Chapter 3
Step 1: Performing an Initial Evaluation

Joshua Lipton and Kate LeJeune

Abstract Before initiating a formal equivalency analysis, the first step in the process typically will entail conducting an initial evaluation of the problem. The objective of the initial evaluation is to determine whether an equivalency analysis should be performed and, if so, the appropriate level of detail for the analysis. Determination of whether an equivalency analysis should be initiated will include a preliminary determination of whether:

- The Environmental Liability Directive (ELD) or other relevant legal framework is applicable to the incident.
- Natural resources are likely to have been damaged as a result of an incident;
- Damages to natural resources are likely to have been significant, as defined by the ELD and relevant national legal frameworks.
- Complementary or compensatory remediation might be needed to offset damages; and
- Equivalency analyses are appropriate to the selection and scaling of remediation.

If primary remediation is undertaken, its timing and anticipated outcomes should be considered during the initial evaluation. Consideration of the influence of primary remediation is integral to developing equivalency analyses. The initial evaluation may also involve identification of the Competent Authorities and their implementation agencies, responsible operators, and other stakeholders that may have a role in the process, either in a public review capacity, or through establishment of cooperative relationships between operators, Competent Authorities, and the affected public. In this chapter, we identify typical elements of an initial evaluation. As each incident is unique, the recommended elements presented here are intended to guide rather than being prescriptive.

J. Lipton (✉)
Abt Associates, 1881 Ninth St., Suite 201, Boulder 80304, CO, USA
e-mail: Josh_Lipton@abtassoc.com

K. LeJeune
Le Moulin du Siffré, 66730 Rabouillet, France
e-mail: klejeune@icloud.com

J. Lipton et al. (eds.), *Equivalency Methods for Environmental Liability*,
https://doi.org/10.1007/978-90-481-9812-2_3

Keywords Initial evaluation · Data availability · Remediation planning
Appropriate scale of assessment

3.1 Introduction

Natural resources can be damaged by various kinds of incidents. An incident could be a chemical release, spill, discharge, or emission; physical impacts or destruction; an introduction or release of a biological agent or entity (e.g., a genetically modified organism or an invasive non-native species); a combination of these; or a by-product, cascading effect, or synergistic effect of a chemical or physical incident.

Once an incident has occurred, the first step in equivalency analysis generally will entail an initial evaluation of the problem. The objective of this initial evaluation is to determine whether an equivalency analysis should be performed and, if so, the appropriate level of detail for the analysis (see Box 3.1, which summarises the key issues that need to be taken into account during this Step of an equivalency analysis).

Box 3.1: Key Issues and Actions in Performing an Initial Evaluation
The fundamental objective of the initial evaluation is to determine whether an equivalency analysis should be performed and, if so, the appropriate level of detail of the analysis. Key questions to answer during the initial evaluation include:

- Are natural resources likely to have been (to be) damaged by an incident covered by the Environmental Liability Directive (ELD) (or other relevant Directives)?
- Are damages likely to be significant (to be determined by the Member States but likely including considerations about extent, severity, and duration of damages)?
- Will primary remediation fully compensate for environmental damages?
- Will complementary or compensatory remediation be needed to offset losses?
- Are services to humans likely to have been or will be affected by the damage?
- What is the appropriate level of detail of the assessment?

The following steps are typically part of the evaluation process (see Fig. 3.1):

