministry of Infrastructure and the Environment, has opted to continue with soil remediation as part of the soil remediation program of the province of Noord- Brabant, on the basis of Article 30 of the Soil Protection Act. Remediation of the top soil in 2014, from 2015 on the subsurface and groundwater are being remediated (not yet completed).

13. Tools/equipment and methods used

Sample bottles, case, transport according to guidelines, laboratory.
Material used to carry out drilling. Both manual (Edelman drill) and mechanical (Geoprobe), plug-in sleeves for taking unstirred soil samples for analysis on volatile compounds.
The standard sampling tools were used: A vehicle equipped for the task of sampling. A telescopic pole with 1 litre angle beaker, stainless steel bucket, stainless steel ladle 250 ml, ladle 125 ml, per prescription pack containing preservative, gloves, work clothing (suitable overall, safety shoes, helmet, safety glasses and gas detection meter.
For ship sampling and tank sampling different tools were used. All samples were cooled in a thermostatic storage (between 1 and 5 degrees Celsius) immediately after sampling. For all samples pH, electrical conductivity and temperature were measured using suitable equipment.
All field data were noted and reported digitally.

14. Other Applied Legislation

Waters: Water Act
Soil: Soil Protection Act and Environmental Management Act (Wet milieubeheer)

Screening

15. Conduction of the screening

See par. 17 below. The fire was located in a chemical plant and the fire extinguishing waters were used to extinguish the fire, so there was a risk of presence of chemicals in the fire extinguishing water.
It was immediately clear that the ditches were contaminated with fire extinguishing water because of the colours of the surface waters (orange and purple).
Due to the extinguishing water that entered the soil and the remaining slurry at ground level, the risk of contamination was very high.

16. Guidelines used

See par. 19 below.

Determination of clues

17. Clues found

Specialized employees of the water board took water samples. Analyses were carried out, among other things, in a laboratory that is a form of cooperation (common arrangement) of various water boards. Subsequently, the results were assessed by employees of the water board. In this case, in addition to water quality specialists, the assessment was also done by ecologists.
The ground and groundwater investigation were carried out by the Environmental Measurements Agency (part of the province) certified for soil investigation (BRL 2000). The analyses (AS3000) were performed by an accredited laboratory (requirements of the Decree on soil quality decree: https://wetten.overheid.nl/BWBR0022929/2016-05-24#Bijlage1).
In addition to standard packages, screening analyses were also carried out to get a first picture of

the contaminants present.
The research and analysis protocols can be found at: https://www.sikb.nl/bodembeheer/richtlijnen
Due to the fact that the fire took place at a company in storage and packaging of chemicals, a lot of chemicals were found in the fire extinguishing water.
During the legal proceedings, the question was raised whether the contamination was only caused by the fire at the addressed chemical plant.
The water board had sufficient evidence for this because water samples were taken at various locations (outside the contamination).
It was mapped out which contamination is likely to be the result of the fire, which contamination is partly the result of the fire and whether there is contamination that is probably not the result of the fire. This was done on the basis of the research results after the fire, previously conducted investigations at / near the location and the 'fire department list' with products and substances present at the location.
There was no (special) ecosystem in the ditch where the fire extinguishing water was released. However, 33,000,000 kg of fire extinguishing water was present in the local water system. Fire extinguishing water also permeated into the soil.
An area of approximately 8 hectares of land and 16 hectares of groundwater has become contaminated.
The soil contamination covers an area of approximately 30,000 m^2 (surface) and 80,000 m^2 of underground. The total contaminated water surface involved is approximately 10,000 m^2.
18. Conduction of the determination of clues
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19. Guidelines used
Decree on soil quality (https://wetten.overheid.nl/BWBR0022929/2016-05-24#Bijlage1) and protocols for soil investigation (https://www.sikb.nl/bodembeheer/richtlijnen).
Determination of evidence
20. Evidence found
From visual inspection and then the soil investigation resulted that the soil and groundwater were highly contaminated (>> standard).
As for the causal link, the water board had sufficient evidence for this because water samples were taken at various locations (outside the contamination). It was mapped out which contamination is likely to be the result of the fire, which contamination is partly the result of the fire and whether there is contamination that is probably not the result of the fire. This was done on the basis of the research results after the fire, previously conducted investigations at / near the location and the 'fire department list' with products and substances present at the location.
21. Conduction of the determination of evidence
On the basis of soil investigation.
22. Significance thresholds considered
Pollution above the intervention values has been found and the size is large. There are risks for humans and the environment.
For substances for which no standard was available, RIVM has derived ad-hoc standards (if possible). Subsequently, this was tested. In addition, substances were compared with standards of comparable substances. The standard (intervention values) are included in the Soil Remediation Circular: https://zoek.officielebekendmakingen.nl/stcrt-2013-16675.html. Due to the large size of the contamination, it was not possible to completely eliminate it. In the end, an assessment was made on the basis of risks and costs and the remediation criterion "suitable for use as an industrial site" was used. The maximum industry value must be met for the soil (see Soil Quality Regulation: https://wetten.overheid.nl/BWBR0023085/2018-11-30), and for the groundwater the intervention value must be met.
Use is made of the site www.rivm.nl/rvs . This contains standards for different situations. This is

a useful tool. To pick out the real problem cases, we often use "five times the norm" as the limit value / significant threshold.

23. *Guidelines used*

For soil analysis BRL2000 and analyses in accordance with AS3000.

Furthermore, there is a guidance document for the application of the implementation legislation of the EU environmental liability directive. This document contains among other thing information on how to apply the thresholds for environmental damage (to waters, protected species and natural habitats and to soil). In this case, the authorities did base themselves on other legislation that works into the same direction as the ELD implementing legislation.

KEY FINDINGS AND LESSONS LEARNED

The (early) analysis results have accelerated the entire procedure. These results played a role in the initial decision-making.

Because of the water samples, no questions were asked about this in the judicial procedures.

This is applicable also in general. In the event of environmental damage to water, water samples are a key to successful government action. This is true for both administrative law and criminal law response actions. With analysis results the action can be motivated and the results indicate the extent of the environmental damage. The causal link between the environmental damage and the offender can also be established via water samples.

The same is true for soil / groundwater. Analysis of the list of substances present was crucial to determine potential contamination. This was hampered by the fact that for many products only the product name is known and the ingredients are not known at substance level but at group level and are included in the safety data sheets. At a later stage (2013) an inventory was made by a specialist as to whether any substances could have been missed (see the substances memorandum, appendix) and via which analyses the remediation can be carried out on guidance substances. A guidance substance is a substance that is used in analyses but is representative of a larger group of similar substances (“sibling substances”). At the chemical plant a large number of aromatic hydrocarbons have been found that are not included in the standard package, but which all have similar properties (distribution, degradation). An analysis package has been compiled in which the most important substances are analysed, but the results also say something about the group of “sibling substances”.

DETERMINATION OF CLUES AND EVIDENCE IN THE SAME TYPES OF DAMAGE

The first values to be tested for are oxygen consumption and pH.

Check with the municipality or environmental department whether there is a soil quality map (provides information about the general soil quality). The province has information about general groundwater quality based on the results of the groundwater monitoring network. In addition, check with the municipality and province whether soil research has already been carried out (baseline situation investigation when applying for a permit for a business or building permit for homes / properties). Results of soil investigations are kept in the archive.

For soil / groundwater for research, in any case use a standard package (for the composition of the package, see: https://www.sikb.nl/doc/BRL9335/Stoffenpakket%20080604.pdf) soil and groundwater, pH and EC (electrical conductivity) and a GC-MS screening analysis (Gas chromatography mass spectrometry). And in case it is known which substances were present, these must also be included. Determine which further analyses are needed based on initial analysis results and available products / substances.

Based on the starting situation and the new situation, it can be determined whether there is any environmental damage.

When employees of the water board arrive to a possibly contaminated water after a report, unusual incident or complaint, they usually start the investigation with a field meter. This is in addition to sensory perceptions. With this field meter, oxygen content, acidity and electronic conductivity are measured. The results can be used to conclude directly whether there is contamination. The next step is often to take water samples and isolate the contamination.

TRAINING NEEDS
A good basis for the operation of instruments used for taking water samples is necessary. And, also, knowledge of substances harmful to the aquatic environment. Knowledge of different sources of pollution, for example industry or agriculture, is also important. Experienced monitoring authorities can best transfer their experience by training new monitoring authorities / supervisors. They can show to what matters attention should be paid. What does contaminated water look like? How does contaminated water smell? Where should samples be taken? How do I enter into a conversation with a potential offender? The same for soil / groundwater. In addition, knowledge of substances.
ADDITIONAL INFORMATION, REMARKS, CONCERNS, REQUESTS, SUGGESTIONS
For substances with which there is not, or almost no experience, it is important to pay attention to the method of sampling in relation to characteristics of the substance, analysis period and method and degree of variation in analysis results.

ANNEX III. Other case studies

Damage to protected species and natural habitats

1. Case treated under national ELD transposing legislation in Poland: renovation work on a bridge resulting in environmental damage to the natural habitats and species of swallows. This damage occurred in Szczecin and destroyed about 320 swallow nests (dropped in the water) and baby birds. It resulted in a significant negative impact on the appropriate conservation status of the species and its habitats; thus the competent authority required the operator to undertake remedial measures monitoring the number of nests and birds over four years (BIO Intelligence Service, Implementation challenges and obstacles of the Environmental Liability Directive, 2013, p. 110).
2. Two cases treated under national ELD transposing legislation in Germany:
    a. Construction in the tunnels of a railway affecting protected bats and their natural habitats (located in the tunnel); and
    b. Construction of a solar energy park affecting protected reptiles and their natural habitats. Due to these construction works, the population of animals decreased; thus the competent authority required the operators to restock the different sites providing new habitats for the affected species (BIO Intelligence Service, 2013, p. 104).
3. Case treated under national ELD transposing legislation in Germany: Biogas leak at biogas plant affecting protected fish species (some of the fish died) in the lake Veerse. In this case, there was a large amount of available data to determine the baseline, thus compensatory measures were undertaken (restocking of the lake) (BIO Intelligence Service, 2013, p. 103).
4. Two cases in France where conditions to apply ELD were not met – damage was considered not significant enough (Discharge of soda into Vienne River and discharge of black liquor into Arcachon Basin) (BIO Intelligence Service, 2013, p. 100). One of the cases occurred in 2011, a tank filled with 600 m^3 of sodium burst on the site of a paper pulp production plant at Saillat-sur- Vienne, causing significant spill of sodium into the Vienne river. The installation of a conventional emergency system with a floating dam enabled the pollution to be contained effectively. This action combined with a high watercourse flow rate spared the flora and fauna serious consequences (French general commission for sustainable development, 2012).
5. Case treated under ELD transposing legislation: construction of a cableway in Stóg Izerski in Poland: the competent authority imposed remedial action on the operator. Due to the lack of data on the initial state of the environment and population of endangered species, it was difficult to assess the extent of the damage and provide adequate forms of protection. It was difficult to prove operator's responsibility for the biodiversity damage (BIO Intelligence Service, 2013, pp. 109, annex B).
6. Case treated under ELD transposing legislation in Germany: maintenance works on a riverbank in Natura 2000 site which affected biodiversity. The competent authority considered that the damage caused to priority natural habitats and nests (protected birds), was significant. The damage has been remediated by applying the ELD regime (BIO Intelligence Service, 2013, p. 103).
7. Case treated under ELD transposing legislation in the UK: a farm worker applied manure to a 10 ha Site of Special Scientific Interest notified for calcareous grassland. It was established that 10% of the site was covered in negative species (mainly nettles) and without any action, this was likely to get progressively worse and more significant. The competent authority required the farmer to undertake remedial actions (DEFRA, The Environmental Damage (Prevention and Remediation) Regulations, 2009, p. 99).
8. Case treated under national ELD transposing legislation in Poland: The construction of cableway for a ski run which caused damage to protected species and habitats (reduction of a population of black