1. Identify the relevant Directive(s);
2. Describe the incident;
3. Identify available data;

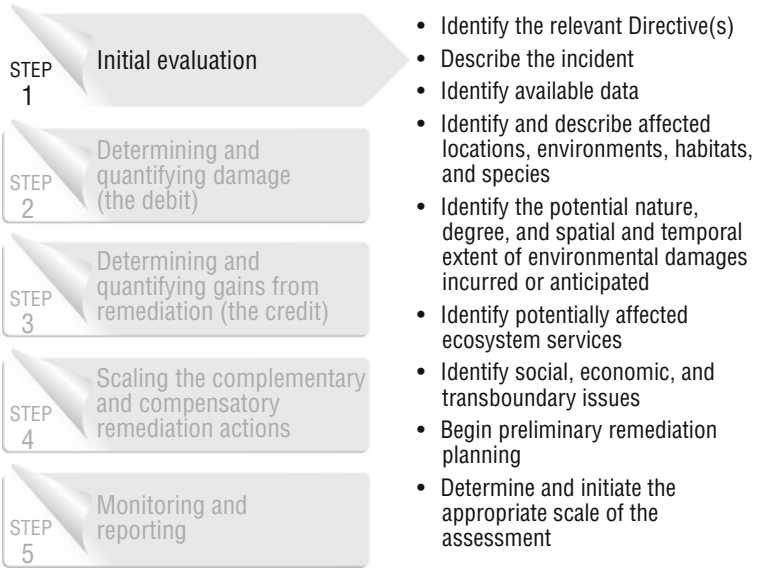

Fig. 3.1 Step 1 of equivalency analysis

4. Identify and describe affected locations, environments, habitats, and species;
5. Identify the potential nature, degree, and spatial and temporal extent of environmental damages incurred or anticipated;
6. Identify potentially affected ecosystem services;
7. Identify social, economic, and transboundary issues;
8. Begin preliminary remediation planning; and
9. Determine and initiate the appropriate scale of the assessment.

To complete these steps, a rapid compilation of available information is typically conducted. These might include conducting a site visit; reviewing literature, databases, reports, and internet sources; and consulting incident responders and experts such as resource managers.

It is important to note that the information collected through the preliminary evaluation may be necessary to determine whether or not a specific incident is covered by the Environmental Liability Directive (ELD) or other relevant legal framework. Therefore, it is not necessary to conclude that an incident is covered by the ELD before conducting a preliminary evaluation.

3.2 Identification of Relevant Directives

The ELD refers to several distinct Directives that describe the resources to which the ELD applies. The appropriate Directive (or enabling national law) should be identified to ensure that the activity that caused the environmental damage is covered. Proper identification also ensures that the appropriate evaluation criteria are applied when the incident is assessed and the remediation scaling is performed. In some cases, more than one Directive can be relevant, depending on the nature of the incident and damage. For details of the Directives relevant in this context, please see Chap. 1.

3.3 Description of the Incident

Details of the incident can inform questions about the potential type and duration of damages, causality and liability, and resource recoverability. The description of the incident should be as detailed as is practical given readily available information. It is important that analysts consider applicable Directives or national legislation when evaluating potential liabilities associated with different types of incidents.

For *ex ante* damages (e.g., in the context of the Environmental Impact Assessment Directive (EIAD), Habitats Directive (HD), and Wild Birds Directive (WBD), plans and designs can provide useful information about the types, timing, severity, and location of anticipated adverse effects. Depending on the situation, it might be prudent to make conservative assumptions about adverse effects. Such assumptions would ensure that an unanticipated outcome does not cause an inordinate difference in the amount of offsetting remediation needed.

For *ex post* damages (e.g., in the context of the ELD), details on the nature, timing, location, and duration of the incident should be compiled. Gathering relevant details could involve preliminary investigatory work. For accidents such as spills and releases, environmental conditions that affect transport and exposure in the environment should be described. In addition, potential adverse effects that might be related to the incident should be identified, and data relevant to determining whether there is a causal link between the incident and potential adverse effects should be identified and considered. During the preliminary evaluation phase, it may be preferable to identify a broad suite of potential adverse effects rather than to risk overly circumscribing potential consequences of an incident.