grouse). The competent authority required the operator to undertake preventive measures with the reference to the increased risk of the environmental damage. However, the operator contested the authority's decision so these measures have not been carried out. But, in this case, the competent authority considered that these preventives actions could prevent the environmental damage from becoming more significant (BIO Intelligence Service, 2013, p. 109).

Water Damage

1. Rupture of a tank at a chemical factory located next to the English coast (UK): any solvent which had entered the estuary had not resulted in a lowering of its status under the WFD due to dilution by tidal flushing, and had thus not exceeded the threshold for water damage under the ELD transposing legislation (BIO Intelligence Service, 2013, p. 115).
2. Case treated under national ELD transposing legislation in Hungary – 'Red sludge' case. Red sludge and alkaline water spilled from a reservoir in an alumina factory leading to the formation of wave of toxic waters and sludge flooding nearby localities. The release of toxic reached a secondary arm of the river Danube. Thus, the inspectorate ordered the operator, to carry out emergency actions. In this case, as many prompting countries are located further down the river Danube, the competent authority had the duty to require emergency remedial actions to limit the environmental impacts of the accident (BIO Intelligence Service, 2013, p. 107). According to information gathered (Bergkamp & Goldsmith, The EU Environmental Liability Directive: A Commentary, 2013), a major effort was made to reduce the downstream impact of the release; measures undertaken to eliminate soil contamination included: small dams built, gypsum and acid added to rivers to neutralise the pH, top layer of soil removed, most contaminated soil removed from the area and disposed of, special material used to lower the soil pH, planting for food and feed prohibited. The remediation was oriented on limiting negative impact on environment and human health; however little information is available on restoration of other damage, such as damage to aquatic habitat (Bergkamp & Goldsmith, 2013, p. chapter 5.36).
3. Case treated under national ELD transposing legislation in UK: Releases of sediment in fresh water impacting protected species and natural habitats. The competent authority considered that the damage was not significant enough to prove the operator's responsibility but a prevention notice was served to the operator in order to prevent the damage becoming significant (stabilise the landslip area and improve measure to trap sediment) (BIO Intelligence Service, 2013, p. 115).
4. incident of toxic waste spillage from a zinc mine near a Spanish national park. 10,000 hectares of farmland along the banks of the river were poisoned, with disastrous impacts on the environment (high river acidity level, contamination along the food chain, ground water contamination etc.). Tourist incomes and farming land was lost and there were huge clean-up costs. The sludge was stopped just before it reached the national park, but nevertheless caused damage to a fragile ecosystem, and there is no information if other impacts like water contamination affected the national park ecosystem. (EFFACE, Understanding the damages of environmental crime, Review of the availability of data, Deliverable No. 3.1)., p. 33)

Land damage

1. The Danish guidelines give concrete examples of situations which can be treated as environmental damage to land (Danish EPA and ASEP (Agency for Spatial and Environmental Planning) Guidelines, 2012):

- Land pollution from a large dry cleaner affects the indoor climate in nearby homes, so mechanical ventilation or other measures will be necessary. This type of pollution will often also lead to groundwater pollution which can be damage to water.
- Mucosa is accidentally delivered with illegal and large amounts of problematic substances to a field, and it turns out that the area will be unusable for cultivation of crops.
- A waste incineration plant's smoke purification system cuts out, and pollution of surface soil with heavy metals in excess of the cut-off criteria occurs in a nearby residential area.
- Oil pollution from a ship reaches a beach where there is a risk of affecting many people.

2. Three cases treated under ELD transposing legislation in UK: soil contamination by volatile hydrocarbons, spill of kerosene heating oil caused by oil supplier at residential property and discharge of neat powder coating from factory onto adjacent land. In these cases, the competent authority proved the operator’s responsibility for land damage considering that these damages had or could have significant adverse effects on human health. The ELD regime was applied (BIO Intelligence Service, 2013, p. 114).
3. Case treated under ELD transposing legislation in UK: in 2009 a fuel storage tank in the courtyard of a galvanising installation was vandalised leading to a leak of diesel. Six months later, and despite the immediate actions, it was found that there were hydrocarbon vapours which represented a risk to human health. The local authority required the operator to undertake remedial measures (DEFRA, 2009).

ANNEX IV. Questionnaire

1) **Which are authorities that conduct the ascertainment and the assessment of environmental damage and which is the enforcing authority of the preventive and remedial measures?**

Please describe the authorities that conduct the ascertainment and the assessment of the environmental damage and threats of damage. Moreover, describe the authority that conduct the enforcement of preventive and remedial measures. Please refer to protected habitats and species (also in pursuance of national legislation on nature conservation), waters and land.

Phases	**Authorities**
Ascertainment *Determination of clues and evidence of environmental damage and threat through information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysys, ascertainment/investigation plan and actions*	Under ELD regime: ▪ *(your answer) …* Under other legislation: ▪ *(your answer) …*
Assessment *Environmental damage quantification and monetisation, preventive and remedial measures identification*	Under ELD regime: ▪ *(your answer) …* Under other legislation: ▪ *(your answer) …*
Enforcing *Ordinances and actions for prevention and remediation of environmental damage*	Under ELD regime: ▪ *(your answer) …* Under other legislation: ▪ *(your answer) …*

2) Title of the example/case-study

Please give a name that characterizes your example (for instance, 'Groundwater contamination of drinking water supply in …', or 'Fuel tank explosion in …').
…(your answer) …

3) Is it an ELD case or a non-ELD case (is the ELD applicable to the case or not)?

Please specify if the case has been dealt under the ELD provisions or under provisions of other legislation. Tick the box with copy-paste of ☒

- ☐ ELD case
- ☐ Non-ELD case

… if it is a non-ELD case, which is the legislation concerned?
… (your answer) …

4) Types of environmental damage

Please specify which type of environmental damage was generated by the event: land damage or/and water damage or/and damage to protected habitats and species. Tick the box with copy-paste of ☒

- ☐ Land damage
- ☐ Water damage
- ☐ Damage to protected habitats and species
- ☐ Air damage (in some Countries this environmental compartment is also considered)

5) Description of the event

Please describe the event, giving the following information:

a) Location of the event (*Please write the Country, Region, Province, Municipality, geographical coordinates*)

… (your answer) …

b) Natural resources and services involved and adversely affected (*Please specify not only the adversely affected targets but list the natural resources and services involved and why*)

Examples of answers:
1) The natural resources involved/impacted (damage was not found) were …
2) Natural resources affected (damage was found) were …

… (your answer) …

c) How was the event known?

… *(your answer)* …

d) Who conducted the ascertainment/investigation? (*Please specify who conducted the whole process of ascertainment/investigation, from the discovery of the event to the end of the determination of evidence)*

Examples of answers:
1) The ascertainment/investigation on site (information and data collection of the event, data collection of the environmental quality status ex-ante and ex-post, sampling and analysys, ascertainment/investigation plan and actions) was conducted by …
2) The ascertainment/investigation onsite was lead by …

… *(your answer)* …

e) Cause of the event and offense committed

… *(your answer)* …

f) Date and duration of the event *(As duration of the event we refer to the time duration of the source of damage, from the activation to the deactivation of the source)*

Examples of answers:
1) The event occurred/was discovered on day/month/year …
2) The event lasted from … to …

… *(your answer)* …

g) Source of the impact

Examples of answers:
1) The source of the impact was identified in the release of the following substances/ in the overabstraction of the following volume/in the introduction-killing of individuals of the following species …

… *(your answer)* …

h) Magnitude of the event (*Please give information about the quantity, the volume, the concentrations involved in the event*)

Examples of answers:
1) The magnitude of the event is characterized by: ▪ the quantity of … ▪ the volume of … ▪ the concentration of the specified pollutants was equal to … ▪ (other types of data)

… *(your answer)* …

i) Consequences to the natural resources and description of the causal link

… (your answer) …

j) Timeline of the event and of the determination of clues and evidence *(Please describe the timeline from the discovery of the event to the end of the determination of evidence)*

… (your answer) …

k) Spatial extent

Examples of answers:
1) The event involved and area of approximately … Km^2 …

… (your answer) …

6) Did your authority do the screening? If yes, how was the screening conducted? Were guidelines used?

Please note that the screening is conducted at the very early stage of the ascertainment to decide whether there may be reasonable grounds to believe that there is environmental damage or threat, in another words, that the event can potentially be an environmental damage or threat.
The screening phase starts from the activation (the discovery or the communication of the event to the competent authority) and ends with the decision to take action to investigate the event in order to find further information and data. Thus, the screening can be done in the absence of the site-visit.
Moreover, as already mentioned, the screening can be used to dismiss the minor non-compliances discovered during routine and non-routine inspections of regulated sites, which do not entail potential environmental damage or threat. Thus, the screening can be useful for environmental inspectors to recognize potential/non-potential environmental damages caused by the violations.
Please describe criteria, procedures and technical aspects.
Did your authority do the screening?
Tick the box with copy-paste of ☒

- ☐ Yes
- ☐ No

… how was the screening conducted?