In identifying the nature of the incident, analysts should attempt to identify those characteristics that may influence the nature and extent of potential adverse effects and will help inform decisions regarding remediation. Types of data and information that might be gathered during the initial evaluation include:

- A detailed description of the release, incident, or project;
- The timing and duration of the event;

- The specific nature of the chemical, physical, or biological stressors associated with the incident;
- Weather conditions;
- Any emergency response actions, primary remediation, or planned mitigation that has already been performed;
- Mapping, tracking, video, and photography/imagery (ground, aerial, or satellite imagery, as appropriate) of the incident, release, or spill;
- Samples of materials that might disperse, dissipate, degrade, denature, or be diluted;
- Supporting environmental data (e.g., temperature, streamflows, pH, dissolved oxygen content, currents, tides, other potential transport vectors);
- Collection of carcasses or data related to transient effects on resources;
- Notes related to scavenging of carcasses;
- Techniques and procedures used to collect ephemeral data;
- Identification of potentially exposed or affected resources and services (including ecological and human services);
- Identification and enumeration of human uses potentially affected by the incident or release;
- Data on the physical, biological, or chemical quality of affected natural resources;
- Data on community ecology relevant to food-chain transfer potential; and
- Baseline information.

Not all of the data or information listed above will be relevant to all incidents. Therefore, it is important that analysts consider the type of preliminary data needed to characterise a specific incident at a given location.

3.4 Preliminary Identification of Available Data

The initial evaluation should include preliminary identification of available data relating to the location of the incident and its effects. This step will assist the Competent Authority in determining the feasibility, ease, and level of detail of a possible assessment. This preliminary identification should include:

- Consideration of the types of available data;
- Quality and quantity of such data;
- Temporal and spatial coverage of data;
- Whether data regarding baseline conditions are available;
- Other information relevant to the identification and description of affected resources and services; and
- Data relevant to determining the degree and extent of the damage, locations, environments, habitats, species, functions, and services.

3.5 Preliminary Identification and Description of Affected Locations, Environments, Habitats, and Species

To aid in the evaluation of potential damages, a preliminary identification of potentially affected locations, environments, habitats, and species should be undertaken. This will facilitate identification of the resources most likely to have been affected or to be at risk from the incident. It might be necessary to evaluate potential resource or habitat scarcity; local or regional importance; and conservation status of potentially affected species, critical habitats, and other local or regional factors that might increase or decrease the likelihood or extent of damage.

Initial evaluation steps might include a site visit; review of incident reports and interviews with any incident responders; review of the literature, databases, and internet sources to identify information relevant to resources (potentially) at risk; and definition of the baseline ecology, biology, and physical attributes of the affected resources. Experts could be contacted for additional information. For example, resource managers often have unpublished data that can be used to characterise baseline conditions and identify potentially affected resources.

3.6 Preliminary Identification of Nature, Degree, and Spatial and Temporal Extent of Environmental Damage

The initial evaluation should include a preliminary identification of the potential nature, degree, and spatial and temporal extent of environmental damage incurred or anticipated. This evaluation could include direct observations (e.g., physical impacts, fish kills, chemical sheens, etc.), descriptions of analogous situations in which damage has been characterised, interviews with incident responders or knowledgeable local observers, accession of satellite or other remote sensing imagery, literature syntheses, comparisons of chemical concentrations with toxicity thresholds, and simple modelling. The preliminary evaluation should attempt to answer the following questions:

- Have resources been exposed to environmental stressors because of the incident?
- What habitats, communities, and species are likely to be at greatest risk of harm?
- Is there direct evidence of damage (e.g., fish kills)?
- What is the nature of potential damage (e.g., mortality, habitat loss, population reductions, contamination that limits productive capacity of habitats)?
- How spatially widespread are potential damages?
- How long might damage persist? Is damage likely to continue into the future?

3.7 Preliminary Identification of Potentially Affected Services

Ecosystem services are the functions performed by a natural resource for the benefit of the public and/or other natural resources. Preliminary identification of damaged services should include evaluation of potentially affected ecosystem services, including ecological services and human use and non-use services. To identify potentially affected ecological functions, the ecology and biology of potentially affected species, communities, habitats, and landscapes should be considered. Examples of ecological services can include:

- Habitat services;
- Maintenance of population dynamics, including consideration of reproductive capacity; maintenance of critical life-stages; age-size distributions; maintenance of necessary reproductive, rearing, foraging, refugia, or other critical habitats;
- Uses of areas as migration corridors;
- Uses of areas as stopover habitats during migration;
- Food chains and nutrient cycling processes that supply energy to sustain populations, habitats, communities, and landscapes;
- Preservation of biodiversity (including at the individual [e.g., genetic], species, population, and habitat levels);
- Alterations in community composition;
- Alterations in landscape dynamics (e.g., edge effects, landscape heterogeneity, thermal properties);
- Loss of the assimilative capacity of wetlands or riparian zones to attenuate contaminants and erosive energy; and
- Reductions in the ability of watersheds to regulate water quality.