Examples of answers:
1) The screening was conducted in this way: …

… (your answer) …

…were guidelines used?
Tick the box with copy-paste of ☒

- ☐ Yes
- ☐ No

Which paragraph and pages interval of the guidelines should we refer to? … *(your answer)*

7) **What clues were found? How was the determination of clues conducted? Were guidelines used?**

The determination of clues starts from the decision to take action to investigate the event in order to find further information and data and ends with the decision to take action to investigate to find evidence.
An example of clue is when you find a connection between the source of impact and an environmental receptor through an environmental pathway.
Please describe methodology, procedures and technical aspects (for instance, considerations on pollutants, levels of contamination, pathways, sensitivity of environmental targets).
What clues were found?

Examples of answers:
1) The clues of environmental damage were … because …

… (your answer) …

…how was the determination of clues conducted?

Examples of answers:
1) The clues of environmental damage were founded by …

… (your answer) …

…were guidelines used?
Tick the box with copy-paste of ☒
- ☐ Yes
- ☐ No

Which paragraph and pages interval of the guidelines should we refer to? … *(your answer)*

8) **What evidence was found? How was the determination of evidence conducted? Were guidelines used?**

Evidence stands when significance thresholds are overcome.
Please describe methodology, procedures and technical aspects (for instance, considerations and investigations on baseline conditions, level of damage and significance thresholds).
What evidence was found?

Examples of answers:
1) The evidence of environmental damage were … because …

… (your answer) …

… how was the determination of evidence conducted?

Examples of answers:
1) The evidence of environmental damage were founded by …

… *(your answer)* …

… were guidelines used?
Tick the box with copy-paste of ☒

- ☐ Yes
- ☐ No

Which paragraph and pages interval of the guidelines should we refer to? … *(your answer)*

9) Significance thresholds that have been considered

Examples of answers:
1) For the determination of environmental damage, the following significance thresholds have been considered: …

… *(your answer)* …

10) In the whole ascertainment/investigation process, did you comply with legal procedural and technical requirements (for instance the rights of defence of the penal code, national/international quality standards of sampling and lab analysis)? Which ones?

Did you comply with legal procedural and technical requirements?
Tick the box with copy-paste of ☒

- ☐ Yes, compliant
- ☐ Not, compliant
- ☐ Not applicable

Which ones?

Examples of answers:
1) The legal procedural and technical requirements to comply with were …

… *(your answer)* …

11) Tools/equipment and methods used for the determination of clues and evidence and how

For instance, sampling equipment, mobile/permanent laboratory, air/surface/underwater drones, satellites, as well as operators/workers/witnesses interviews, internet research, database consultation, public bodies coordination

Examples of answers:
1) The tool/equipment/method used for the determination of clues were cameras, air/surface/underwater drones, satellite images and …
2) This tool/equipment/method was used in this way … to identify the following clues …
3) These tool/equipment/method revealed that …

… *(your answer)* …

12) Key findings and lessons learned about the determination process

Please describe difficulties and weaknesses, successes and strengths, keystones, shortcomings and rooms for improvement.
Please give your opinions as regard to 1) methodology and procedures, 2) technical aspects 3) legislative, organizational aspects.
Please Note: do not consider quantification and monetisation of environmental damage, as well as preventive and remedial measures identification (these are outside the scope of this project).

Examples of answers:
1) The key findings (difficulties and weaknesses, successes and strengths, keystones, etc.) in the process of determination of environmental damage were …
2) The lessons learned in the process of determination of environmental damage were …

… (your answer) …

13) Given the clues and the evidence found in the specific case, can you suggest criteria for the determination of clues and the determination of evidence referable to the same type of damage?

Please suggest criteria for the determination of clues and the determination of evidence referable to the same type of damage, that is for land damage/water damage/habitats and species damage.

Examples of answers:
1) For the determination of clues in similar cases, it is advisable to follow the criteria that …
2) For the determination of evidence in similar cases, it is advisable to follow the criteria that …

… (your answer) …

14) Training needs for the ascertainment of environmental damage and threats of damage

Please give your opinion as regard to the training needs from the technical, procedural, organizational point of view and which training tool you think is effective (workshops, training on-the job, webinars, e-learning, etc.).
… (your answer)…

15) Additional information, remarks, concerns, requests, suggestions

Please feel free to give any additional information, remarks, concerns, requests, suggestions
… (your answer)…

ANNEX V. Legislative Background

Purpose of the Environmental Liability Directive (2004/35/EC) is to establish a framework of environmental liability based on the 'polluter-pays' principle[45] and on the preventive principle.
The preventive principle provides that operators should take measures to avoid damaging the environment. If prevention fails and a pollution incident happens, the polluter pays principle provides that the person who caused the environmental damage should pay for its remediation and restoration[46]. These principles are also is in line with the precautionary principle[47], upon which EU Law and policy is based.
Sanctioning criminal offences is rather made under the Environmental Crimes Directive (2008/99/EC).

The legislative background related to the CAED project scope is mainly concerned with the following EU Directives:

- Directive 2004/35/CE (ELD) on environmental liability with regard to the prevention and remedying of environmental damage (Amended by Directives 2006/21/EC, 2009/31/EC, 2013/30/EU and Regulation 2019/1010/EU)

and its connected Directives:

- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitat Directive)
- Directive 79/409/EEC on the conservation of wild birds (Birds Directive)
- Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive)
- Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy
- Directive 2006/118/EC on the protection of groundwater against pollution and deterioration

The legislative background of the project included also the national transposition of the ELD into the national legislation of Member States and the national laws of Member States, which envisages other systems of liability for environmental damage.