In gathering information about potentially affected services, analysts should keep in mind the scarcity or abundance of the services, their regional importance to humans or to the ecosystem, and potential future threats to the area or to resources that provide similar services.

3.8 Preliminary Identification of Social, Economic, and Transboundary Issues

If there are concerns about environmental justice or socially targeted service losses, it might be necessary to obtain existing data that characterises the social and economic landscape of the area under investigation. If the effects of the incident span jurisdictional boundaries, enabling laws, regulations, guidelines, and requirements may vary within the assessment area. Underlying social, economic, and political factors that influence resource use, management, and service flows can also vary. Likewise, if the effects of the incident cross unofficial, but perceived, social or

economic geographic boundaries, service losses might vary spatially as a function of these boundaries, in addition to varying with the distribution of contaminants and physical stressors.

3.9 Preliminary Remediation Planning

Remediation planning typically should begin as soon as possible after an incident. Planning includes consideration of whether to conduct primary remediation and, if so, the appropriate nature and extent of primary remediation alternatives. The Toolkit presented in this book does not address primary remediation directly. However, the choice of whether to conduct primary remediation or not and the anticipated benefits of primary remediation are critical when estimating the complementary and compensatory remediation that might be needed. In addition, if the scope of primary remediation can be enhanced to ensure the return of resources and services to baseline conditions (either more completely or more rapidly), then additional remediation might not be needed. Questions to address in the initial evaluation include the following:

(i) *Will primary remediation be conducted?*

Primary remediation is not always feasible or prudent. If conditions at the incident site are endangering human health or safety, certain primary remediation actions may be deemed unacceptable. Similarly, if primary remediation actions are unlikely to substantially benefit the environment or if actions that could be taken are likely to cause substantial collateral damage, primary remediation might not be desirable.

If a decision is made to conduct primary remediation actions, the nature of these actions potentially can be tailored to facilitate the recovery of damaged resources to baseline conditions. If a rapid primary remediation action can remove threats to public health and welfare or the environment and can also return resources rapidly to baseline condition, further complementary or compensatory remediation activities may not be necessary.

By taking the following actions, which can be incorporated into primary remediation goals, the need for complementary and compensatory remediation potentially could be reduced:

- Accelerate recovery to baseline conditions (rather than simply reduce risks to human health or the environment) by reestablishing, for example:
  - the quantity and quality of surface water flow that occurred before the incident;
  - the quantity (depth) and quality (nutrient cycling ability, nutrient availability; water storage capacity) of soil that was present before the incident;
  - baseline vegetation community composition and structure;

  - components of the food web that support fish and wildlife, such as invertebrate communities essential to insectivorous fish and wildlife, and small mammal communities essential for raptors and carnivorous mammals; and
  - habitats that might have been degraded as a result of damages caused by the incident.

- Reestablish access to the recreational services formerly provided by the area.
- Accelerate the recovery of resource uses, such as fishing or beach-going.
- Reestablish access to commercial services provided by the resources.

Additional primary remediation actions that might be taken to address ecosystem services might include the following:

- Remove contaminated soils to restore baseline soil chemistry (rather than remove contaminants to a clean-up level that differs from baseline) to ensure that soil biota, plants, and soil processes are not adversely affected by residual contamination above baseline concentrations;
- Regrade, recontour, and revegetate with native species to accelerate natural recovery after disturbance related to primary remediation actions; and
- Enhance aquatic habitat through riparian vegetation planting or in-stream work in order to restore a system to its baseline physical condition, or better, after primary remediation actions.

(ii) *Will primary remediation restore baseline conditions quickly?*

If primary remediation actions are expected to restore resources to baseline conditions quickly and completely, there may be no need to consider complementary or compensatory remediation actions. If it is clear that the cost (monetary or otherwise) of estimating the marginal benefit of additional remediation (through equivalency analysis) will exceed the benefit to be gained from the additional remediation, a decision should be made early on whether further analysis of damage and remediation is necessary.

(iii) *Are complementary or compensatory remediation actions appropriate and feasible?*

When primary remediation is not expected to restore baseline conditions quickly and fully, additional off-site remediation (either complementary or compensatory or both) may be needed to return resources and services to baseline condition and/or compensate for interim damages. This situation may arise when:

- Primary remediation, even if designed to restore baseline conditions, will not be conducted until some time in the future;
- Primary remediation, even if designed to restore baseline conditions, will involve actions that take a long time to complete;
- Primary remediation, even if designed to restore baseline conditions, will entail a lengthy recovery period; or

- Primary remediation will not result in a complete recovery of resources/services to baseline conditions.

In the above cases, compensatory remediation may be needed to offset the interim losses that would occur between the time of the incident and the time that baseline conditions are restored. In addition, in the latter situation, complementary remediation is needed to offset the difference between conditions at the site following completion of the primary remediation and baseline conditions. As a practical matter, remediation projects that are implemented to complement and compensate often can be one and the same, particularly if the services to be replaced are similar.

(iv) *Should economic valuation be considered?*

If the lost resources and services are not amenable to any type of remediation, either on- or off-site, an economic valuation might be appropriate. This could occur in cases where the lost resources and services are particularly unique and irreplaceable or where restoring them is technologically infeasible or cost-prohibitive. These economic approaches might be useful when equating public values of loss with gain of different types of resources and/or services ('out-of-kind') or when determining compensatory payments.

For example, monetary compensation for damages might be used to benefit the environment in a way that is not directly related to the losses but is valued equally by the affected public nonetheless. Note that this is not simply money changing hands, it is compensation payment used for environmental improvements that are not necessary directly comparable to the damaged resources or services. Surveys and assessments of individuals' values might be more informative and the resulting out-of-kind improvements more desirable than excessively costly or risky in-kind resource or service remediation projects.

Economic methods might also be preferable if a unique environment that has no equivalent in the area is damaged or an area of such an extent or location that equivalent remediation may be disproportionately costly or even impossible (e.g., sufficiently large areas of the relevant habitat may not exist within a given area) is damaged. Similarly, complementary and compensatory restoration of abundant resources or services might be undesirable. However, funding for a smaller out-of kind project to compensate for a scaled loss might be highly valued by the public. In cases where the replacement project is out-of-kind or ecologically-based adjustment factors are not readily available, economic valuation methods might be one way to equate public values of the loss and gain.

3.10 Initiating and Determining the Appropriate Scale of the Assessment

Based on the preliminary evaluation described above, additional work to scope complementary and compensatory remediation using an equivalency approach may be needed and warranted if the following conditions apply:

- An incident covered by the ELD or related Directives and/or Member State-specific frameworks/regulations has occurred or may occur (including the 'imminent threat' conditions mentioned in the ELD);
- The quantity and concentration of contaminants released or the degree of physical damage are sufficient to potentially cause harm to natural resources;
- Natural resources, or services provided by the natural resources, are potentially damaged;
- Primary remediation actions will not adequately remedy the harm resulting from the incident;
- Opportunities potentially exist off-site to conduct complementary and compensatory remediation projects; and
- Data necessary to quantify damages and conduct remediation planning and scaling are available, can be collected at reasonable cost, can be modeled, or can be reasonably estimated.

Next, a decision should be made about the level of effort to expend in performing the assessment. Depending on the degree, severity, duration, and extent of impacts; the sensitivity or scarcity of affected resources and services; and other transboundary, cultural, and political issues, the assessment could be expedited by using only existing data or models or extended by conducting additional data collection and analysis. Also, uncertainty in the different steps of the equivalency analysis will need to be considered as early as possible.