[45] The polluter pays principle (PPP) was first mentioned in the recommendation of the OECD of 26th May 1972 (http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En) and reaffirmed in the recommendation of 14th November 1974 (https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0133). Since 1987 the principle has also been enshrined in the Treaty of the European Communities (PPP is mentioned in Art. 191 (2) of the EU-Treaty as a principle of EU environmental law. Though, its substance is not defined there) and in various pieces of national legislations world-wide.

[46] https://ec.europa.eu/environment/legal/liability/pdf/Summary%20ELD.pdf

[47] The precautionary principle enables decision-makers to adopt precautionary measures when scientific evidence about an environmental or human health hazard is uncertain and the stakes are high. It first emerged during the 1970s and has since been enshrined in a number of international treaties on the environment, in the Treaty on the Functioning of the European Union and the national legislation of certain Member States. Article 174 (2) of the European Community Treaty provides that all Community policy on the environment shall be based on the precautionary principle. Following the European Council's adoption of the Nice Declaration on the future of the European Union in December 2000, the principle's operational field has been extended also to health and safety policy. The characteristic feature of the precautionary principle is risk prevention in the face of scientific uncertainty. The precautionary principle aims to prevent harm before a hazard has come into existence https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52000DC0001

Moreover, the CAED project has been inspired by the resolution of the European Parliament resolution of 26 October 2017 on the application of Directive 2004/35/EC and by the REFIT evaluation on its effectiveness, efficiency and relevance in 2016 and the subsequent Multi-Annual Work Programme from 2017 to 2020.

Each Member State has different and numerous legislative requirements for the ELD Directive implementation and, in particular, for the determination of the environmental damage that can arise from different natural resources.

The European Commission has issued various guidance on ELD implementation[48]. Some Member States published domestic legislation or guidance which sets out the types of mechanisms that are acceptable, in which circumstances, and in some cases may specify the tresholds.

Futher information on Environmental Liability Directive (ELD) and its implementation[49]
The Environmental Liability Directive (ELD) entered into force on 30 April 2004 and the Member States had three years to complete transposition.
The Directive establishes a common legal framework for liability with a view to preventing and remedying damage to animals, plants, natural habitats and water resources, and damage affecting the land. The liability scheme applies to certain specified occupational activities covered by strict liability and to other activities in cases where the operator is at fault or negligent. The public authorities are also responsible for ensuring that the liable operators take or finance the necessary preventive or remedial measures themselves.
The Environmental Liability Directive deals with the 'pure ecological damage', and it is subsequently based on the powers and duties of public authorities ('administrative approach') as distinct from a civil liability system which is more appropriate for 'traditional damage' (damage to property, economic loss, personal injury). This approach has been welcomed by the Member States.
The newly adopted Environmental Crimes Directive (2008/99/EC), further supports the legal approach of this Directive, as it requires that the Member States imposes sanctions for certain environmental criminal offences.
The Environmental Liability Directive was already amended fourth times through Directive 2006/21/EC on the management of waste from extractive industries, Directive 2009/31/EC on the geological storage of carbon dioxide, Directive 2013/30/EU on safety of offshore oil and gas operations and, finally, through art. 3 of Regulation 2019/1010/EU on the alignment of reporting obligations in the field of legislation related to the environment.
Directive 2006/21/EC broadened the scope of strict liability by adding one more dangerous activity ('management of extractive waste') to the list of dangerous occupational activities in Annex III of the ELD. Directive 2009/31/EC adds another dangerous activity ('operation of storage sites pursuant to Directive 2009/31/EC') but includes also genuine responsibility and financial security provisions separate from the ELD, whereas Directive 2013/30/EU clarifies that holders of authorisations for offshore oil and gas operations pursuant to Directive 94/22/EC are also the liable 'operators' within the meaning of Directive 2004/35/EC. In this context, definition of water damage in Directive 2004/35/EC has been amended to cover also damage to marine waters.

The ELD covers environmental damage, or any imminent threats of damage, under three categories:

[48] https://ec.europa.eu/environment/legal/liability/index.htm
[49] Mostly estracted by the Handbook on the Implementation of EU Environmental Legislation edited by Hulla & Co Human Dynamics 2015-2016.
(http://www.ecranetwork.org/Files/Handbook_on_Implementation_of_Environmental_Legislation.pdf).

- damage to protected species and natural habitats as defined by the Directive, that is damage to protected species and natural habitats that has significant adverse effects on reaching or maintaining the favourable conservation status of such species or habitats;
- water damage, that is, damage that has a significant adverse effect on ecological, chemical and/or quantitative status and/or ecological potential, as defined in the Water Framework Directive 2000/60/EC and the Marine Strategy Framework Directive 2008/56/EC;
- land damage, that is, any land contamination that creates the significant risk of an adverse effect on human health as a result of the direct or indirect introduction in, on or under the land, of substances, preparations, organisms or micro-organisms.

The elementary foundations of the Environmental Liability Directive comprise:
Imposes strict liability on operators who undertake an activity covered by the EU legislation listed in Annex III of the Directive for the above three types of environmental damage. In 2006 and 2009 this Annex was amended to include mining waste activities and the geological storage of CO_2.
Imposes fault-based liability on operators of non-listed occupational activities. These operators can be held liable for damage to protected species and natural habitats and not for other types of damage.
Shall apply to environmental damage and any imminent threat of such damage occurring by reason of occupational activities that are listed in Annex III.
Shall also apply to damage that adversely affects biodiversity and that results from occupational activities not listed in Annex III.
Does not cover environmental damage resulting from armed conflict, national defence, a natural disaster, or pollution that is of a widespread or diffuse character where a causal link to an individual operator cannot be established.
Does not apply to environmental damage caused by activities covered by the international conventions (mainly IMO Conventions) listed in Annex IV relating mainly to maritime transport and by nuclear activities covered by the Treaty establishing the European Atomic Energy Community or activities covered by the international conventions listed in Annex V.
Shall require the operator (the potential polluter) to take necessary preventive and restorative measures (the latter based on rules and principles contained in Annex II) for environmental damage. Shall require that, in cases where the operator is not in a position to take preventive or restorative measures, these could be undertaken by the competent authority and the costs recovered at a later date, within five years at the latest.
Leaves it open to Member States to provide for the so-called permit defence. The permit defence would allow operators under certain circumstances to escape from bearing the costs of measures if they demonstrate that they were not at fault or negligent and that the damage was caused by an emission or event expressly authorised under applicable national laws. Leaves it open to Member States to provide for the so-called state of the art defence. The state of the art defence would allow operators to escape from bearing the costs of measures if they demonstrate that they were not at fault or negligent and that the damage was caused by an emission or activity or any manner of use of a product in the course of an activity that the operator demonstrates was not considered likely to cause environmental damage according to the state of scientific and technical knowledge at the time the emission was released or the activity took place.
Does not provide for specific cost allocation mechanisms in case of multi-party causation, but leaves the issue to the Member States to decide.
Provides investigative and related powers for competent authorities. Establishes a 'request for action' procedure for addressing third-party requests and provides related access to courts or comparable decision-making bodies as a means of redress where requests for action are not satisfactorily addressed. Third parties are defined as natural or legal persons affected or likely to be affected by environmental damage; or having a sufficient interest

in environmental decision making relating to damage; or alleging the impairment of a right where this is required under national law. Any non-governmental organisation promoting environmental protection and meeting any national law requirements is deemed to have sufficient interest/impairment of a right.
Sets out the rules and procedures for remedying environmental damage (Annex II). Requests Member States to encourage the development of financial security/insurance mechanisms. Requires co-operation between mutually affected States in matters of environmental damage prevention or remediation. Being prospective as of its effective implementation date (30 April 2007) and not retroactive.

The Commission reported on 12 October 2010 on the effectiveness of the Directive in terms of actual remediation of environmental damages and on the availability at reasonable costs and on conditions of insurance and other types of financial security: Report from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions under Article 14(2) of Directive 2004/35/EC on the environmental liability with regard to the prevention and remedying of environmental damage (COM/210/0581 final).[50]

The abovementioned Report proposed several measures to improve the effectiveness of the Directive, which should be taken into account by the candidate countries during implementation:

- improving information exchange and communication between stakeholder/practitioner groups;
- carry out awarenes raising actions in order to promote awarenes of industrial operators and financial security providers;
- develop guidelines on the application of the Environmental Liability Directive, in particular its Annex II. Provide interpretation of the key concepts of the ELD, such as 'environmental damage', 'significant damage', 'baseline conditions'.
- establish records and registers of ELD cases. Such registers may provide support to ELD stakeholders, but also help the competent authorities in fulfiling the reporting obligations.

A second implementation report on Directive 2004/35/EC on environmental liability with regard to the prevention and remedying of environmental damage (COM/2016/0204) presents the experience gained in applying the Directive between 2007 and 2013.[51] It contains conclusions and recommendations on how to improve the implementation. The document must be read in conjunction with a Staff Working Document (SWD (2016)121).[52]
The main Commission's recommendations stipulated in the second implementation report (COM/2016/0204) were the following:

- support the implementation efforts with proactive initiatives (such as guidance documents, training,
- electronic tools for risk analysis, baseline setting, financial security models, etc.) as some Member States have done already;
- exchange administrative experiences and best practices and support each other in capacity-building efforts;
- review the interpretation of key provisions of the Directive, in particular in relation to 'significance';
- record data on ELD incidents and publish ELD registers if they have not done so already;
- systematically gather the necessary data that can document that the application of the Directive in their country is effective, efficient and in line with the overall situation in the EU.

[50] http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52010DC0581
[51] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2016:204:FIN
[52] http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX%3A52016SC0122

Successively, the Environmental Liability Directive had been subject to the so-called REFIT evaluation on its effectiveness, efficiency and relevance in 2016. Main findings of this REFIT evaluation had shown that the directive works in principle but that there is room for improvement in several areas and that the variance or diversity between the EU Member States in the implementation of the Environmental Liability Directive is significantly high.
The Commission set up together with the Member States a Multi-Annual Work Programme from 2017 to 2020 in order to improve the implementation and to increase the level playing field of this directive across the EU.
That meant to tackle in particular the following challenges:

- low availability of data on ELD cases,
- low awareness of the directive by main stakeholders and practitioners,
- ambiguities around key concepts and definitions such as the 'significance threshold',
- the many exceptions and defences to the scope of environmental damage and strict liability, and
- insolvency of operators in case of large losses.

In 2017 and 2018 the main tasks consisted in

- building an assessment framework,
- establishing an Environmental Liability Directive (ELD) information system,
- investigating capacity building measures,
- developing a Common Understanding Document on ELD key terms and concepts, and
- reviewing an IT concept for risk and damage assessment.

In 2019, the work of the EU Commission and the DG Environment focused on improving the evidence base. Apart from some continued work on capacity building and the existing ELD training programme, an IT tool for damage assessment has been looked at and work on improving financial security for ELD liabilities is being carried out.
The main work stream in the first half of 2019 resulted however in the establishment of 28 ELD Member State fiches showing the implementation of the ELD in their country.

The ELD country fiches contain always the same structure for each Member State:

- legal framework,
- administrative structure, and
- facts and figures on ELD cases.

The country fiches are subject to continuous updates with fresh data and information and should thus become an important instrument for a better knowledge and evidence base. As they are based on CIRCABC-system hosted by the Commission's environmental liability website on the Europa server, they area accessible to everyone[53].
The purpose is not only to serve the Commission in its task to monitor and to evaluate the Directive and any progress achieved in it. The country fiches will also help all ELD stakeholders and practitioners, such as authorities, operators, insurers and NGOs to obtain reliable information and data about their own country and across the whole EU. They will also contribute to better information of interested citizens and the general public.

[53] https://circabc.europa.eu/ui/group/cafdbfbb-a3b9-42d8-b3c9-05e8f2c6a6fe/library/82e90a00-fa70-4af6-bc4b-ab54207b1694?p=1&n=10&sort=modified_DESC

Another achievement of 2019, which is directly relevant for the establishment of a better evidence base at EU level, is the adoption by the European legislator of the new Article 18 of the Environmental Liability Directive on reporting. This provision is part of the streamlining of reporting and information efforts resulting in the so-called Reporting Alignment Regulation in the field of legislation related to the environment.

Consequently, by April 2022 information from the Member States on the experience gained in the application of this directive shall be collected, covering the data set out in the new Annex VI of the ELD. On the basis of that information the Commission shall by April 2023 carry out and publish an evaluation of the Directive. Henceforth, every five years thereafter shall the information and data from the Member States be collected and likewise one year later the Commission shall publish its evaluation.

Finally, as part of this legal amendment the Commission is obliged to prepare 'Guidelines on Environmental Damage' by the end of 2020. This work, taking results from

- the aforementioned Common Understanding Document,
- relevant case law of the Court of Justice of the European Union and
- other pertinent sources,

shall contribute to the task to improve the clarity and understanding of key terms and definitions in the Environmental Liability Directive.[54]

As regard to the Case Law related to the ascertainment phase, the Court of Justice of the European Union (CFJEU) is the sole source of definitive interpretation of EU law.
The Court of Justice of the European Union provided interpretation of some relevant ELD terms and concepts by its judgments of[55]:

- 9 March 2010 in the preliminary ruling case ERG and Others, C-378/08 and combined cases C-379/08 and case C-380/08,
- March 2015, FIPA Group and Others, case C-534/13,
- 1 June 2017, Gert Folk, case C-529/15,
- 13 July 2017, Túrkevei Tejtermelö Kft., case C-129/16.

In Raffinerie Mediterranee, the European Court of Justice found that the ELD does not specify how a causal link between the activities of the operator(s) and the environmental damage is to be established. Whilst the Court recognises the possibility that a Member State may impose remedial measures for environmental damage on the presumption that there is a causal link between the pollution found and the activities of the operator(s), if the latter are located close to that pollution, it requires the competent authority to have 'plausible evidence' capable of justifying that presumption.[56]

[54] Mr. H. Lopatta presentation of ELD Directive at the ISPRA Conference for the presentation of the 1st biennual report of ISPRA (Italian National Institute for the Environmental Protection and Reasearch) on the ascertained cases of environmental damage in 2017-2018 (http://www.isprambiente.gov.it/it/events/il-primo-rapporto-ispra-sul-danno-ambientale.-i-casi-accertati-in-italia-negli-anni-2017-2018).
[55] https://ec.europa.eu/environment/legal/liability/index.htm
[56] ECJ, 9 March 2010, Case C-378/08, Raffinerie Mediterranee; Fogleman, 'The European Court of Justice', 39 ff.

In addition, the Weser ruling (C-461/13), of the Court of Justice of the European Union (CJEU) concerning the interpretation of 'Deterioration of the status of a body of surface water' of Article 4(1)(a)(i) to (iii) of Directive 2000/60/EC help to find a clarification about the ascertainment of water damage.
In the Weser ruling, the Court linked the deterioration to individual quality elements instead of the overall water quality status by stating that deterioration occurs as soon as the status of at least one quality element falls by one class. In other words, the Court clarified that the environmental objectives of the WFD are legally binding on the member states when permitting new developments and a drop in any Biological Quality Element is considered an infringement of the WFD Directive.
In principle according to the WFD Directive, if the status is classified as being below 'good' (or if it is deteriorating from ' high ' to ' good '), actions are to be taken to restore the status. A recent ruling in the EU court 2 has demonstrated that this principle has legislative validity even for the risk of deterioration of individual BQEs (Paloniitty 2016). Assessments of overall ecological status, and of individual BQEs, are used to support decisions about programmes of measures and to identify which measures should be taken to restore the status.[57]

[57] Paloniitty, 2016, The Weser Case: Case C-461/13 BUND V GERMANY, Journal of Environmental Law